



Department of Energy

Argonne Site Office
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Argonne, Illinois 60439

FEB 04 2009

Dr. Donald Levy
Vice President for Research and
For National Laboratories
Chief Executive Officer
UChicago Argonne, LLC
5800 South Ellis Avenue
Chicago, IL 60637

Dear Dr. Levy:

**SUBJECT: DEPARTMENT OF ENERGY (DOE) FISCAL YEAR (FY) 2008 YEAR-END
EVALUATION OF UCHICAGO ARGONNE, LLC FOR THE MANAGEMENT
AND OPERATION OF ARGONNE NATIONAL LABORATORY
(ARGONNE) CONTRACT NO. DE-AC02-06CH11357**

Enclosed is the Department of Energy (DOE) FY 2008 Year-End Evaluation Report of UChicago Argonne, LLC's management and operation of Argonne. The FY 2008 Performance Evaluation Measurement Plan (PEMP) serves as the basis for this evaluation. A grade of "B+" is assigned to performance results that meet the "expected" performance for a Goal/Objective. Grades above a "B+" indicate performance that exceeds expectations, while lower grades indicate performance which does not meet expectations.

The DOE FY 2008 evaluation concluded that performance generally met or exceeded expectations within the Science and Technology (S&T) Goals (Goals 1-3) as evidenced by the evaluations provided by each of the DOE HQ Program Offices. Performance on the Management and Operation (M&O) Goals (Goals 4-8) met or exceeded DOE's expectations with the exception of Goal 5 – Integrated Safety, Health, and Environmental Protection.

As compared to FY 2007 grades, the S&T Goals stayed essentially the same except for Goal 3 – Science and Technology Research Project/Program Management, which is slightly lower. The majority of the M&O Goals slightly improved except for Goal 8 – Integrated Safeguards and Security Management and Emergency Management Systems, which was slightly lower than FY 2007, however, met expectations.

Based on the FY 2008 evaluation, the total S&T score is 3.6/A-, and the total M&O score is 3.3/B+. These scores result in UChicago Argonne, LLC earning 94 percent of the maximum earnable performance-based fee of \$5,300,000. Therefore, UChicago Argonne, LLC is authorized to draw fee in the amount of \$4,982,000 for the FY 2008 performance period.

Dr. Donald Levy

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FEB 04 2009

We look forward to continuing to work with you in FY 2009 to enhance the value of the Laboratory to the missions of DOE and the Nation.

Sincerely,



Sergio E. Martinez
Contracting Officer



Ronald J. Lutha
Site Manager

Enclosure:
As Stated

cc: R. Rosner, ANL, w/encl.
S. Richardson, ANL, w/encl.
E. Isaacs, ANL, w/encl.
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U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy

Performance Evaluation Report of the
University of Chicago for
Management and Operations of Science and Technology at the

Argonne National Laboratory

For the period October 1, 2007, to September 30, 2008

EXECUTIVE SUMMARY

The Office of Energy Efficiency and Renewable Energy (EERE) participates in the award-fee evaluation process to assess the performance of National Laboratories 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 University of Chicago's operation of the Argonne National Laboratory (ANL). It assesses ANL's performance of work for programs in EERE from October 1, 2007, to September 30, 2008.

Each reporting EERE program that obligated \$1.0 million or more to ANL 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 ANL as of August 31, 2008, as the weighting factor.

The following EERE programs submitted evaluations: Biomass (BP); Hydrogen, Fuel Cells and Infrastructure Technologies Program (HFCIT); Industrial Technologies Program (ITP); Solar Energy Technologies Program (Solar); and Vehicle Technologies Program (VTP).

EERE rated ANL's performance for fiscal year 2008 with a score of 3.93 for Goal 1: Accomplish Mission; 3.94 for Goal 2: Effective and Efficient Operation of Facilities; and 3.85 for Goal 3: Effective Science and Technology Research Project and Program Management. ANL's total score for fiscal year 2008 is 3.91.

Numerical Grades by Performance Goal	Goal 1: Accomplish Mission	Goal 2: Effective and Efficient Operation of Facilities	Goal 3: Effective Science and Technology Research Project and Program Management
Biomass	4.10	3.00	3.83
Hydrogen, Fuel Cells and Infrastructure Technologies Program	3.96	3.40	3.87
Industrial Technologies Program	3.54	3.65	3.77
Solar Energy Technologies Program	3.55	3.50	3.47
Vehicle Technologies Program	3.95	4.30	3.87
Weighted Average Grade	3.93	3.94	3.85
Final Numerical Score	3.91		

Grades of 3.3 or higher signify that ANL'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.

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

INTRODUCTION

This evaluation has been prepared as part of the DOE contractual obligation to assess University of Chicago's performance for Management and Operations of Science and Technology at ANL. Specifically, it assesses ANL'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.

This evaluation report, covering the period from October 1, 2007, through September 30, 2008, comprises five sections. The first section highlights the given performance goals, objectives and measures provided to each DOE EERE technical program office. The second section addresses the process followed to grade the laboratory's performance. The third section presents the overall grades resulting from the evaluation. The fourth section lists key achievements and areas of concern. The fifth and final section provides guidance for the next performance period.

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: Accomplish Mission
 - Objective 1.1: Accomplish Mission;
 - Objective 1.2: Leadership;
 - Objective 1.3: Produce high quality, original and creative results that advance science and technology (recognition of science and technology breakthroughs);
 - Objective 1.4: Delivery.

- Goal 2: Effective and Efficient Operation of Facilities
 - Objective 2.1: Provide effective and efficient operation of facilities supporting the EERE program.
- Goal 3: Effective Science and Technology Research Project and Program Management
 - Objective 3.1: Effective program vision and leadership.
 - Objective 3.2: Effective and efficient science and technology project and program planning and management.
 - Objective 3.3: Effective and efficient communications and responsiveness to EERE and Project Management Center (PMC) needs.

EERE also adjusted the Performance Measures under Goal 1 to include success in meeting program milestones and other criteria appropriate to applied research. EERE uses only one Performance Objective under Goal 2, namely the effective and efficient operation of facilities to support EERE programs. EERE only constructs facilities at the National Renewable Energy Laboratory (NREL).

EVALUATION PROCESSES: NUMERICAL SCORES AND AVERAGING

After collecting the scores, EERE weighted them against specific program obligations for fiscal year 2008 at ANL, as reported in the DOE Standard Accounting and Reporting System as of August 31, 2008. See the following table for total funding allocated to each program.

Program Office	Year-To-Date Obligations at ANL as of August 31, 2008
Biomass	\$2,265,000
Hydrogen, Fuel Cells and Infrastructure Technologies Program	\$14,707,354
Industrial Technologies Program	\$1,745,003
Solar Energy Technologies Program	\$1,400,000
Vehicle Technology Program	\$31,027,676
Total	\$51,145,033

EERE then computed a weighted average score for each Performance Goal. The following example illustrates the algorithm used to compute a weighted average.

Program	Numerical Score	Fiscal Year 2008 Obligations	Weighted Score
One	4.3	\$2,000,000	8,600,000
Two	3.9	\$20,000,000	78,000,000
Three	3.3	\$6,000,000	19,800,000
SUM		\$28,000,000	106,400,000
Weighted Average (Sum of Weighted Score/Sum of RY 2008 Obs)			3.80

OUTCOME BY PERFORMANCE GOAL

EERE rated ANL's performance for fiscal year 2008 with a score of 3.93 for Goal 1: Accomplish Mission; 3.94 for Goal 2: Effective and Efficient Operation of Facilities; and 3.85 for Goal 3: Effective Science and Technology Research Project and Program Management.

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:

Numerical Grades by Performance Goal	Goal 1: Accomplish Mission	Goal 2: Effective and Efficient Operation of Facilities	Goal 3: Effective Science and Technology Research Project and Program Management
Biomass	4.10	3.00	3.83
Hydrogen, Fuel Cells and Infrastructure Technologies Program	3.96	3.40	3.87
Industrial Technologies Program	3.54	3.65	3.77
Solar Energy Technologies Program	3.55	3.50	3.47
Vehicle Technologies Program	3.95	4.30	3.87
Weighted Average Grade	3.93	3.94	3.85

Based upon the scores assigned by each program office for each performance goal and objective, ANL's overall final numeric score is 3.91 as calculated in the table below:

Goal	EERE Weight	Weighted Numerical Score (All Programs)	Portion of Final Score
Goal 1: Accomplish Mission	60%	3.93	2.36
Goal 2: Effective and Efficient Operation of Facilities	10%	3.94	0.39
Goal 3: Effective Science and Technology Research Project and Program Management	30%	3.85	1.16
Final Numerical Score		3.91	

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

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

SELECTED EXAMPLES OF ACHIEVEMENTS AND DEFICIENCIES

EERE, in the order of each Performance Goal, has highlighted selected major achievements recognized throughout fiscal year 2008. It also addresses certain areas within the ANL research and development (R&D) environment needing management attention.

GOAL 1: ACCOMPLISH MISSION with the following objectives:

- Accomplish Mission;
- Leadership;
- Produce high-quality, original and creative results that advance science and technology (recognition of science and technology breakthroughs); and
- Delivery.

SIGNIFICANT ACHIEVEMENTS

- **Biomass**

- **Objective 1.1**

- ANL's Greenhouse Gases, Regulated Emissions and Energy Use in Transportation (GREET) model has been used by many organizations for evaluating the lifecycle greenhouse gas emissions associated with a variety of fuels, including biofuels. The model is available to the public and there are approximately 9,000 users of GREET around the world. The model is being utilized by many organizations both in the private sector and in government agencies for state-of-technology assessments, regulatory analysis, and international comparisons. The program has furnished invited speakers, conference chairs, or recognized

experts in a number of areas as follows: plenary speech at Illinois Agronomy Day, panel chair on chemicals from biomass at Illinois Biotechnology Industrial Organization's annual meeting, and the Illinois Biotech Group's Council for Chemical Research conference on Biobased Feedstocks. ANL staff gave an invited presentation on biomass at the first Midwest Alternative Energy Venture Forum, gave an invited panel presentation on commercial biomass opportunities at the Chicago Fed Reserve's First Clean Tech Forum, and served on the steering and/or advisory committee for several Midwest biomass R&D centers.

Objective 1.2

- The U.S. Environmental Protection Agency is using the GREET model as one of its analytical tools to determine the lifecycle greenhouse gas emissions associated with biofuels. The California Air Resources Board is also using the model as part of its proposed Low Carbon Fuel Standard regulation. General Motors (GM) has endorsed the model as the "gold standard" in the lifecycle evaluation area. Michael Wang of ANL has worked collaboratively with the U.S. Department of Agriculture to incorporate better data and methodologies into the model. There is interest from the Department of Defense to utilize this framework for the evaluation of greenhouse emissions from aviation fuels.

Objective 1.3

- Under the leadership of [REDACTED], the GREET model has undergone significant improvements in the last few years. There is better representation of distillers' dry grains with solubles (DDGS) in the model. DDGS is an important co-product of the ethanol conversion process and accurate accounting of this animal feed supplement has significant implications in terms of accounting for greenhouse gas impacts of ethanol. [REDACTED] has also begun the process of accounting for direct and indirect land use changes associated with biofuels. This work is being done in a collaborative effort between Argonne and Purdue University. Incorporation of land use changes in the model will make GREET an even more valuable tool for greenhouse gas analytical activities.

Objective 1.4

- [REDACTED] and [REDACTED] at Argonne have been extremely responsive to quick turn-around tasks as required by DOE headquarters. These tasks often arise at the last minute and require careful review and rapid response. Headquarters staff can rely upon [REDACTED] and [REDACTED] to provide this type of response. Even when on travel, they can be available for discussions and questions. [REDACTED] has responded within hours from China to e-mail enquiries from [REDACTED].

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

Objective 1.1

- Task Title: Non-Platinum Bimetallic Cathode Electrocatalysts. The following accomplishments were realized in fiscal year 2008:
 - Calculated preferred reaction pathways and barriers for two possible O₂ reduction reaction mechanisms on slabs of pure metals using density functional theory: a dissociative mechanism through -OH formation and an associative mechanism through -OOH formation.

- Calculated reaction force field potentials for Pd (palladium) and PdCu (a palladium-copper alloy).
 - Determined effect of Pd particle size (1.2 to 20 nm) on oxygen reduction reaction (ORR) kinetics--5 nm particle size shows highest ORR mass activity.
 - Synthesized and characterized a series of PdCu, PdNi (a palladium-nickel alloy), PdFe (a palladium-iron alloy) catalysts via co-impregnation; determined the effect of Pd to base metal ratio, post-deposition heat treatment temperature and atmosphere, and acid treatment.
 - Developed a strong electrostatic adsorption technique for PdCo (a palladium cobalt alloy) and achieved Co core-Pd shell structure.
 - Developed a colloidal technique for PdCu; synthesized and characterized a series of colloidal PdCu catalysts.
 - Determined that Cu modifies the valence band density of states of Pd.
 - Achieved factor of 3.75 improvement in ORR activity of PdCu/C catalyst by using alternative colloidal technique.
 - Achieved ORR mass activity of approximately 75 percent that of commercial Pt/C with PdCu/C catalyst (@800 mV).
- Task Title: Polymer electrolyte membrane fuel cell using Aligned Carbon Nanotubes as Electrodes in membrane electrode assemblies (MEAs). Methods of preparing dense, uniform aligned carbon nanotubes (ACNT) layers with adjustable thickness were successfully developed using chemical vapor deposition (CVD) technique. A variety of solution impregnation methods were developed to catalyze ACNTs with good metal dispersion. A co-CVD process was developed to functionalize ACNT by directly depositing Pt through a gas phase reaction. MEA fabrication method was successfully developed to transfer ACNT to Nafion® membrane. ACNT-MEA showed improved performance over commercial product in single cell tests.
 - Task Title: Fuel Cell Testing. Characterized a 1-kW stack for sensitivity to operating conditions. The maximum power the stack developed was 1332 Watts at ambient pressure, achieving a thermodynamic efficiency of 53.8 percent. At 25 percent of rated power, the efficiency increased to 65.6 percent. ANL characterized two 5-kW complete systems. ANL staff participated in and made technical presentations at the second meeting of the International Standards Organization (ISO) Working Group 11 under Technical Committee 105 of the International Electrotechnical Commission, held on December 17-18, 2007, in Frankfurt am Main, Germany. The goal of this international group is to draft the technical specification of a single-cell test protocol. Representatives from six countries attended. The lab upgraded the test facility by replacing the air supply subsystem to provide clean, hydrocarbon-free air to the fuel cells or systems under test.
 - Task Title: System Level Analysis of Hydrogen Storage Options.
 - Updated the storage capacity of the cryo-compressed Gen 2 system with data from technology developers.
 - Revised analysis of the storage capacity of the cryogenic activated carbon system to reflect 2010 and 2015 delivery pressure targets.

- Determined the intrinsic capacities, thermodynamics, and water and heat management requirements for on-board sodium borohydride hydrolysis (SBH) storage system.
 - Evaluated the overall fuel cycle efficiency of SBH regeneration using flowsheets proposed by Millennium Cell and Rohm and Haas, and provided input to DOE and the independent Systems Integrator on DOE's go/no-go decision for SBH.
 - Conducted systems analysis to determine the extrinsic capacities, thermodynamics, and decomposition kinetics of alane (aluminum hydride) in slurry form.
 - Completed preliminary energy and efficiency analysis of off-board regeneration requirements.
 - Conducted preliminary analysis of regeneration of an organic liquid carrier and determined the overall fuel cycle efficiency.
 - Performed preliminary energy and efficiency analysis of ammonia borane (AB) regeneration using a scheme developed by the DOE Chemical Hydrogen Storage Center of Excellence.
 - Identified processes that consume a significant amount of energy in regeneration and provided feedback to the Center.
- Task Title: Fuel Cell Systems Analysis.
 - Analyzed the performance of stacks with the 3M nanostructured thin film catalysts and determined the optimum operating pressures and temperatures.
 - Analyzed experimental data for Honeywell's integrated compressor-expander module (CEM) and developed a scalable compressor map and scalable expander maps for different nozzle areas.
 - Proposed and analyzed alternative CEM configurations capable of approaching the maximum parasitic power target of 5.4 kW for an 80-kW fuel cell system.
 - Analyzed the performance of advanced radiators with metal foams, high-density louver fins and microchannel plain fins.
 - Identified a compact radiator design with the lowest pumping power.
 - Analyzed the performance of enthalpy wheel humidifiers at part load and at different rotational speeds.
 - Analyzed the performance of a membrane humidifier and determined the conditions of optimum operating temperature and pressures at part load.
 - Compared the performance of two fuel cell systems, one with an enthalpy wheel humidifier and the other with a membrane humidifier.
 - Hydrogen Quality Issues for Fuel Cell Vehicles: Conducted a fuel quality modeling workshop to discuss pressure swing adsorption (PSA) and fuel cell impurity effects modeling (August 2007). Participated in ISO Working Group 12 meetings and held in-depth discussions on modeling impurity effects on fuel cell systems (November 2007 and April 2008). Presented and discussed Hydrogen Quality Working Group activities at several FreedomCAR and Fuel Partnership's Technical Team meetings and at other forums (May 2007, June 2007, October 2007, November 2007, January 2008, and April 2008).

Developed PSA performance models for different design and operating conditions and levels of various contaminants in product H₂. Developed methodology to evaluate effect of impurity level on hydrogen production cost, using H₂A.

- Hydrogen Well-to-Wheels Analysis: Supported early market analysis of fuel cell powered fork lifts and distributed power with comparative well-to-wheel analysis of competing technologies. The GREET model was modified to include these early market pathways. The project milestone was achieved. Well-to-wheel analysis was developed for gasoline and hydrogen plug-in hybrids. Various regional electrical supplies and hydrogen production pathways were included in the analysis. The GREET model was updated to include the plug-in vehicle option. The project milestone was achieved.
- Hydrogen Delivery Modeling: The second version of the Hydrogen Delivery Scenario Analysis Model (H₂A Delivery model) was issued in March.

Objective 1.2

- Argonne organized and hosted meetings of DOE's Hydrogen Quality Working Group and a workshop on Hydrogen Fuel Quality with participation from Canada and Japan. Argonne led and coordinated the DOE Hydrogen Storage Systems Analysis Working Group. Argonne organized and hosted a market transformation workshop for the deployment of fuel cells at national lab facilities. As examples of collaborative efforts that enhance the effectiveness and productivity of the Laboratory's efforts, Argonne conducted collaborative hydrogen and fuel cell research with numerous industry and university partners, including Los Alamos National Laboratory, Oak Ridge National Laboratory, NREL, Chevron, BP, Shell, GM, Ford, Chrysler, Caltech, University of Chicago, University of Nevada, Las Vegas, Johns Hopkins University, University of Illinois, Northern Illinois University, Kettering University, Japan Institute of Energy, REB Research and Consulting, American Science and Technology, Chicago State University, General Electric, Taiwan Industrial Technology Research Institute, and International Energy Agency Fuel Cell Annex Participants. Argonne's work has opened new opportunities and changed the direction of research in the hydrogen and fuel cell fields. Argonne attracts the highest quality researchers, Post-Docs, and research partners.

Objective 1.3

- Argonne inventions and patents are indicative of the original and creative outputs resulting from Argonne's EERE-sponsored work. Eight invention disclosures were documented in fiscal year 2008. Five patent applications were filed and two patents were granted in fiscal year 2008. Argonne staff presented invited talks at major national and international conferences that have generated significant interest and awareness in the hydrogen and fuel cell field.

Objective 1.4

- Argonne conducted research under 32 agreements in 18 project areas during fiscal year 2008 for the HFCIT Program. Multiple milestones per agreement were defined in the Annual Operating Plan (AOP). Out of 81 total milestones, 76 milestones were completed on time or are on track to be completed on time. Quarterly technical reports, monthly cost reports, and inputs for the program annual report were submitted in a timely manner.

- **Industrial Technologies Program**

- **Objective 1.1**

- Argonne has demonstrated excellent applied research capabilities in the area of advanced reciprocating engine system R&D through the use of state-of-the art technical capabilities.

- **Objective 1.2**

- Argonne has shown that it is effective in responding to revisions in priorities with respect to the change from the Office of Electricity to EERE. They have established excellent collaboration with the leading private sector engine manufacturers.

- **Objective 1.3**

- Argonne has developed important understandings on elements critical to meeting the challenging goals of the advanced reciprocating engine systems (ARES) effort. Of particular note is the progress made in understanding laser-based ignition processes.

- **Objective 1.4**

- None

- **Solar Energy Technologies Program**

- **Objective 1.1**

- Good work.

- **Objective 1.2**

- Good work.

- **Objective 1.3**

- None

- **Objective 1.4**

- Argonne has met all its milestones.

- **Vehicle Technologies Program**

- **Objective 1.1**

- **Vehicle Systems:** The ANL Vehicle Systems Group consists of three major functional sections: Powertrain Modeling and Simulation, Component Hardware-in-the-Loop Testing, and Advanced Vehicle Performance Testing. Each element of ANL's testing disciplines is designed to address DOE's mission as stated in the plug-in hybrid electric vehicles (PHEV) R&D Plan. The combination of researcher skill sets, outstanding test facilities, and advanced instrumentation ensures world-class research capabilities. ANL's project design and technical deliverables were highly rated in DOE merit reviews in fiscal year 2008. Project progress reports were submitted regularly. ANL project reviews were presented to DOE management on a quarterly basis. In addition, Glenn Keller scheduled Vehicle Systems Group project updates with the DOE VTP for more in-depth descriptions of project outcomes every five weeks.

In support of DOE outreach and data dissemination requirements, ANL conducted more than 40 presentations on vehicle testing results and computer model simulations at industry gatherings, electric utilities, and to public, private, government and vehicle manufacturer groups. In further support of public dissemination requirements, ANL researchers gave interviews to local and national press organizations including Business Week, Automotive

News, MSNBC, Discovery Channel, Public Television, regional newspapers, and foreign press interests. Laboratory staff also acted as vehicle testing information resources to other government agencies such as the National Science Foundation, California Air Resources Board, Environmental Protection Agency, Department of Transportation, and Department of Defense.

- **Advanced Combustion and Emissions Control:** The funding support from the Advanced Combustion and Emissions Control program was split into the following four agreements: Fuel spray research using X-rays at the Advanced Photon Source, light duty engine combustion research using the GM 1.9 liter diesel engine, hydrogen fueled light duty engine research in collaboration with Ford and Sandia National Laboratories, and a Cooperative Research and Development Agreement (CRADA) effort on diesel particulate filter (DPF) with Corning and Caterpillar. The hydrogen fueled light-duty engine team demonstrated a pathway to achieve the 45 percent thermal efficiency goal of the VT Program. Successful completion of BMW Hydrogen 7 vehicle testing - project was initiated because of ANL's hydrogen engine expertise. Water injection on hydrogen engines was shown to significantly reduce nitrogen oxide emissions (50 percent and more). Exhaust gas recirculation will be implemented as a more practical solution. Joint publications between Sandia National Laboratories and ANL were based on close collaboration and the exchange of hardware (e.g. custom-designed fuel injectors). BMW R&D is interested in joining the Ford/ANL/Sandia consortium for hydrogen engine research. The on-going progress of fuel spray research using X-rays continues to be the large attraction of the worldwide research community and a top researcher from Bosch, the world's largest manufacturer of fuel injection systems, visited and worked with ANL researchers for six weeks. ANL initiated a new collaboration with the Engine Research Center (ERC) at the University of Wisconsin. A Ph.D. student from ERC will spend an extended period at Argonne in 2009 and will participate in spray measurements. The student will then use the data to validate and improve ERC's engine modeling code. Unprecedented assistance was given by GM. The GM engine is operating flawlessly and ANL expects to generate critical data in fiscal year 2009. The engine was extensively baselined to provide a complete stock vehicle-level engine performance map, which matched the GM original map to within 3 percent for power, load, fuel efficiency, and emissions performance. Peak brake thermal efficiency of the stock engine was verified to be 42 percent. Support received from GM includes a complete engine performance map to initiate the programming of an open engine controller, machining of a new cylinder head to accommodate endoscopic combustion chamber access, and machining 36 piston crowns to allow for changing the compression ratio of the engine to four different levels.
- Argonne staff produced ten peer reviewed publications in leading professional journals. Several staff members were invited to give lectures nationally and internationally. Technical lectures were given in India, South Korea, and Japan. This gives positive publicity to EERE/VT programs. For the first time, ANL has entered into a cost-shared CRADA with two major manufacturers, Caterpillar and Corning, to conduct research in advanced DPF. This grew out of the leading edge morphology and chemistry research with the innovative thermophoretic sampling system. The DPF test facility has been developed and integrated with the GM light-duty engine to collect particulate matter (PM) emissions. First observation of PM filtration has successfully been obtained by using a microscopic imaging system. Major international manufacturers such as Toyota, Hyundai, and Honda have

contacted ANL's Principal Investigator on his PM morphology research. Cost shared collaborative research with international sponsors is a distinct possibility.

- **Energy Storage:** In fiscal year 2008, ANL researchers published more than 40 papers related to lithium battery R&D in referenced technical journals and gave presentations at several international and/or national technical meetings and symposia.
- **Lightweight Materials Technology Completion of Plastics Recycling CRADA:** In the VT Lightweighting Material thrust, ANL completed, in August 2008, a five-year CRADA with the Vehicle Recycling Partnership (the automotive-recycling-focused consortium of the United States Council for Automotive Research and the American Chemistry Council Plastics Division (the main trade association of the automotive-plastics supplier industry). In this five-year effort, several technologies have been developed for the economical recycling of post-consumer (i.e., end-of-life vehicle) plastics scrap.
- **Commercialization of Post-Consumer Plastics-Recycling Technology:** A shredder firm in the Midwest has agreed to commercialize technologies developed at ANL for recovering post-consumer plastics scrap usually relegated to land fills. The shredder firm will pay for the bulk of the commercialization with technology-transfer assistance from ANL under VT-LM funding. The significance of the two achievements above is that a long-held perceptual barrier to the increased use of lightweighting polymer-based materials in vehicles may have been removed.
- **Light-Metals Recycling Workshop:** ANL organized and held, on September 24, 2008, a workshop to look at the issue of recycling light metals like aluminum (Al) and magnesium (Mg). Automotive steels have a significant competitive advantage over such light metals because most automotive steels can be melted together, from which base new steels can be made very cost-effectively. The workshop looked at the state-of-the-art for economically recycling the various Al and Mg alloys directly back to their original alloy without melting together. ANL is now developing a roadmap plan for evaluating the current technologies or developing new technologies for this purpose.

Objective 1.2

- **Vehicle Systems:** ANL is recognized as DOE's leading research laboratory for vehicle testing activities for emerging technologies such as PHEVs and major powertrain components. Moreover, ANL has been recognized for its excellence in advanced vehicle research by the automotive original equipment manufacturers (OEMs)--both domestic and foreign), by major component suppliers, and other industry trade groups such as the Electric Power Research Institute, Society of Automotive Engineers, etc. Recently, ANL's programs have been the recipient of several R&D 100 awards for excellence. Argonne closely coordinates vehicle testing activities through its collaboration with Idaho National Laboratory (INL), and provides test results and test vehicle components to NREL and Oak Ridge National Laboratory. ANL/INL collaboration on data acquisition and analysis of real world driving cycles and the comparison of results from standardized lab dynamometer testing with fleet testing demonstrates the synergistic value of cooperative research to enhance the state of knowledge on vehicle testing. The Advanced Vehicle Testing Activity (AVTA) Program utilizes the assets of both ANL and INL for cost-effectively testing advanced vehicles by sharing test scheduling and collaborating on performance data and system depreciation.

- **Advanced Combustion Engine Technologies:** ANL received recognition from the European Hydrogen Internal Combustion Engine consortium for doing outstanding research in hydrogen fueled engines. Joint publications in prestigious journals with Sandia National Laboratories resulted from this project. In X-ray based fuel spray characterization, ANL continues to be the recognized leader. Several engine and fuel systems manufacturers have contacted ANL with the prospect of establishing new collaborations. These include Delphi, Bosch GDI, Convergent Science, and Chrysler.
- **Energy Storage:** ANL organized and hosted the 1st International Conference on Advanced Lithium Batteries for Automobile Applications. The objectives of the conference, attended by more than 400 battery researchers representing industries, academic institutions, and governments from around the world, were to enhance the global effort on R&D of advanced lithium batteries for automobile applications; accelerate the discussion and communication of R&D progress, achievement and problems; and further strengthen the global collaboration in this important and challenging field.

Objective 1.3

- **Vehicle Systems:** As DOE's only integrated vehicle systems testing activity, the Center for Transportation Research at ANL designs creative testing methods for emerging technologies that act as benchmarks to DOE and industry alike. It allows DOE to gauge industry advancements of technologies such as PHEVs. Argonne staff conscientiously examines the quality and completeness of their data and reporting practices. The lab maintains an on-line database of test results organized to allow ease of user access and provides hybrid electric vehicle (HEV) auxiliary subsystems testing results to other DOE laboratories in support of developing and changing modeling parameters. ANL also conducts testing of emerging technologies that requires development of testing procedures and unique instrumentation that must creatively balance laboratory and INL field testing constraints.
- **Advanced Combustion Engine Technologies:** The demonstration of 45 percent thermal efficiency in a light duty engine is a major breakthrough for the ANL-Ford-Sandia National Laboratories team. The unique DPF testing facility has successfully been tested in connection with a light-duty diesel engine. More than 10 high quality technical papers of permanent reference value were published by major societies such as the American Society of Mechanical Engineers and the Society of Automotive Engineers. ANL's contribution of deployable technologies was evident from the exchange of personnel with Bosch and a steady stream of invitations to ANL staff to visit and give lectures at prestigious national and international institutions.
- **Energy Storage:** ANL and an industrial partner, EnerDel, Inc., were presented with an R&D 100 award for the joint development of an advanced, high-power lithium-ion battery system, recognized by *R&D Magazine* as one of the year's most significant technological innovations. ANL has developed and licensed a family of advanced, lithiated mixed metal oxide layered composite cathode materials and associated processing technology to Toda Kogyo Corporation, a major supplier of lithium-ion battery materials. The new cathode material possesses enhanced stability compared to conventional cathode materials.

Objective 1.4

- **Vehicle Systems:** ANL meets unscheduled and unanticipated information requests, which are often generated by DOE management, within timelines requested. The Argonne Vehicle

Systems Team met all scheduled milestones with several significant milestones completed early, including the revision of PHEV component R&D goals for the PHEV R&D Plan.

- **Advanced Combustion Engine Technologies:** The delivery of results was good. ANL staff participated in many national and international conferences as authors, organizers and conference chairmen. The demonstration of BMW hydrogen fueled vehicles was a resounding success. The ANL staff took part in DOE's Merit Review and the Combustion Memorandum of Understanding meetings organized by Sandia National Laboratories. Technology transfer to industry by direct participation of industry researchers in ANL's fuel spray experiments was very effective.

NOTABLE ACHIEVEMENTS

- **Biomass**

- **Objective 1.1**

- None

- **Objective 1.2**

- None

- **Objective 1.3**

- None

- **Objective 1.4**

- None

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

- **Objective 1.1**

- **Pressurized Steam Reforming of Bio-Derived Liquids for Distributed Hydrogen Production:** ANL quantified the improvement in yield resulting from the permeation of hydrogen from a reforming zone operating at elevated pressures. The lab demonstrated the effectiveness of the catalyst on the conversion/ suppression of C2 hydrocarbons. They set up and validated a mathematical model of their membrane reactor, which can now be used to predict conditions necessary to meet hydrogen production rates consistent with efficiency targets.

- **Objective 1.2**

- Argonne hosted a meeting of the Hydrogen Production Technical Team under the FreedomCAR and Fuel Partnership.

- **Objective 1.3**

- None

- **Objective 1.4**

- None

- **Industrial Technologies Program**

- **Objective 1.1**

- None

- **Objective 1.2**

- None

Objective 1.3

- None

Objective 1.4

- Although hampered somewhat by the changes involved in the transition from the Office of Electricity to EERE, Argonne has done a good job in resuming research associated with the ARES effort.

- **Solar Energy Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Vehicle Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- Energy Storage: ANL developed in-situ diagnostics techniques and demonstrated that kinetic limitations were the main cause of the degradation in performance seen in lithium-ion cells operating at low temperature. Argonne scientists developed and used new diagnostic tools in unique ways to investigate phenomena that limit the life and performance of lithium-ion cells being developed for use in HEVs. They recently achieved significant progress in understanding factors responsible for the gradual performance loss observed during long-term aging of high-power cells that employ nickel-manganese-cobalt mixed metal oxide cathodes.

Objective 1.4

- Vehicle Systems: Argonne meets DOE expectations for completing testing assignments in agreed to schedules and complies with all reporting deadlines for progress reports and status updates
- Energy Storage: Reviews of the Energy Storage Programs are held every four months and are well regarded by program participants and outside reviewers for their thorough coverage of program activities and accomplishments.

NOTABLE DEFICIENCIES

- **Biomass**
 - Objective 1.1**
 - None
 - Objective 1.2**
 - None
 - Objective 1.3**
 - None
 - Objective 1.4**
 - None
- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**
 - Objective 1.1**
 - None
 - Objective 1.2**
 - None
 - Objective 1.3**
 - None
 - Objective 1.4**
 - None
- **Industrial Technologies Program**
 - Objective 1.1**
 - None
 - Objective 1.2**
 - None
 - Objective 1.3**
 - None
 - Objective 1.4**
 - None
- **Solar Energy Technologies Program**
 - Objective 1.1**
 - None
 - Objective 1.2**
 - None
 - Objective 1.3**
 - None

Objective 1.4

- None

- **Vehicle Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

SIGNIFICANT DEFICIENCIES

- **Biomass**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Industrial Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Solar Energy Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Vehicle Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

SUPPORTING COMMENTS

- **Biomass**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Industrial Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Solar Energy Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Vehicle Technologies Program**

Objective 1.1

- ANL serves as the coordinating laboratory for a multimillion dollar battery R&D program that uses the resources of four other National Laboratories and three universities to address cross-cutting barriers facing the lithium-ion systems that are closest to meeting the technical energy and power requirements for hybrid electric vehicles and plug-in hybrid electric vehicles.

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

GOAL 2: EFFECTIVE AND EFFICIENT OPERATION OF FACILITIES with the following objective:

- Provide effective and efficient operation of facilities supporting the EERE Program.

SIGNIFICANT ACHIEVEMENTS

- **Biomass**
 - Objective 2.1**
 - None
- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**
 - Objective 2.1**
 - Argonne operates a one-of-a-kind fuel cell test facility, unique among National Laboratories, with capabilities for evaluating full-size automotive fuel cell systems of up to 100 kW in size. Leveraging EERE's previous investment in battery testing capability has allowed Argonne to operate the fuel cell facility with a high level of efficiency and effectiveness. Testing was carried out on cutting-edge fuel cell stacks and systems from industrial developers to benchmark progress in the technology and to identify areas of further research and development needs. Test data and reports were provided to DOE/EERE and to the respective fuel cell developers. ANL upgraded the test facility by replacing the air supply subsystem to provide clean, hydrocarbon-free air to the fuel cells or systems under test. The lab characterized a 1-kW stack for sensitivity to operating conditions. The maximum power the stack developed was 1,332 watts at ambient pressure, achieving a thermodynamic efficiency of 53.8 percent. At 25 percent of rated power, the efficiency increased to 65.6 percent.
- **Industrial Technologies Program**
 - Objective 2.1**
 - None
- **Solar Energy Technologies Program**
 - Objective 2.1**
 - None
- **Vehicle Technologies Program**
 - Objective 2.1**
 - Vehicle Systems: ANL operates and maintains one of the most advanced four-wheel chassis dynamometers in the country and utilizes this facility on a daily basis for the conduct of vehicle and component evaluations for the VTP. The lab minimizes costs to DOE by arranging testing partnerships with outside private and government entities that allow access to private and state of the art test labs and facilities. ANL also interacts with Idaho National Laboratory and Oak Ridge National Laboratory to ensure the Argonne testing facilities are fully utilized. They use non-DOE owned vehicles from the New York State Energy Research

and Development Authority, Environment Canada, PHEV converters, and auto OEMs to minimize testing and facility costs to DOE.

- **Advanced Combustion Engine Technologies:** All the facilities assigned to the combustion and emissions project were available promptly. The test equipment is up-to-date and capable of measuring all criteria pollutants with a high degree of accuracy. The X-ray spray visualization facility is one-of-a-kind and provides data used by many industrial partners.
- **Energy Storage:** ANL maintains a world-class facility for testing advanced batteries under a variety of charge-discharge regimes and temperatures in order to provide DOE, United States Advanced Battery Consortium, and battery developers with reliable, independent, and unbiased performance evaluations of cells, modules, and battery packs.

NOTABLE ACHIEVEMENTS

- **Biomass**
 - Objective 2.1**
 - Argonne has done the best it can with the small program it has with Biomass. ANL's analysis capabilities are significant and they are working toward developing a user facility to accommodate the Biomass Program's hybrid technologies, in particular syngas fermentation. Constructing this facility remains a goal of the management if additional funds are available.
- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**
 - Objective 2.1**
 - None
- **Industrial Technologies Program**
 - Objective 2.1**
 - None
- **Solar Energy Technologies Program**
 - Objective 2.1**
 - None
- **Vehicle Technologies Program**
 - Objective 2.1**
 - None

NOTABLE DEFICIENCIES

- **Biomass**
 - Objective 2.1**
 - None

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**
Objective 2.1
 - None
- **Industrial Technologies Program**
Objective 2.1
 - None
- **Solar Energy Technologies Program**
Objective 2.1
 - None
- **Vehicle Technologies Program**
Objective 2.1
 - None

SIGNIFICANT DEFICIENCIES

- **Biomass**
Objective 2.1
 - None
- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**
Objective 2.1
 - None
- **Industrial Technologies Program**
Objective 2.1
 - None
- **Solar Energy Technologies Program**
Objective 2.1
 - None
- **Vehicle Technologies Program**
Objective 2.1
 - None

SUPPORTING COMMENTS

- **Biomass**
Objective 2.1
 - None
- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**
Objective 2.1
 - There have been some safety issues with hydrogen and with the fuel cell test facility, but ANL has taken measures to prevent any damage to personnel or

infrastructure and to correct problems with the facility. ANL management notified DOE appropriately and conducted a thorough safety investigation.

- ***Industrial Technologies Program***

- ***Objective 2.1***

- None

- ***Solar Energy Technologies Program***

- ***Objective 2.1***

- None

- ***Vehicle Technologies Program***

- ***Objective 2.1***

- None

GOAL 3: EFFECTIVE SCIENCE AND TECHNOLOGY RESEARCH PROJECT AND PROGRAM MANAGEMENT with the following objectives:

- Effective program vision and leadership.
- Effective and efficient science and technology project and program planning and management.
- Effective and efficient communications and responsiveness to EERE and PMC needs.

SIGNIFICANT ACHIEVEMENTS

- **Biomass**

Objective 3.1

- [REDACTED] has assembled an excellent team at Argonne to respond to DOE Headquarter (HQ) needs. [REDACTED] and [REDACTED] provide support and complement the GREET activities. [REDACTED] is involved in a report on water requirements for biofuels which has already generated considerable interest among stakeholders. [REDACTED] is involved in a water remediation project involving hybrid poplars. [REDACTED] has supported life cycle assessment activities at EPA, California Air Resources Board, and the U.S. Department of Agriculture. Significant expansion activities are planned for the GREET model to make it more user friendly and to better incorporate direct and indirect land use change impacts.

Objective 3.2

- [REDACTED] has a vast amount of expertise in the life cycle arena and has worked in this area for so long that he knows the technical issues that need to be considered in this type of analysis. This is an invaluable resource for DOE headquarters staff because often they have to respond to analysis and assessments done by others and they utilize [REDACTED] knowledge and expertise to respond to work by the academic community as well as by industry and other government agencies.

Objective 3.3

- The program provides an adequate level of input to HQ and the Project Management Center. ANL is often asked to perform analysis and provide responses to upper level management, Congress, the White House, and other stakeholders. The lab relationship manager, [REDACTED], maintains a good level of communications through attendance at staff meetings and e-mail to technical managers.

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

Objective 3.1

- Argonne staff participated as members of the Fuel Cell Technical Team and the Hydrogen Storage Technical Team under the FreedomCAR and Fuel Partnership. This joint planning with partners, collaborators, and stakeholders was successful in more effectively focusing the research and enhancing EERE program efforts. Argonne displayed scientific and technical leadership as the operating agent and key participant in two annexes under the International Energy Agency's Advanced Fuel Cells Implementation Agreement. Argonne displayed scientific and technical vision by presenting its research results at major hydrogen and fuel cell conferences (Fuel Cell Seminar, National Hydrogen Association, Electrochemical Society, inter alia) to maximize the value of the research and development results and to gain appropriate recognition for DOE, EERE, HFCIT, and the Laboratory.

Objective 3.2

- Argonne prepared and submitted high-quality R&D plans, i.e. Field Work Proposals (FWPs) and AOPs, which identified the technical risks and proposed approaches to minimize the technical risks. With regard to safety, experimental safety reviews were written, reviewed, and approved prior to the beginning of any experimental project. The

safety reviews are based on and fully implement the principles of Integrated Safety Management. Argonne staff provided technical evaluation and support in the planning, development, and execution of EERE roadmaps and program plans, including documenting the progress of the EERE programs towards meeting the long-term performance, cost, and durability targets.

Objective 3.3

- Argonne promptly reported to DOE program managers a safety-related incident involving a major hydrogen leak in a vendor-supplied hydrogen gas storage tank. Oral and written reports were provided.

- **Industrial Technologies Program**

Objective 3.1

- Argonne has established itself as a lead organization in the development of advanced reciprocating internal combustion engines. They have enabled the Industrial Technologies Program to resume the important Advanced Reciprocating Engine Systems effort following transfer from the Office of Electricity.

Objective 3.2

- Argonne has effectively resumed pursuit of the important technical issues associated with high efficiency reciprocating engines following transition from the Office of Electricity to EERE.

Objective 3.3

- Argonne has proven sensitive to the needs of the Industrial Technologies Program with relation to the transfer of their activities from the Office of Electricity to EERE. Through their efforts they have enabled the Advanced Reciprocating Engine Systems effort to resume with minimal disruption.

- **Solar Energy Technologies Program**

Objective 3.1

- Good work.

Objective 3.2

- None

Objective 3.3

- None

- **Vehicle Technologies Program**

Objective 3.1

- Vehicle Systems: ANL effectively plans new research programs with an eye towards predicting the industry's and DOE's needs for advanced technology development. The lab consults multiple stakeholders, and monitors technology introductions in Europe and Asia, to help us develop our vision. Many examples exist (like the ANL designed robust PHEV data acquisition recorders) where ANL efforts had a new process or testing methodology in place in advance of the DOE's needs.
- Advanced Combustion Engine Technologies: Top quality research staff, 90 percent with Ph.D.s in engineering, are available at ANL for this program. ANL invests significant

laboratory directed research and development funds to promote EERE programs. All projects have major industrial partners to commercialize our technologies. X-ray spray diagnostics were conceived at ANL and numerous industrial partners have used this facility. ANL started the Hydrogen Internal Combustion Engine R&D project with Ford, which has produced significant results.

Objective 3.2

- **Vehicle Systems:** ANL designs testing methodologies and procedures for vehicle technologies, such as PHEVs and unique alternative fuels, and makes tradeoffs between costs, technical risks, and information requirements when designing testing programs. ANL also provides all FWP and annual reports to Congress as requested. ANL highly leverages DOE testing funding with other entities, such as the AVTA/Idaho National Laboratory PHEV demonstration and testing fleets, in order to create research synergies.
- **Advanced Combustion Engine Technologies:** ANL kept current the AOPs and FWPs and followed strictly DOE guidelines. The lab makes a deliberate effort to bridge the gap between basic science disciplines and applied engineering research. ANL provided timely inputs to the Corporate Planning System at EERE. ANL management took an active part in interacting with the Office of Science's Basic Energy Sciences Program in building a bridge between basic and applied research.

Objective 3.3

- **Vehicle Systems:** ANL provides responses to requests for information from DOE and Congress that range from PHEV fuel efficiency surveys, to PHEV and other advanced vehicles' impacts on petroleum displacement and greenhouse gas abatement, to technology assessments. Specific requests have included information for the General Accountability Office and the House Ways and Means Committee on various aspects of PHEV performance and cost on extremely short response deadlines. ANL generates weekly updates to headquarters on all positive and negative testing events and industry interactions. The lab supports the DOE PHEV Technology Acceleration and Demonstration Activity selection process with technology proposal reviews.
- **Advanced Combustion Engine Technologies:** DOE has a single point of contact at ANL regarding this program. All results were timely, and concerns were promptly resolved. Through active participation with the external research community, ANL provided quick and accurate responses to inquiries.

NOTABLE ACHIEVEMENTS

• **Biomass**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

Objective 3.1

- None

Objective 3.2

- Argonne project managers undertook training and achieved proficiency with the EERE Corporate Planning System for tracking projects and agreements.

Objective 3.3

- High-quality quarterly technical progress reports and monthly cost reports were prepared and submitted to HQ in a timely manner. Well-written technical contributions were prepared for the Hydrogen Program Annual Progress Report. Numerous high-quality technical research results were presented at the Hydrogen Program's Annual Merit Review & Peer Evaluation, in both oral and poster presentations. Argonne staff responded to EERE and Project Management Center needs by providing high-quality reviews of technical proposals submitted in response to DOE solicitations. Argonne kept HQ fully informed regarding high-profile visits to Argonne (by Assistant Secretary Andrew Karsner, John Mizroch, et al.) and by various members of Congress and their staff.

- **Industrial Technologies Program**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

- **Solar Energy Technologies Program**

Objective 3.1

- Argonne has been responsible, under the joint management directives of DOE and the Bureau of Land Management (BLM), for the development of a Solar Programmatic Environmental Impact Statement (PEIS). This includes several notable achievements, including arranging and facilitating 11 public scoping meetings, establishing and populating a SOLAR PEIS web site, and coordinating activities with the DOE and BLM (co-leads in the PEIS).

Objective 3.2

- None

Objective 3.3

- None

- **Vehicle Technologies Program**

- **Objective 3.1**

- Energy Storage: ANL spearheaded a multi-institutional effort, involving four National Laboratories and two universities, to develop and apply novel diagnostic tools to identify factors that contribute to the degradation in battery cell performance that takes place as the cells are cycled. Researchers from ANL and NREL collaborated on the conduct of vehicle analyses and battery sizing studies that were the basis of the battery performance requirements used when soliciting proposals from potential battery developers and for benchmarking progress in the various development programs.

- **Objective 3.2**

- None

- **Objective 3.3**

- Vehicle Systems: ANL keeps headquarters informed of unusual events to avoid headquarters being caught off-guard.
 - Energy Storage: The ANL Energy Storage Program maintained a very high level of agreed milestones being either on track or completed on schedule. In addition, the program's management has consistently responded to DOE guidance and to requests for information or clarification regarding program direction, industry trends, and other related information.

NOTABLE DEFICIENCIES

- **Biomass**

- **Objective 3.1**

- None

- **Objective 3.2**

- None

- **Objective 3.3**

- None

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

- **Objective 3.1**

- None

- **Objective 3.2**

- None

- **Objective 3.3**

- None

- **Industrial Technologies Program**

- **Objective 3.1**

- None

- **Objective 3.2**

- None

<ul style="list-style-type: none">• Objective 3.3<ul style="list-style-type: none">▪ None• Solar Energy Technologies Program<ul style="list-style-type: none">• Objective 3.1<ul style="list-style-type: none">▪ None• Objective 3.2<ul style="list-style-type: none">▪ None• Objective 3.3<ul style="list-style-type: none">▪ None• Vehicle Technologies Program<ul style="list-style-type: none">• Objective 3.1<ul style="list-style-type: none">▪ None• Objective 3.2<ul style="list-style-type: none">▪ None• Objective 3.3<ul style="list-style-type: none">▪ None

SIGNIFICANT DEFICIENCIES

<ul style="list-style-type: none">• Biomass<ul style="list-style-type: none">• Objective 3.1<ul style="list-style-type: none">▪ None• Objective 3.2<ul style="list-style-type: none">▪ None• Objective 3.3<ul style="list-style-type: none">▪ None• Hydrogen, Fuel Cells and Infrastructure Technologies Program<ul style="list-style-type: none">• Objective 3.1<ul style="list-style-type: none">▪ None• Objective 3.2<ul style="list-style-type: none">▪ None• Objective 3.3<ul style="list-style-type: none">▪ None• Industrial Technologies Program<ul style="list-style-type: none">• Objective 3.1<ul style="list-style-type: none">▪ None• Objective 3.2<ul style="list-style-type: none">▪ None
--

Objective 3.3

- None

- **Solar Energy Technologies Program**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

- **Vehicle Technologies Program**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

SUPPORTING COMMENTS

- **Biomass**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

- **Industrial Technologies Program**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

- **Solar Energy Technologies Program**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

- **Vehicle Technologies Program**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

GUIDANCE FOR THE NEXT PERFORMANCE PERIOD

PERFORMANCE EXPECTATIONS FOR ARGONNE NATIONAL LABORATORY FOR THE NEXT PERFORMANCE PERIOD (for example, anticipated accomplishments and level of work, areas of concentration and remedial actions).

- **Biomass**

- Argonne should continue to provide the quality analysis support and maintain the leadership role it has established. Increased capabilities in conversion technologies would be ideal. Continued pursuit of the syngas fermentation capability would be a good addition to the program portfolio and distinguish Argonne with this capability. Continued improvement in communications is desirable, including being proactive in bringing new ideas and capabilities or partnerships to the headquarters program staff to assist in formulation of future directions for the biomass program.

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

- Keep up the good work. Continue to focus on meeting milestones and deliverables in the Annual Operating Plans and provide prompt feedback to DOE Technology Development Managers, particularly with respect to critical analysis work.

- **Industrial Technologies Program**

- We anticipate that the Argonne team working with ITP will improve on their excellent performance in the next period, since they won't have to revise the focus

of their work to accommodate a change in program goals. The switch from the Office of Electricity to EERE required a major change in the drivers for the work they were doing. They responded to the change very well, but there was a learning curve.

- **Solar Energy Technologies Program**
 - During the next performance period, Argonne is expected to conduct the analysis which identified which BLM-managed land is most appropriate for solar projects. This will require close cooperation with NREL, BLM, and DOE.
- **Vehicle Technologies Program**
 - Vehicle Systems: ANL will increase its efforts to evaluate advanced plug-in hybrid electric vehicle drivetrains and components, will work with industry partners on developing an industry standard vehicle modeling and simulation tool based on the Powertrain systems Analysis Toolkit modeling tool developed by ANL, and will complete development and validation of new efficiency testing procedures for PHEVs. In the next performance period, ANL will concentrate on advancing fuel spray research and increase the power density of the light-duty engine under low temperature combustion conditions. Visioscope images will be obtained at high speeds and loads. In the hydrogen engine project, a multi cylinder, direct injected engine will be evaluated for efficiency and emissions.

INPUT ON CONCERNS FOR LABORATORY MANAGEMENT (discussion of potential problem areas):

- **Biomass**
 - None
- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**
 - HFCIT recommends that ANL support the existing effective Principal Investigators' communications and interactions with HFCIT teams through stronger corporate coordination and communications between ANL and HQ. Examples include coordinated and timely submittal of quarterly and annual reports, and at least quarterly visits of a corporate ANL relationship manager to meet with HFCIT leads to discuss project progress, program priorities, and challenges. Bring Hydrogen Production projects to a logical conclusion in FY2009 with sufficient production data for H₂A analysis of the technologies' cost and performance potentials.
- **Industrial Technologies Program**
 - None
- **Solar Energy Technologies Program**
 - None

- ***Vehicle Technologies Program***
 - No potential problem areas could be identified.



Attachment I

HQ Program Office Evaluations



**Office of
Science**

U.S. DEPARTMENT OF ENERGY

Laboratory Year-End Performance Assessment Report

Date:

11/5/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of UChicago Argonne, LLC
for Management and Operation of the Argonne National Laboratory

Agency:

Department of Energy - Office of Science

Program Office:

Office of Advanced Scientific Research

FY Funding Level: (Budget Authority)

Evaluator:

Phone Number:

E-mail Address:

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.61

Goal Grade: A-

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 1.0 Performance Summary Statement:

ANL continues to play a key role in ASCR research efforts with many significant contributions to applied math, computational science, computer science, distributed computing, and high performance computing (HPC). ANL is hugely influential in programming models for leadership computing (e.g. MPI, p4 parallel programming library, MPICH2, PVFS2) with important advances in FY08. These efforts also form the core of the DARPA HPCS software effort. ANL is also a recognized leader in optimization - a research area that was identified as underpinning success for many of the Department's activities. ANL also plays a leadership role in several SciDAC efforts and has produced a leader for the emerging DOE basic research in cyber security community.

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

Score: 3.7

Grade: A-

Weighting: 40

Objective 1,1 Performance Summary Statement:

ANL research plays a critical role in the ASCR portfolio and ASCR has very high expectations for this program. However, ANL has, in FY08, delivered some results that exceeded ASCR's high expectations.

- ANL's Portable, Extensible Toolkit for Scientific computation (PETSc) was recognized as a Top Ten Recent Breakthroughs in Computational Science and Enabling Technologies" supported by ASCR, as determined by an external panel of experts in FY08.
- ANL deployed a major new release of Cobalt in FY08. Cobalt is an open source platform for HPC system software research that enables rapid reconfiguration of components, permitting exploration of many interlinked system management issues. Cobalt also makes porting and adapting code to new platforms and system models relatively easy. But the most dramatic feature of the new release is Cobalt's increased scalability — up to 500 teraflop/s on the IBM Blue Gene/P.
- A team of researchers led by [REDACTED] of ANL and [REDACTED] of Virginia Tech received first place in an international competition for the most effective approach in using large-scale storage for high-performance computing. The award was presented November 15 at the SC07 conference. Using a novel software framework for distributed I/O called ParaMEDIC, the team of researchers from Argonne National Laboratory, Virginia Tech, and North Carolina State University searched the sequences of all completed microbial genomes against each other.
- Members of the Mathematics and Computer Science Division at ANL received three best paper awards at major international meetings in the Summer of FY06.
- ANL researchers made significant contributions to the high energy physics STAR experiment to leverage virtualization in distributing STAR applications.
- ANL developed a method for analyzing the performance of such derivative-free algorithms with surprising results that the model-based solvers performed better than geometry-based solvers, even for noisy and piecewise-smooth problems.
- The PETSc toolkit now supports the Zoltan parallel partitioning and load balancing toolkit as an external library. Zoltan's hypergraph partitioner can be used to partition meshes, thereby improving load balance and reducing communication in large-scale, parallel applications using unstructured meshes in PETSc.
- ANL developed an Automatic Dynamic Load Balancing (ADLB) library for use in SciDAC's Universal Nuclear Energy Density Function (UNEDF) project. One of the aspects of the UNEDF work will be to use the Argonne Green's Function Monte Carlo (GFMC) program to compute properties of carbon-12 using Argonne's Blue Gene/P.
- ANL developed a technique, which was implemented in the Globus Toolkit 4.1.2 release in FY08, to speed up file transfers that has proven useful to researchers in Argonne's Advanced Photon Source for transferring beamline users' data in near-real time.

Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 3.8

Grade: A

Weighting: 30

Objective 1.2 Performance Summary Statement:

ANL research plays a critical role in the ASCR portfolio and has, in FY08, played a leadership role in key areas that exceeded ASCR's very high expectations in FY08.

ANL is playing a very significant role in the emerging Cyber security community with [REDACTED] stepping in at a critical point and providing strong leadership and direction for the grass roots effort.

In Applied Mathematics, ANL focuses on optimization and has a world leading team that are clearly the very best in the U.S. as demonstrated by their performance in a highly competitive new solicitation in this area in FY08. Standouts are [REDACTED], [REDACTED], [REDACTED], [REDACTED], and [REDACTED].

- [REDACTED] produced 15 publications in FY08 in an array of top journals.

In Computer Science, ANL researchers are recognized leadership in high performance file systems, programming models and distributed computing. Standouts are [REDACTED], [REDACTED] and [REDACTED].

In SciDAC, ANL researchers are assuming leadership roles in many projects - most significantly [REDACTED] in UNEDF, [REDACTED] in accelerator R&D, [REDACTED] in visualization and [REDACTED] in distributed computing.

- In FY08, ANL's [REDACTED] was recognized as one of the top three most influential computer scientists worldwide, according to the h-index, a method for ranking scientists based on the number of papers they publish and citations they receive, [REDACTED] ranks third with a score of 67.

Stevens played a leadership role in chairing the 2008 SciDAC conference and in organizing the international computer science research community to address the needs of extreme scale computing.

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:

ANL work in all of the ASCR core research areas provide sustained efforts and world leading groups that are critical to the continued success of our program. The quality and quantity of projects and researchers and pace of progress continues to meet ASCR's very high expectations and delivers results for ASCR and for our partner programs. Argonne Applied Mathematics and Computer Science Research PIs published over 25 peer-reviewed papers in journals including Journal of Fluid Mechanics, Journal of Computational Physics, and International Journal of High Performance Computing Applications. Particularly noteworthy was ANL's [REDACTED] who alone had 15 publications in FY08 in an array of top journals.

Objective 1.4 Provide for Effective Delivery of Products

Score: 3.2

Grade: B+

Weighting: 15

Objective 1.4 Performance Summary Statement:

The quantity and quality of the ANL program in ASCR core research is especially strong in key areas both in terms of publications and continued progress as meets ASCR's high expectations for Argonne research.

ANL's optimization team garnered especially strong comments and thus fared a bit better than expected in the highly competitive new solicitation in this area in FY08. In addition, ANL performed very well, but as expected of such a strong group, in a highly competitive FY08 solicitation in Fast Operating Systems.

ANL 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: 3.51

Goal Grade: A-

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 2.0 Performance Summary Statement:

In July, the Argonne Leadership Computing Facility (ALCF) successfully completed their final project milestone in the ALCF project, on cost, within scope and ahead of schedule. Additionally, the 100 Teraflop IBM Blue Gene/P was transitioned to operations and the ALCF supported 20 Innovative and Novel Computational Impact on Theory and Computation (INCITE) projects. Over the past year, the lab overcame challenges that arose from a lack of communication with IBM and the Office of Advanced Scientific Computing Research (ASCR) and a lack of senior staff. The ALCF success was due in large part to the high quality of the project staff and the oversight of the Federal Project Director.

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: 3.4

Grade: B+

Weighting: 15

Objective 2.2 Performance Summary Statement:

Early in the construction or installation phase of the project, IBM encountered problems with their chip design. Argonne and ALCF staff worked with IBM to diagnose the problem. At this time the ALCF chose not to fully inform ASCR of these problems in a timely matter. Once ASCR staff expressed their concerns about the success of the project, the ANL lab director replaced the ALCF director with [REDACTED].

[REDACTED] has worked diligently to increase ASCR's confidence in the success of the project by rebuilding communications with ASCR and IBM. Further he worked with IBM to find an acceptable solution for the chip problem. As noted above the level 1,100 Teraflop machine milestone was met on schedule, scope and within cost. In July, the final level 1 milestone, to install an additional 443 Teraflops of IBM Blue Gene/P was completed within scope and cost and ahead of schedule.

[REDACTED] has taken ES&H issues very seriously. For example he immediately stood down the facility

when notified by IBM that in rare cases a failed power supply could pose a safety risk if installed incorrectly, without proper grounding. Working with the IBM, an Argonne electrician and their ES&H representative, the team confirmed that the power supplies were installed correctly and the staff allowed to return to work.

Objective 2.3 Provide Efficient and Effective Operation of Facilities

Score: 4.0

Grade: A

Weighting: 75

Objective 2.3 Performance Summary Statement:

Given the short time they have been in operation and the limited staff, the ALCF has exceeded expectations for a new facility. The Operational Assessment (OA) review team convened in August, 2008 to establish the ALCF operational baseline found that the ALCF is “proving of benefit to all stakeholders including the Office of Science” and that “good science has already been accomplished on the new architecture.” Three of the top ten scientific advancements as identified by a panel of experienced computational scientists were enabled by resources at the ALCF.

In February, 2008, the Office of the Inspector General (IG) initiated an audit of the Office of Science’s Innovative and Novel Computational Impact on Theory and Experiment (INCITE) program. Since 80% of the computing resources at the ALCF are allocated through the INCITE program, the IG auditors reviewed the ALCF policies and procedures. The policies and procedures put into place by staff at ANL, particularly Bair and Dave were instrumental the IG’s conclusion that there no material weakness within INCITE and terminated the audit.

Even though understaffed, the ALCF Scientific support staff or catalysts guided by [REDACTED], the new Director for Science, are providing timely responses to DOE requests for scientific accomplishments and excellent assistance to their user community. For example by redesigning a post-processing algorithm in a cardiac simulation code, the catalysts were able to drop the time to extract data from 600 seconds to 1 second. They were also able to grow the maximum problem size by 16 through other algorithm improvements.

As an example of careful financial management, the decision to do self-maintenance on parts of the facility, such as compute nodes and disk systems resulted in a savings of about \$1M.

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

Score: 3.7

Grade: A-

Weighting: 10

Objective 2.4 Performance Summary Statement:

Several new INCITE submissions identified Argonne’s Leap to Petascale workshop as a key factor in their decision to apply for INCITE at the ALCF. The effectiveness of the ALCF’s outreach to the both their internal lab researchers and the external scientific community is evidenced by the fact that requests for INCITE time at ANL grew from 240M hours for 2008 to over one Billion hours for 2009.

There is a concern within ASCR that the ANL is still too focused on growing facility resources rather than growing its staff to support its user base.

Goal 3.0 Provide Effective and Efficient Science and Technology Program Management

Goal Score: 3.04

Goal Grade: B

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 3.0 Performance Summary Statement:

ANL is a leader in HPC, applied math, and computational science, making significant contributions to the vision, planning and coordination of these efforts and changing the thinking or direction of the international community in areas such as programming models for HPC, distributed computing, parallelization tools, optimization and simulations in materials, nuclear physics, nuclear energy, and climate. Development of the Leadership Computing Facility (LCF) has encountered obstacles - both technical and organizational. ANL has worked hard in FY08 to overcome those obstacles and ASCR is very pleased with the results of those efforts but serious mistakes were made early on that required senior DOE intervention.

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

Score: 3.5

Grade: A-

Weighting: 30

Objective 3.1 Performance Summary Statement:

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

- ANL has done an excellent job in FY08 with regard to outreach for INCITE, SciDAC (██████████, ██████████), and distributed computing, and in turning research efforts into integrated tools that advance the goals of other fields and projects.
- ANL have provided leadership and vision to the multi-institutional Cyber security effort.
- ANL had demonstrated leadership in organizing the international computer science research community to address the needs of extreme scale computing.

Articulation of scientific vision

- ANL have made progress in developing and articulating a clear and ambitious scientific vision.

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

- ANL are strong partners in the IBM/LLNL/ANL research project to develop the Blue Gene architecture and ensure its continued productivity for science applications.

Ability to attract and retain highly qualified staff.

- ANL has exceeded expectations in attracting and retaining highly qualified staff with FY08 standouts ██████████ and ██████████ for the ALCF.

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

Score: 3.1

Grade: B+

Weighting: 40

Objective 3.2 Performance Summary Statement:

Quality of R&D and/or user facility strategic plans, adequacy in considering technical risks and success in identifying/avoiding technical problems

- ANL research planning continues to be excellent and to enable successful long-term multi-institutional and multi-disciplinary efforts in high risk areas.
- ANL facility efforts have encountered obstacles - both technical and organizational. But ANL has worked hard in FY08 to overcome those obstacles.

Effectiveness in leveraging (synergy with) other areas of research

- In this area ANL has demonstrated excellence - both in adopting results from other areas and applying them in innovative ways and in transferring results to other areas.

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

- While the lab has made tough decisions, such as to keep ALCF staffing down to enable faster growth of the resource, this strategy also increases risk.

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

Score: 2.5

Grade: B-

Weighting: 30

Objective 3.3 Performance Summary Statement:

Although ANL has made major improvements, ANL problems in this area early in FY08 did not meet program expectations and small problems persist in each of these areas:

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

- At least one ANL project failed to notify ASCR in a timely fashion about the changed status of a pending award with the potential for overlap with ASCR proposed work.

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

- ASCR was not fully apprised of the problems with the IBM chips for the ALCF in a timely fashion and there was significant miscommunication with IBM that required senior DOE intervention.

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

- At least one ANL FWP had the wrong program contact and/or contact information, causing confusion and lost time for ASCR program staff.



Laboratory Year-End Performance Assessment Report

Date: 11/10/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of UChicago Argonne, LLC for Management and Operation of the Argonne National Laboratory

Agency:
Department of Energy - Office of Science

Program Office:
Office of Basic Energy Sciences

FY Funding Level: (Budget Authority)

Evaluator:
[Redacted]

Phone Number:
[Redacted]

E-mail Address:
[Redacted]

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.40 Goal Grade: B+

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 1.0 Performance Summary Statement:

The materials sciences research programs have demonstrated sustained leadership and significant impact in x-ray and neutron scattering science and instrumentation, magnetic and superconducting materials. Chemical sciences research programs in atomic, molecular, and optical sciences, heavy element chemistry, separations, chemical dynamics, and photochemistry continued to demonstrate sustained scientific progress and impact.

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

Score: 3.2 Grade: B+ Weighting: 50

Objective 1.1 Performance Summary Statement:

The Condensed Matter Physics and Materials Chemistry activities supported by the Materials Sciences and Engineering (MSE) Division were reviewed in FY 2008. The review found the program to be of high scientific quality. ANL maintained a program that is synergistic, multidisciplinary and served to address DOE mission-relevant science areas. In particular, ANL was recognized as a world leader in several areas of materials science, including magnetic materials, superconductors, complex oxides, and advanced characterization. The output of the staff in terms of the quantity and quality of scientific papers in peer-reviewed journals was impressive. Researchers had valued collaborations within ANL and active participation and leadership within national and international scientific communities. During the previous review, ANL was asked to strengthen its ties to universities. Since then, the laboratory hired several joint lab-university scientists as well as a significant number of high-quality post-doctoral and graduate students. However, the Field Work Proposals (FWPs) of Materials Theory Institute, Nanostructured Carbons, and Biocomposite Materials had issues which required action items that included submission of a revised management plan, a focused research plan, and a research/ staffing transition plan, respectively. Another FWP, Molecular Materials, was phased out due to its continued lack of focus and a clear BES-centric vision.

The Chemical Dynamics program, supported by the BES Chemical Sciences, Geosciences, and Biosciences (CSGB) Division within the Gas-Phase Chemical Physics activity, was reviewed onsite in November 2007. On the whole, the activity received outstanding reviews, with results demonstrating scientific quality, impact, and relevance to the DOE mission. The effort employed unique capabilities and took good advantage of the national laboratory setting. The strongly coupled theory and experimental efforts were a core element of this program's approach, lending it unique scope and quality, as did the degree of innovation and collaboration displayed across the program. The program was notably strengthened by an excellent hire in theoretical chemistry who contributed significantly to the current success of the program and its future prospects.

Ongoing CSGB Division programs in Atomic, Molecular, and Optical (AMO) Physics, Separations Science, Heavy Element Chemistry, Catalysis Science, and Photochemistry were not reviewed in FY 2008, but were generally quite strong, contained several world-class investigators, and continued to make excellent progress. The AMO Physics program was noted for its extensive collaborations with other research programs within the CSGP AMO Sciences program.

Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 3.3

Grade: B+

Weighting: 20

Objective 1.2 Performance Summary Statement:

Research projects supported at ANL by the BES MSE Division were deemed to be world-leading according to the most recent review. The synergy of the theory and synthesis efforts, coupled with the laboratory's x-ray and neutron scattering expertise in instrumentation and technique development, ensured the program's prominence in important energy-relevant areas in condensed matter physics. A state-of-the-art oxide molecular-beam epitaxy (MBE) system was constructed which is capable of the precise layer-by-layer deposition of new materials. The strong interaction among synthesis, characterization and theory will likely produce new and exciting results. The superconductivity research group was very strong, with the principal investigators recognized as among the leaders in the field. The combination of synthesis, characterization, theory and computation made this activity particularly strong.

The Chemical Dynamics program reviewed in FY 2008 was generally outstanding in its scientific merit, innovation, productivity, and impact on the field of combustion-relevant chemical physics. The laboratory staff included world-renowned scientists noted for innovations in the field. The AMO Physics program was not reviewed in FY 2008, but continued to make strong contributions to planning for science next-generation light sources, particularly regarding ultrafast science at specialized beamlines at the Advanced Photon Source (APS), Advanced Light Source (ALS), and the Linac Coherent Light Source (LCLS). CSGB Division programs in Heavy Element Chemistry, Separation Science, Catalysis Science, and Photochemistry not reviewed in FY 2008 also have nationally and internationally recognized investigators.

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 activities supported by the MSE Division continued to produce a large number of high-quality peer reviewed journal articles. The program frequently reported research accomplishments and high-impact publications in prestigious journals in areas of high temperature superconductivity, magnetism, and complex materials.

Overall, the quantity and quality of research outputs in peer-reviewed journals for the programs of the CSGB Division were fully acceptable. The Chemical Dynamics program reviewed in FY 2008 produced 114 publications in peer-reviewed journals during the previous 3-year funding cycle, an excellent record of productivity and quality.

Objective 1.4 Provide for Effective Delivery of Products

Score: 3.8

Grade: A

Weighting: 15

Objective 1.4 Performance Summary Statement:

The activities supported by the MSE Division were effective in transmitting the results to the community. ANL management for the materials research program was very responsive to BES requests.

CSGB Division research programs were effective and efficient in meeting scientific objectives and milestones, as measured by peer review. 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: 3.32

Goal Grade: B+

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 2.0 Performance Summary Statement:

While the Advanced Photon Source continues to be a leading national facility with a large number of users and publications, its management has not demonstrated visionary leadership in strategic planning

and in effective management of its Short Pulse X-ray Source Project. The Center for Nanoscale Materials (CNM) has operated a robust user program with outstanding scientific output.

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

Score: 3.2

Grade: B+

Weighting: 10

Objective 2.1 Performance Summary Statement:

APS management was in the early stages of defining a strategic plan, including a design of the facility's upgrade. APS management has been interacting with the community to define the best technical approach for the upgrade.

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: 3.7

Grade: A-

Weighting: 25

Objective 2.2 Performance Summary Statement:

In FY 2008, ANL Electron Microscopy Center staff participated in the DOE TEAM project by taking an active role working with CEOS, as a subcontractor to ANL, to build and assess the viability of unique state-of-the-art chromatic aberration correctors. This highly specialized technical work in electron optics progressed well in FY 2008, leading to substantial progress in these correctors. Much of this work was done at CEOS facilities in Europe, necessitating some significant travel abroad. Also accomplished in FY 2008 were preparations for a postdoc position in electron optics and preparations to bring a test column to ANL to support further corrector testing there. ANL also performed well in FY 2008 in magnet and girder assembly integration efforts in support of the LCLS project.

Objective 2.3 Provide Efficient and Effective Operation of Facilities

Score: 3.0

Grade: B

Weighting: 45

Objective 2.3 Performance Summary Statement:

The APS operated with very high reliability (97.6%) for 4503 hours in FY 2008. It had a total of 3279 unique users, of which 50 were remote users. A BES Scientific User Facility Division triennial operations review was held December 10-13, 2007. There was increased user support on the CAT beamlines that have transitioned to facility beamlines. The web-based proposal system and evaluation process were excellent. However, APS had some serious shortcomings in the scientific and technical leadership in both the Accelerator Systems Division and the X-ray Science Divisions. There was a top-down management style with no transparent process for setting priorities in consultation with users, staff, and advisory committees (UEC and SAC).

The Intense Pulsed Neutron Source ceased to operate in January 2008 due to a major BES budget shortfall. It started the process of transitioning to decommissioning of the facility. During the first quarter of FY 2008 there were 89 unique users.

Both the Center for Nanoscale Materials (CNM) and the Electron Microscopy Center (EMC) user facilities operated efficiently and effectively with minimal downtime. Operating time and capabilities

were constrained primarily by budget limitations and by equipment maintenance and repair needs.

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

Score: 3.6

Grade: A-

Weighting: 20

Objective 2.4 Performance Summary Statement:

The APS was a key facility for ANL scientists in biology, chemistry, and the material sciences. The ANL CNM nanoprobe beamline is located on the APS Storage Ring, and CNM staff and users employed this and other beamlines for characterization of nanomaterials.

The CNM continued to carry out and facilitate a strong scientific program, as reflected by several recognitions for work done within the facility. The number of users in FY 2008 increased very substantially over that in FY 2007, and CNM staff was also involved in planning and organizing user meetings and other workshops of substantial interest to the broad scientific community.

The Electron Microscopy Center (EMC) continued to provide capabilities that were used widely within the laboratory for its research programs. A modest decrease in the number of users in FY 2008 versus FY 2007 was in line with historical user numbers for the prior several years and consistent with approximately flat funding over this period.

Goal 3.0 Provide Effective and Efficient Science and Technology Program Management

Goal Score: 3.33

Goal Grade: B+

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 3.0 Performance Summary Statement:

The Materials Science Division has demonstrated effective program management and leadership in developing compelling program visions through effective strategic planning. Program management within the newly formed ANL Chemical and Engineering Sciences Division is still in transition, and needs a clearly defined strategic plan that is well aligned with objectives of the laboratory and of the BES program. The interim Chemistry Division leadership was effective and responsive to BES mission needs. The Advanced Photon Source had serious shortcomings in the scientific and technical leadership in both the Accelerator Systems Division and the X-ray Science Divisions.

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

Score: 3.0

Grade: B

Weighting: 40

Objective 3.1 Performance Summary Statement:

Research activities supported by the MSE Division in the topical areas of magnetic materials, superconductors, complex oxides, and advanced characterization were recognized as scientific leaders. These projects were a central part of ANL's core competencies. The FY 2008 review of the program found the majority of efforts to be synergistic, multidisciplinary, and addressing DOE mission-relevant science areas.

The ANL coordinator of the programs supported by the MSE Division was effective with frequent communications along properly defined management lines. The coordinator played a major role in organizing and participating in several BES Basic Research Needs Workshops. This year, the coordinator took a leadership role in the BESAC New Era Sub-committee which was charged with organizing a Photon Sciences Workshop to supply BESAC with recommendations for future light source needs to achieve the research goals outlined in the Basic Research Needs workshops.

In FY 2008, the ANL Chemistry Division was merged with the Chemical Technology Division to form the Chemical and Engineering Sciences (CSE) Division. The stated strategic motivation for this merger was to enhance synergy and integration between CSGB Division supported programs and those supported by DOE technology offices, particularly in the areas of catalysis and heavy element/nuclear chemistry. Improved integration between basic and applied research was an important and timely subject, but it remained unclear that a whole scale merger of two rather disparate organizations will affect significant improvement in this area. The CSGB Division is also concerned that this merger could damage the scientific quality of its basic research programs at ANL. A complete understanding of the advantages or consequences of the new CSE Division structure awaits the leadership of the new division director (hired at the start of FY 2009) and subsequent CSGB program reviews, particularly those in the areas thought to benefit most from the new organization – catalysis and heavy element chemistry.

The interim CSE Director continued the clear strategic vision for the ANL Chemical Dynamics and AMO Physics groups. These groups developed beneficial strategic relationships with external organizations, and they were effectively focusing efforts on BES mission goals. The recent hiring of a very talented, mid-career scientist into the Chemical Dynamics program benefitted that program significantly.

Also, mentioned before, the APS had some serious shortcomings in the scientific and technical leadership in both the Accelerator Systems Division and the X-ray Science Divisions. There was a top-down management style with no transparent process for setting priorities in consultation with users, staff, and advisory committees (UEC and SAC).

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

Score: 3.3

Grade: B+

Weighting: 30

Objective 3.2 Performance Summary Statement:

The programs supported under Condensed Matter Physics and Materials Chemistry exhibited excellent planning and management, with the laboratory coordinator strategically investing in high performing areas. The laboratory's strategic planning exercise resulted in several new projects. In FY 2008, the laboratory began a new project in Quantum Mesoscopic Materials and Structures which will enhance the Theoretical Condensed Matter Physics activities.

Management of the ANL Chemical and Engineering Sciences Division put forth a clear and logical plan to the CSGB Division in which the bulk of the funding from the terminated Radiation Chemistry program should be reinvested in the ANL AMO Physics and Chemical Dynamics programs that have demonstrated excellence in peer review. The successful review of the Chemical Dynamics program in FY 2008, which follows an equally successful review of the AMO Physics program in FY 2007, fully validated that plan.

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:

Management of the programs supported by the MSE Division was effective with frequent communications along properly defined management lines. The laboratory continued to do an outstanding job in community outreach activities associated with the Basic Research Needs Workshops.

Communications between the CSGB Division and the interim management of the ANL Chemical and Engineering Sciences Division was generally thorough and timely in FY 2008.



Laboratory Year-End Performance Assessment Report

Date:

11/3/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of UChicago Argonne, LLC
for Management and Operation of the Argonne National Laboratory

Agency:

Department of Energy - Office of Science

Program Office:

Office of Biological and Environmental Research

FY Funding Level: (Budget Authority)

Evaluator:

Phone Number:

E-mail Address:

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.04

Goal Grade: B

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 1.0 Performance Summary Statement:

The Structural Biology Center (SBC) at the Advanced Photon Source (APS) continues to provide world leadership in the field of protein structure determination.

ANL's synchrotron-based methods continue to provide cutting edge analyses for environmental studies within the Environmental Remediation Sciences Program (ERSP).

ANL has tremendous unrealized potential with its limited research program that is excellent and in some cases, e.g., structural biology, world class. However, overall, the very limited amount of research in environmental remediation sciences, climate change, and life sciences other than

structural biology is a concern and a challenge for the lab to continue their development efforts.

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

Score: 3.1

Grade: B+

Weighting: 30

Objective 1,1 Performance Summary Statement:

The Structural Biology Center (SBC) at the Advanced Photon Source (APS) continues to provide world leadership in the field of protein structure determination. Experiments at its insertion device (ID) beamline resulted in more new structures of proteins and protein complexes being deposited in the Protein Data Bank than any other beamline in the world, by a margin of more than 30% over the second-best beamline. The structures were in many cases the subject of research articles in top-tier journals such as *Science* and *Nature*. ANL's synchrotron-based methods continue to provide cutting edge analyses for environmental studies within the Environmental Remediation Sciences Program (ERSP). In climate change research, ANL is successfully developing a new modeling approach, a scalable and extensible earth system model.

Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 3.1

Grade: B+

Weighting: 20

Objective 1.2 Performance Summary Statement:

The SBC is a leader in implementing new technology, in providing outstanding structural information and in attracting the most prominent researchers in biophysics as collaborators. The director of the SBC is acknowledged world-wide as one of the leaders in this field and is in high demand to speak about the SBC vision and accomplishments at major scientific meetings. In Climate Change Research, Argonne is leading the development of an Earth System Model for testing new aerosol parameterizations. ANL continues to be a leader in adapting synchrotron-based methods at the APS to environmental studies as evidenced by numerous productive collaborations that have developed.

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

Score: 2.8

Grade: B

Weighting: 20

Objective 1.3 Performance Summary Statement:

The SBC provides outstanding quantity and quality of structures of proteins and protein complexes. Its ID beamline is the most productive in the world, and the more than 70 peer-reviewed scientific publications in FY 2008 from the SBC and its users is well above that of most other such programs world-wide. The staff of the SBC has been highly responsive to the recommendations of the most recent merit review, held in 2006. The research projects in Genomics: GTL also are highly productive. ANL continues to publish impactful science manuscripts employing synchrotron techniques in high quality peer reviewed journals such as *Environmental Science & Technology*, *Public Library of Science*, and others.

Overall, the unrealized potential of ANL's program limits its ability to contribute broadly to BER program goals. A multipurpose laboratory like ANL should be making significant contributions to many different areas across the breadth of the BER program.

Objective 1.4 Provide for Effective Delivery of Products

Score: 3.1

Grade: B+

Weighting: 30

Objective 1.4 Performance Summary Statement:

The SBC provides outstanding quantity and quality of structures of proteins and protein complexes. Its ID beamline is the most productive in the world, and the more than 70 peer-reviewed scientific publications in FY 2008 from the SBC and its users is well above that of most other such programs world-wide. The staff of the SBC has been highly responsive to the recommendations of the most recent merit review, held in 2006. The research projects in Genomics: GTL also are highly productive. ANL continues to publish impactful science manuscripts employing synchrotron techniques in high quality peer reviewed journals such as *Environmental Science & Technology*, *Public Library of Science*, and others. ANL continues to work with ERSP investigators on project of mutual interest requiring the synchrotron capabilities of the APS.

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

Goal Score: 3.71

Goal Grade: A-

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 2.0 Performance Summary Statement:

ANL's Structural Biology Center (SBC) at the APS leads the world in its efficient use of its beamline.

The Atmospheric Radiation Measurement (ARM) Climate Research Facility (ACRF) exceeded its operational metrics for each quarter in FY 2008 and its Environmental Safety and Health record was exceptional.

ANL's SBC and ACRF are leading facilities for the conduct of biological and climate change research, attracting leading scientists and resulting in high profile, impactful publication. However, ANL has done relatively little to use either the SBC or the ACRF to grow its internal climate or biology research programs.

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: 3.8

Grade: A

Weighting: 90

Objective 2.3 Performance Summary Statement:

The Atmospheric Radiation Measurement (ARM) Climate Research Facility (ACRF) was very productive in 2008. Using procedures to ensure that instruments are operating within specifications, ACRF exceeded its operating metrics for each quarter for FY 2008. The ACRF met with several user groups, including international workshops, and has initiated an activity to provide measurements of a critical parameter for climate models, vertical velocity. The Environmental Safety and Health record is exceptional; there were no lost-time work days, no days with a recordable accident, no days with property damage incidents, and no days with a reportable loss to vehicles for FY 2008. The ACRF has been active outreach; thus, the number of users has significantly exceeded DOE expectations for FY 2008. ANL has successfully recruited personnel to cover key facility activities.

The SBC leads the world in the efficiency of use of its ID beamline, producing 285 depositions in the PDB in FY 2008, almost 100 more than its nearest competitor worldwide. The bending magnet beamline is also used effectively, despite its poorer brightness, in particular for preliminary experiments to select crystals for use at the ID beamline. This enables maximum use to be made of the ID beamline and is a reason for its extraordinary productivity.

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

Score: 2.9

Grade: B

Weighting: 10

Objective 2.4 Performance Summary Statement:

In FY 2008, ACRF users produced significant science, and have made improvements to several climate models. For example, a study using five years of data that demonstrated a strong diurnal evolution of clouds. These results are being used to evaluate model simulations of clouds. The Community Climate System Model is one of these impacted models, and the new representation of aerosols will improve the simulations for the next IPCC assessment. Users have also improved the accuracy of weather forecast models. The ACRF is a recognized leader for climate observations, as evidenced by the invitation of the ANL ACRF manager to participate in an international steering committee tasked with building an international climate observing network. This group has acknowledged ACRF as the standard for surface-based observations. A concern is that the Laboratory has done relatively little to use the ACRF to grow its internal climate research programs.

The SBC attracts a large number of collaborators and is a major contributor to the Laboratory's external user community. This record is outstanding. The leadership role of SBC staff in the Midwest Center for Structural Genomics, a large National Institutes of Health program project at the Laboratory, is also evidence for the ability of the Laboratory to use the APS to grow its research base. A concern is that the Laboratory has done relatively little to use the APS to grow its other biological research programs in

areas relevant to the DOE missions in energy and environment.

Goal 3.0 Provide Effective and Efficient Science and Technology Program Management

Goal Score: 3.04

Goal Grade: B

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 3.0 Performance Summary Statement:

ANL exhibits outstanding management of programs related to or associated with the SBC and ACRF, including doing an excellent job of proactively communicating with BER program managers.

ANL has been relatively ineffective in efforts to expand its environmental, climate, and non-SBC focused biology programs.

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

Score: 2.7

Grade: B-

Weighting: 20

Objective 3.1 Performance Summary Statement:

The Laboratory provides outstanding stewardship of and vision for its capabilities in structural biology, including the retention of outstanding scientists such as those in the SBC, but has demonstrated only moderate programmatic vision in the biological sciences outside that area. It has made only modest connections with outside scientists in areas such as bioenergy and biological research for environmental applications. In FY2008 ANL demonstrated its scientific vision through the development of the ANL science plan for environmental remediation. ANL has incorporated external collaborations into its ERSP program and is in the early stages of seeking to broaden its expertise to take advantage of emerging capabilities (metagenomics). The ACRF Operations Manager is an invited active member of a World Meteorological Organization steering committee tasked with building an international climate observing network.

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

Score: 2.5

Grade: B-

Weighting: 30

Objective 3.2 Performance Summary Statement:

The research plans of the SBC are well thought out, proactive, and endorsed by external experts. Contingency plans exist for potential problems, for example the failure of one of the two detectors in FY 2008 was solved by a short-term measure until the replacement was received. Planning of biological research outside of structural biology is adequate but not as yet strategic. ANL is working effectively with BER staff to improve its ERSP science plan. A key staff member will need to be replaced under ANL's new ERSP program. The ACRF is operating under a strategic plan that was highly rated by a 2007 review panel that emphasized the cost-effective support of the scientific community. New planning is underway to address changing DOE priorities. ANL has been relatively ineffective in efforts to expand its environmental, climate, and non-SBC focused biology programs.

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:

Laboratory management is effective in providing information for BER Program Office staff on developments and opportunities in the biological sciences. The scientists directing programs such as the SBC provide frequent and valuable updates on progress and accomplishments. The ACRF Operations Manager provides highly informative monthly reports of the facility operations. The manager also contacts in a timely manner DOE concerning any critical issues and proposes a solution to the problem. He addressed the logistical and political issues in dealing with the Chinese government during the current mobile facility deployment with diplomacy and technically sound solutions.



Laboratory Year-End Performance Assessment Report

Date:

Headquarters Program Office Fiscal Year 2008 Evaluation of UChicago Argonne, LLC for Management and Operation of the Argonne National Laboratory

Agency:
Department of Energy - Office of Science

Program Office:
Office of High Energy Physics

FY Funding Level: (Budget Authority)
11,959,000

Evaluator:
[Redacted]

Phone Number:
[Redacted]

E-mail Address:
[Redacted]

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.46 Goal Grade: A-

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 1.0 Performance Summary Statement:

- Detector development and accelerator science are two strengths of the ANL high energy physics.
-

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

Score: 3.5 Grade: A- Weighting: 30

Objective 1,1 Performance Summary Statement:

The Argonne High Energy Physics program features hadron collider physics using ATLAS and CDF, neutrino physics using MINOS and NOvA, particle physics theory, and particle astrophysics with VERITAS and DES. ANL also performs research in accelerator science and R&D on superconducting RF.

The Argonne Wakefield Accelerator (AWA) group has shown that dielectric structures can sustain accelerating gradients over 100MV/m, which is almost five times the gradient typically used in accelerators today.

Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 3.5

Grade: A-

Weighting: 30

Objective 1.2 Performance Summary Statement:

██████████ was selected to be deputy physics coordinator for the ATLAS Collaboration at the LHC, which has approximately 2100 physicists from 35 countries. He will succeed the current physics coordinator after one year. ██████████ led the commissioning ATLAS hadronic calorimeter.

Argonne guided the membership of Northern Illinois University in the ATLAS Collaboration. The NIU group worked ATLAS for several years as an affiliate member sponsored by ANL.

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:

Together with ██████████ and Material Science Division we are developing new large area photo sensors (aimed at DUSEL large Cerenkov) and with pico-second timing resolution.

The AWA group is commissioning of a new klystron is about to finish. This will enable a second beamline for conducting the two-beam acceleration research.

Objective 1.4 Provide for Effective Delivery of Products

Score: 3.4

Grade: B+

Weighting: 10

Objective 1.4 Performance Summary Statement:

Detector development is one of the strengths of the Argonne high energy physics group. This year the first vertical slice of a digital hadron gas calorimeter with 4000 channels was built, operated and analyzed. Based on these results the construction of a 400K channel calorimeter is in progress.

The ANL/FNAL SRF cavity processing facility is now operational at ANL. The results this year

- 5 electropolish procedures for ILC performed
- 3 cavities cold tested
- Reached 33 MV/m after EP with recent single cell

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

Goal Score: 3.40

Goal Grade: B+

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 2.0 Performance Summary Statement:

- ANL is delivering on their commitments to the ATLAS, NOvA, and DES projects.

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: 50

Objective 2.1 Performance Summary Statement:

ANL participates in two HEP projects, the Dark Energy Survey (DES) Project and the NOvA Project. DES received CD-2 in April 2008 and NOvA in September 2008. ANL has played an important role in the engineering of the detector structure for NOvA, unfortunately progress was almost completely stopped by the reduction of funding for NOvA in the FY 2008 Omnibus.

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: 3.4

Grade: B+

Weighting: 50

Objective 2.2 Performance Summary Statement:

DES successfully reached CD-3A in FY 2008 and CD-3B just after the fiscal year ended. This was ahead of schedule. The ANL contributions are in the area of mechanical engineering of the optical system and some work on the instrument control software. All contributions were all satisfactory.

The major fabrication effort (post CD-2) at ANL for the ATLAS project has been completed. ANL has met all of their milestones on time and on budget.

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: 3.54

Goal Grade: A-

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 3.0 Performance Summary Statement:

- The HEP Division dealt effectively to mitigate the impact of the reduced funding due to the FY 2008 Omnibus Appropriation.
- The Director of the High Energy Physics Division has reached out to other parts of Argonne to find expertise to support the high energy physics mission.

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 Director of the High Energy Physics Division has reached out to other parts of Argonne to find expertise to support the high energy physics mission. He has developed collaborations with nuclear physics and materials science to support superconducting RF R&D. The lab is developing a labwide astrophysics initiative, which the High Energy Physics Division is participating.

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

Score: 3.6

Grade: A-

Weighting: 40

Objective 3.2 Performance Summary Statement:

The planning of the High Energy Physics Division has improved in the recent years and the Division dealt effectively to mitigate the impact of the reduced funding due to the FY 2008 Omnibus Appropriation. The Division Director has been proactive in setting up collaborations within the laboratory to address high energy physics needs. He has articulated a realistic ANL program aligned with high energy physics priorities.

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

Score: 3.5

Grade: A-

Weighting: 20

Objective 3.3 Performance Summary Statement:

Communications with OHEP are good. The lab is responsive to requests for information and the responses are generally of good quality.



Laboratory Year-End Performance Assessment Report

Date:

11/18/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of UChicago Argonne, LLC
for Management and Operation of the Argonne National Laboratory

Agency:

Department of Energy - Office of Science

Program Office:

Office of NUCLEAR PHYSICS J04

FY Funding Level: (Budget Authority)

26,121,000

Evaluator:

Phone Number:

E-mail Address:

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.90

Goal Grade: A

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 1.0 Performance Summary Statement:

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

- Conducted high-precision mass measurements of several nuclei in the A~90 region that ruled out the vp-process as the origin of the anomaly in the relative production abundances of $^{92,94}\text{Mo}$.
- Provided new tests of *ab initio* theoretical calculations of light nuclei through measurements of charge radii of $^6,^8\text{He}$, studies of unbound states in ^7He , and precision lifetime measurements of ^{10}Be .

- Further elucidated the existence of a new subshell gap at neutron number $N=32$.
- Published approximately 150 research papers in peer-reviewed journals.
- Delivery of 5670 hours of accelerated beams (exceeded plans) to serve approximately 370 users.
- Sustained progress towards energy upgrade of Argonne Tandem Linac Accelerator System (ATLAS), and construction of the Californium Rare Ion Breeder Upgrade (CARIBU), which will deliver accelerated beams of rare fission fragments.
- Continued R&D effort and pre-conceptual design of the Facility for Rare Isotope Beam (FRIB).

The scores and grades for Goal 1-3 are based on the written material provided in lieu of the annual ATLAS S&T review, communication to NP at the February Laboratory Managers' Briefings, Project Reviews (peer review), quarterly reports by project contract managers, biweekly conference calls with Physics Division management, NP program manager's observations at national meetings, and NP program manager's judgment.

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

Score: 4.0

Grade: A

Weighting: 35

Objective 1,1 Performance Summary Statement:

The ANL Physics Department low energy subprogram scientists conduct high priority research at the Argonne Tandem Linac Accelerator System (ATLAS) in nuclear structure, reaction, astrophysics, and fundamental interactions to address goals of the national program. The ANL program is essential to accomplish many of the milestones in these areas, including nuclear structure near closed shells, exploration of the proton dripline, reactions important to the stellar production of radionuclides, and data necessary to test the unitarity of the quark mixing matrix. These studies are performed using stable and radioactive ion beams that are produced in either batch mode or in flight.

The ANL scientists operate several powerful state-of-the-art detector systems for their users: (a) Gammasphere (the world's most powerful high-resolution gamma detection system) for studies of nuclei at high spins, K-isomers in very heavy nuclei, exotic shapes and novel symmetries, and transactinide nuclei; (b) the Fragment Mass Analyzer (FMA) to probe nuclear structure and properties at or near proton dripline; and (c) the Canadian Penning Trap for precision mass measurements.

The ANL scientists have performed high-precision mass measurements of several nuclei in the $A\sim 90$ region that ruled out the νp -process as the origin of the anomaly in the relative production abundances of $^{92,94}\text{Mo}$.

The ANL scientists performed several experiments to test *ab initio* calculations of light nuclei, and refine development of two- and three-body realistic interactions. They included measurements of charge radii of $^{6,8}\text{He}$, studies of unbound states in ^7He , and precision lifetime measurements of ^{10}Be .

The ANL scientists performed spectroscopic studies of several nuclei around ^{54}Ti to further elucidate the existence of a new subshell gap at neutron number $N=32$.

The ANL group has developed the concept and fabricated a new type of magnetic spectrometer

(HELIOS) that will advance spectroscopic studies of rare isotopes via transfer reactions in reverse kinematics. This device is being commissioned for use in FY 2009.

The ANL scientists and technical staff continued their progress toward energy upgrade of the Argonne Tandem Linac Accelerator System (ATLAS), and construction of the Californium Rare Ion Breeder Upgrade (CARIBU), which will deliver accelerated beams of rare fission fragments.

ANL continues to refine the science case for FRIB, and promote a vision that provides a high level of research opportunities for a new scaled-down facility. They drive the technical design for the FRIB.

RIB R&D scientists and engineers at ANL conduct high priority R&D work essential for realization of next generation facility for rare isotope beams (FRIB) to be constructed in the US. ANL researchers have made advances in two major areas: (a) a novel gas catcher with rf (radiofrequency) carpet achieving high efficiencies needed for FRIB, and (b) development of triple-spoke SRF accelerating cavities with high field gradients and efficiencies for the driver linac of proposed FRIB. Other R&D work at ANL for FRIB includes liquid metal stripping target and high power beam dump targets with noticeable advances.

The Medium Energy (ME) group at ANL continues to be very productive and effective in their research programs at TJNAF. They recently published results on their precision measurement of ^8He using the laser atom trapping technology they developed. The leader of the laser trapping research program, [REDACTED], received the Francis M. Pipkin Award this year. The group includes several PECASE award winners and a recipient of the Tom W. Bonner Prize in Nuclear Physics. Several members of this group play leadership roles in developing the future Medium Energy program for the TJNAF 12 GeV CEBAF Upgrade and a possible future Electron Ion Collider.

ANL nuclear theorists have made important contributions to several areas of great relevance to the nuclear physics research program, including the modeling of the nuclear force and its incorporation in studies of the nuclear structure of light nuclei; the derivation of nuclear reaction rates of relevance to astrophysics; unusual properties of nuclei in extreme situations (high spin and near the neutron drip line); and the spectroscopy of mesons and excitations of the nucleon.

Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 3.9

Grade: A

Weighting: 25

Objective 1.2 Performance Summary Statement:

The ANL Low energy (LE) group is among the world leaders in the exploration of properties of weakly-bound nuclei near proton dripline, use of unstable nuclei to study reactions of interest to nuclear astrophysics, and mass measurements with high precision.

The ANL group members have been leaders for more than a decade to develop the science case and technical concept for the facility for rare isotope beams (FRIB). They have provided highly effective input to the National Academies study of the need for a world-leading U.S. FRIB facility, and to the NSAC taskforce for FRIB. The University of Chicago/Argonne LLC made an application in response to the Funding Opportunity Announcement for FRIB.

A number of the ANL researchers are recognized as leaders in their respective areas, in addition to being recognized internationally as experts in the field. Several group members serve on national international review panels.

ANL scientists are leaders in the development of superconducting radiofrequency accelerating cavities for heavy ion applications, including new types of cavities installed in ATLAS, new designs for FRIB, and R&D for other future accelerators.

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

Score: 3.8

Grade: A

Weighting: 25

Objective 1.3 Performance Summary Statement:

In FY 2008, ANL scientists authored or co-authored 151 articles in refereed journals, and presented 112 invited talks. Ten Ph.D. theses were completed based on research at ATLAS. The journal articles included 63 in nuclear structure and nuclear astrophysics, 32 in nuclear theory, 12 in accelerator physics, and 37 in medium energy physics.

The ANL LE group has driven the intellectual processes to promote the facility for rare isotope beams.

In 2008, two of the postdoctoral associates in Physics received named Fellowships. ANL scientist, [REDACTED] was recipient of the 2009 Pipkin Award of the American Physical Society. His citation reads:

"For development of techniques to laser cool and trap rare and radioactive atomic species; and for applications of these techniques ranging from trace isotope analysis to tests of fundamental symmetries"

Their technical advances in RIB R&D combined with other key advances at other institutions have provided a rare opportunity for the RIB community toward realization of FRIB.

The RIB R&D group publishes in leading technical journals, makes invited and contributed presentations at national and international meetings, and has played a prominent role in the intellectual processes to promote the facility for rare isotope beams. The group provided important input and presentations for the 2007 NSAC Task Force in RIB.

Objective 1.4 Provide for Effective Delivery of Products

Score: 3.8

Grade: A

Weighting: 15

Objective 1.4 Performance Summary Statement:

The ANL Physics Division's Field Work Proposal is comprehensive, with a reasonable financial and workforce plan.

The LE research is well aligned with NP goals in nuclear structure, nuclear astrophysics, and fundamental interactions, and essential to accomplishing approximately 10 of the program milestones over the period 2007-2012.

The group has effectively operated instrumentation for research by users, and served as mentors to a community of 370 users, including a sizeable international community.

The RIB R&D activity is well aligned with the activities of NP goals in Low Energy area by making advances aimed at a timely and affordable realization of FRIB.

The ANL CARIBU project is on cost and schedule.

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

Goal Score: 3.70

Goal Grade: A-

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 2.0 Performance Summary Statement:

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

- Delivery of 5670 hours of stable and radioactive ion beams for 47 experiments.
- Sustained progress toward energy upgrade of ATLAS, and construction of CARIBU, and is on track for timely completion.
- The ATLAS staff effectively exploits the synergy between the radioactive ion beam R&D with the improvement of ATLAS and its experimental systems.

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: 3.7

Grade: A-

Weighting: 85

Objective 2.3 Performance Summary Statement:

The facility provided 5670 beam hours comprising of both stable and radioactive nuclei, exceeding

plans. The overall reliability of the facility is excellent (~95%) and above requirements.

The ATLAS operations and scientific staff have made excellent progress on the CARIBU project that will provide new re-accelerated neutron-rich beam species to enhance the capabilities of the facility.

The ATLAS energy upgrade project is proceeding well and will result in an increase of ~20% in the energies of heavy ions.

There were no lost work days or ORPS reports. There was one injury reported.

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

Score: 3.7

Grade: A-

Weighting: 15

Objective 2.4 Performance Summary Statement:

The ATLAS users program is effective. The experimental program at ATLAS helped in the training of 23 undergraduate students, 27 graduate students, and 22 Postdoctoral associates.

The ANL scientists and researchers organized six topical workshops in FY 2008.

Completion of the ATLAS energy upgrade and CARIBU project will significantly enhance the research capabilities of the facility. The ATLAS/ANL infrastructure is effectively utilized to carry out outstanding enabling R&D for a future US facility for rare isotope beams, for example the fast ion gas catcher, liquid lithium targets and strippers, and accelerator components. Ideas and concepts for rare isotope beam R&D are tested and exploited at ATLAS.

Goal 3.0 Provide Effective and Efficient Science and Technology Program Management

Goal Score: 3.90

Goal Grade: A

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 3.0 Performance Summary Statement:

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

- Effective management of the ATLAS facility for research by an international user community.
- Continued a well-coordinated effort to enhance research capabilities at ATLAS, including both accelerator and instrumental systems.
- ANL is one of the key centers for RIB R&D, and one of the two laboratories that submitted a proposal to site the next generation FRIB.
- Responsive actions and communications concerning facility operations and future plans.

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:

The Physics Division articulates a scientific vision and strategic plan that is devised in consultation with the user community, updated periodically, and serves as a basis for resource planning and justification. The plan identifies development of instruments, nuclear beams, and other resources that are needed to carry out an effective program that is aligned with the national goals.

The ATLAS staff effectively carries out the stewardship of nuclear physics research with both stable and radioactive ion beams to extend the technologies and methodologies necessary for a vital program. The facility serves an international user community.

The ATLAS staff has continued their effort toward energy upgrade of the facility, and completion of the CARIBU project to deliver accelerated beams of fission fragments that are complementary to those available at HRIBF facility at ORNL.

ANL is one of the key centers for RIB R&D providing an effective stewardship of scientific capabilities and program vision. Through this program vision, technical advances have been made that are paving the road toward realization of the next generation FRIB at a lower total cost and in a timely manner.

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

Score: 4.0

Grade: A

Weighting: 40

Objective 3.2 Performance Summary Statement:

The Physics Division has devised a mid-term, and long-term upgrade pathways for the ATLAS facility.

The CARIBU project to provide new RIBs is ongoing, with effective planning and management.

The Laboratory's long-term goal is to build FRIB, and it has put substantial Laboratory resources into R&D, pre-conceptual planning, and related efforts. The Physics Division and the Laboratory have addressed with internal resources high visibility FRIB technical issues and assisted in reducing technical risk to reasonable levels in many relevant areas. In response to an FOA issued by NP in FY 2008, the Physics Division submitted and participated in the review of a proposal to host the FRIB at ANL.

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

Score: 3.7

Grade: A-

Weighting: 20

Objective 3.3 Performance Summary Statement:

The Physics Division responds to requests for information in a timely manner, with information that is reliable. Biweekly teleconferences between the Office of Nuclear Physics and the Physics Division provide a mechanism to communicate issues and concerns routinely.

Appropriate point of contacts are usually known, or provided by the Division management on a timely basis. Reports on the CARIBU project progress are timely and informative.

The RIB R&D group at ANL has participated in several collaborative efforts with groups at other institutions. They have been responsive to program manager for Advanced Technology R&D. They also have been very responsive to inquiries by prospective SBIR companies and in forming collaboration with them in development of new technologies. They have provided opportunities for testing new detectors and instrumentation in collaboration with SBIR companies and other RIB R&D groups.



Laboratory Year-End Performance Assessment Report

Date:

1/14/2009

Headquarters Program Office Fiscal Year 2007 Evaluation of UChicago Argonne, LLC
for Management and Operation of the Argonne National Laboratory

Agency:

Department of Energy - Office of Science

Program Office:

Office of Workforce Development for Teachers and Scientists

FY Funding Level: (Budget Authority)

Evaluator:

Phone Number:

E-mail Address:

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 3.13

Goal Grade: B+

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 1.0 Performance Summary Statement:

The science education at Argonne has developed a well-established mentor culture within the laboratory. The success of the undergraduate internship and the DOE ACTS professional development program funded by WDTS is based on the careful attention given to matching dedicated mentors and talented students/educators. Both students and educators are placed in challenging research environments and are carefully guided to a productive outcome. Student products such as research abstracts are not as competitive as other laboratories and need improvement. The education office is committed to providing the encouragement necessary for all participants to successfully complete deliverables but the importance of the research abstract which are published the *Journal of Undergraduate Research* needs to be impressed upon the undergraduates.

ANL ensures that all participants benefit from the extensive enrichment (science seminars, workshops, exposure to opportunities -U. of Chicago- to pursue advanced degrees, etc.) available across the lab.

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

Score: 3.2

Grade: B+

Weighting: 25

Objective 1,1 Performance Summary Statement:

- The science education office is an institution within the laboratory responsible for all the training, HR requirement, ES&H and security training, work-stations, housing, travel, etc. and all are coordinated to the satisfaction of the laboratory divisions and the interns.
- The director of science education office is very attuned to the immediate and long term workforce needs of the laboratory and the DOE programs offices. He has long and valuable experience in managing effective research internship programs and knows how to use the laboratory resources to inspire career considerations at DOE laboratories

Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 3.3

Grade: B+

Weighting: 30

Objective 1.2 Performance Summary Statement:

- Students and educators are carefully matched with mentors where their talents can be developed and they are able to advance their research project and support their mentor.
- Students and educators are placed in challenging research positions that are in the laboratory core mission areas.
- There is a close working connection between the education staff and the research divisions throughout the laboratory. The divisions look to and rely the education to provide talented, conscientious undergraduate inters to assist with many of the fundamental tasks of research projects.

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

Score: 3.2

Grade: B+

Weighting: 30

Objective 1.3 Performance Summary Statement:

- Research interns and educators are paired with researchers who are funded by the Office of Science and are contributing to SC research.
- The accomplishments of interns needs to be better validated by improving quality research abstracts.
- The educators in the DOE ACTS program should collaborative workshop the requirements of the "electronic portfolio" to make more useful to the participants as well as validating the accomplishments of the participants.

Objective 1.4 Provide for Effective Delivery of Products

Score: 2.5

Grade: B-

Weighting: 15

Objective 1.4 Performance Summary Statement:

- The large majority of WTDS supported interns/educators report through participant surveys a rewarding, but very challenging given the requires deliverables., laboratory experience.
-

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

Goal Score: 0.00

Goal Grade: NA

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

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: 3.30

Goal Grade: B+

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 3.0 Performance Summary Statement:

WDTS sponsored laboratory research participants evaluation data report a high quality research experience. The mentor/protégé relationship was good, the research experience met expectations, the overall laboratory experience has strengthened commitments to pursue science/math/engineering careers but needed more time actually working on their research project.

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

Score: 3.3

Grade: B+

Weighting: 20

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.

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:

- Interns/educators are given an 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 the researcher(s).

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

Score: 3.4

Grade: B+

Weighting: 40

Objective 3.3 Performance Summary Statement:

- The ANL science education office is responsive to customer needs and do effectively communicate and complete program deliverables. But the visibility of the program within Argonne and the overall knowledge of science education across the complex, the office could take more of a leadership developing and sharing best practices.
- The education office is one of the most successful among the laboratories in outreach to under-represented populations and has some of the best inclusion rates from diverse groups.



Department of Energy

Washington, DC 20585

November 13, 2008

Mr. Ronald Lutha
Manager, Argonne Site Office
SC-ASO/Building 201
9800 South Cass Avenue
Argonne, Illinois 60439

SUBJECT: The Office of Energy Efficiency and Renewable Energy's Performance Evaluation of UChicago Argonne, LLC as the Management and Operating Contractor for the Argonne National Laboratory

Dear Mr. Lutha:

The Office of Energy Efficiency and Renewable Energy (EERE) has completed its evaluation of UChicago Argonne, LLC's performance in managing science and technology activities at the Argonne National Laboratory (ANL) for the performance period beginning October 1, 2007, and ending September 30, 2008. The evaluation report is enclosed for your information.

Five of the ten EERE programs, having obligated \$1.0 million or more to ANL, submitted evaluations. The programs are: Biomass; Hydrogen, Fuel Cells & Infrastructure Technologies; Industrial Technologies; Solar Energy Technologies; and, Vehicle Technologies.

For fiscal year 2008, the Office of Science asked EERE to provide only numerical grades to ensure compatible scores; as a result, we used a numerical rating scale for all of the laboratories. An EERE grade of 3.1 or higher (equivalent to a B+) signifies that the laboratory's achievements toward the performance goals translate to substantive accomplishments and results.

EERE graded ANL against three performance goals. ANL received the following numerical scores (and what would be equivalent letter grades) for these goals.

Goal 1: Accomplish Mission – numerical score of 3.93, or A

Goal 2: Effective and Efficient Operation of Facilities – numerical score of 3.94, or A

Goal 3: Effective Science and Technology Research Project and Program Management – numerical score of 3.85, or A



If you have any questions concerning this evaluation, please contact [REDACTED]

Sincerely, [REDACTED]

[REDACTED]
Deputy Assistant Secretary
for Renewable Energy
Office of Technology Development
Energy Efficiency and Renewable Energy

[REDACTED]
Deputy Assistant Secretary
for Energy Efficiency
Office of Technology Development
Energy Efficiency and Renewable Energy

[REDACTED]
Acting Deputy Assistant Secretary
Office of Business Administration
Energy Efficiency and Renewable Energy

Enclosure

cc: [REDACTED]
Supervisory Contract Administrator

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy

Performance Evaluation Report of the
University of Chicago for
Management and Operations of Science and Technology at the

Argonne National Laboratory

For the period October 1, 2007, to September 30, 2008

EXECUTIVE SUMMARY

The Office of Energy Efficiency and Renewable Energy (EERE) participates in the award-fee evaluation process to assess the performance of National Laboratories 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 University of Chicago’s operation of the Argonne National Laboratory (ANL). It assesses ANL’s performance of work for programs in EERE from October 1, 2007, to September 30, 2008.

Each reporting EERE program that obligated \$1.0 million or more to ANL 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 ANL as of August 31, 2008, as the weighting factor.

The following EERE programs submitted evaluations: Biomass (BP); Hydrogen, Fuel Cells and Infrastructure Technologies Program (HFCIT); Industrial Technologies Program (ITP); Solar Energy Technologies Program (Solar); and Vehicle Technologies Program (VTP).

EERE rated ANL’s performance for fiscal year 2008 with a score of 3.93 for Goal 1: Accomplish Mission; 3.94 for Goal 2: Effective and Efficient Operation of Facilities; and 3.85 for Goal 3: Effective Science and Technology Research Project and Program Management. ANL’s total score for fiscal year 2008 is 3.91.

Numerical Grades by Performance Goal	Goal 1: Accomplish Mission	Goal 2: Effective and Efficient Operation of Facilities	Goal 3: Effective Science and Technology Research Project and Program Management
Biomass	4.10	3.00	3.83
Hydrogen, Fuel Cells and Infrastructure Technologies Program	3.96	3.40	3.87
Industrial Technologies Program	3.54	3.65	3.77
Solar Energy Technologies Program	3.55	3.50	3.47
Vehicle Technologies Program	3.95	4.30	3.87
Weighted Average Grade	3.93	3.94	3.85
Final Numerical Score	3.91		

Grades of 3.3 or higher signify that ANL'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.

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

INTRODUCTION

This evaluation has been prepared as part of the DOE contractual obligation to assess University of Chicago's performance for Management and Operations of Science and Technology at ANL. Specifically, it assesses ANL'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.

This evaluation report, covering the period from October 1, 2007, through September 30, 2008, comprises five sections. The first section highlights the given performance goals, objectives and measures provided to each DOE EERE technical program office. The second section addresses the process followed to grade the laboratory's performance. The third section presents the overall grades resulting from the evaluation. The fourth section lists key achievements and areas of concern. The fifth and final section provides guidance for the next performance period.

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: Accomplish Mission
 - Objective 1.1: Accomplish Mission;
 - Objective 1.2: Leadership;
 - Objective 1.3: Produce high quality, original and creative results that advance science and technology (recognition of science and technology breakthroughs);
 - Objective 1.4: Delivery.

- Goal 2: Effective and Efficient Operation of Facilities
 - Objective 2.1: Provide effective and efficient operation of facilities supporting the EERE program.

- Goal 3: Effective Science and Technology Research Project and Program Management
 - Objective 3.1: Effective program vision and leadership.
 - Objective 3.2: Effective and efficient science and technology project and program planning and management.
 - Objective 3.3: Effective and efficient communications and responsiveness to EERE and Project Management Center (PMC) needs.

EERE also adjusted the Performance Measures under Goal 1 to include success in meeting program milestones and other criteria appropriate to applied research. EERE uses only one Performance Objective under Goal 2, namely the effective and efficient operation of facilities to support EERE programs. EERE only constructs facilities at the National Renewable Energy Laboratory (NREL).

EVALUATION PROCESSES: NUMERICAL SCORES AND AVERAGING

After collecting the scores, EERE weighted them against specific program obligations for fiscal year 2008 at ANL, as reported in the DOE Standard Accounting and Reporting System as of August 31, 2008. See the following table for total funding allocated to each program.

Program Office	Year-To-Date Obligations at ANL as of August 31, 2008
Biomass	\$2,265,000
Hydrogen, Fuel Cells and Infrastructure Technologies Program	\$14,707,354
Industrial Technologies Program	\$1,745,003
Solar Energy Technologies Program	\$1,400,000
Vehicle Technology Program	\$31,027,676
Total	\$51,145,033

EERE then computed a weighted average score for each Performance Goal. The following example illustrates the algorithm used to compute a weighted average.

Program	Numerical Score	Fiscal Year 2008 Obligations	Weighted Score
One	4.3	\$2,000,000	8,600,000
Two	3.9	\$20,000,000	78,000,000
Three	3.3	\$6,000,000	19,800,000
SUM		\$28,000,000	106,400,000
Weighted Average (Sum of Weighted Score/Sum of RY 2008 Obs)			3.80

OUTCOME BY PERFORMANCE GOAL

EERE rated ANL's performance for fiscal year 2008 with a score of 3.93 for Goal 1: Accomplish Mission; 3.94 for Goal 2: Effective and Efficient Operation of Facilities; and 3.85 for Goal 3: Effective Science and Technology Research Project and Program Management.

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:

Numerical Grades by Performance Goal	Goal 1: Accomplish Mission	Goal 2: Effective and Efficient Operation of Facilities	Goal 3: Effective Science and Technology Research Project and Program Management
Biomass	4.10	3.00	3.83
Hydrogen, Fuel Cells and Infrastructure Technologies Program	3.96	3.40	3.87
Industrial Technologies Program	3.54	3.65	3.77
Solar Energy Technologies Program	3.55	3.50	3.47
Vehicle Technologies Program	3.95	4.30	3.87
Weighted Average Grade	3.93	3.94	3.85

Based upon the scores assigned by each program office for each performance goal and objective, ANL's overall final numeric score is 3.91 as calculated in the table below:

Goal	EERE Weight	Weighted Numerical Score (All Programs)	Portion of Final Score
Goal 1: Accomplish Mission	60%	3.93	2.36
Goal 2: Effective and Efficient Operation of Facilities	10%	3.94	0.39
Goal 3: Effective Science and Technology Research Project and Program Management	30%	3.85	1.16
Final Numerical Score		3.91	

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

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

SELECTED EXAMPLES OF ACHIEVEMENTS AND DEFICIENCIES

EERE, in the order of each Performance Goal, has highlighted selected major achievements recognized throughout fiscal year 2008. It also addresses certain areas within the ANL research and development (R&D) environment needing management attention.

GOAL 1: ACCOMPLISH MISSION with the following objectives:

- Accomplish Mission;
- Leadership;
- Produce high-quality, original and creative results that advance science and technology (recognition of science and technology breakthroughs); and
- Delivery.

SIGNIFICANT ACHIEVEMENTS

- **Biomass**
 - Objective 1.1**
 - ANL's Greenhouse Gases, Regulated Emissions and Energy Use in Transportation (GREET) model has been used by many organizations for evaluating the lifecycle greenhouse gas emissions associated with a variety of fuels, including biofuels. The model is available to the public and there are approximately 9,000 users of GREET around the world. The model is being utilized by many organizations both in the private sector and in government agencies for state-of-technology assessments, regulatory analysis, and international comparisons. The program has furnished invited speakers, conference chairs, or recognized

experts in a number of areas as follows: plenary speech at Illinois Agronomy Day, panel chair on chemicals from biomass at Illinois Biotechnology Industrial Organization's annual meeting, and the Illinois Biotech Group's Council for Chemical Research conference on Biobased Feedstocks. ANL staff gave an invited presentation on biomass at the first Midwest Alternative Energy Venture Forum, gave an invited panel presentation on commercial biomass opportunities at the Chicago Fed Reserve's First Clean Tech Forum, and served on the steering and/or advisory committee for several Midwest biomass R&D centers.

Objective 1.2

- The U.S. Environmental Protection Agency is using the GREET model as one of its analytical tools to determine the lifecycle greenhouse gas emissions associated with biofuels. The California Air Resources Board is also using the model as part of its proposed Low Carbon Fuel Standard regulation. General Motors (GM) has endorsed the model as the "gold standard" in the lifecycle evaluation area. Michael Wang of ANL has worked collaboratively with the U.S. Department of Agriculture to incorporate better data and methodologies into the model. There is interest from the Department of Defense to utilize this framework for the evaluation of greenhouse emissions from aviation fuels.

Objective 1.3

- Under the leadership of [REDACTED], the GREET model has undergone significant improvements in the last few years. There is better representation of distillers' dry grains with solubles (DDGS) in the model. DDGS is an important co-product of the ethanol conversion process and accurate accounting of this animal feed supplement has significant implications in terms of accounting for greenhouse gas impacts of ethanol. [REDACTED] has also begun the process of accounting for direct and indirect land use changes associated with biofuels. This work is being done in a collaborative effort between Argonne and Purdue University. Incorporation of land use changes in the model will make GREET an even more valuable tool for greenhouse gas analytical activities.

Objective 1.4

- [REDACTED] and [REDACTED] at Argonne have been extremely responsive to quick turn-around tasks as required by DOE headquarters. These tasks often arise at the last minute and require careful review and rapid response. Headquarters staff can rely upon [REDACTED] and [REDACTED] to provide this type of response. Even when on travel, they can be available for discussions and questions. [REDACTED] has responded within hours from China to e-mail enquiries from [REDACTED].

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

Objective 1.1

- Task Title: Non-Platinum Bimetallic Cathode Electrocatalysts. The following accomplishments were realized in fiscal year 2008:
 - Calculated preferred reaction pathways and barriers for two possible O₂ reduction reaction mechanisms on slabs of pure metals using density functional theory: a dissociative mechanism through -OH formation and an associative mechanism through -OOH formation.

- Calculated reaction force field potentials for Pd (palladium) and PdCu (a palladium-copper alloy).
 - Determined effect of Pd particle size (1.2 to 20 nm) on oxygen reduction reaction (ORR) kinetics--5 nm particle size shows highest ORR mass activity.
 - Synthesized and characterized a series of PdCu, PdNi (a palladium-nickel alloy), PdFe (a palladium-iron alloy) catalysts via co-impregnation; determined the effect of Pd to base metal ratio, post-deposition heat treatment temperature and atmosphere, and acid treatment.
 - Developed a strong electrostatic adsorption technique for PdCo (a palladium cobalt alloy) and achieved Co core-Pd shell structure.
 - Developed a colloidal technique for PdCu; synthesized and characterized a series of colloidal PdCu catalysts.
 - Determined that Cu modifies the valence band density of states of Pd.
 - Achieved factor of 3.75 improvement in ORR activity of PdCu/C catalyst by using alternative colloidal technique.
 - Achieved ORR mass activity of approximately 75 percent that of commercial Pt/C with PdCu/C catalyst (@800 mV).
- Task Title: Polymer electrolyte membrane fuel cell using Aligned Carbon Nanotubes as Electrodes in membrane electrode assemblies (MEAs). Methods of preparing dense, uniform aligned carbon nanotubes (ACNT) layers with adjustable thickness were successfully developed using chemical vapor deposition (CVD) technique. A variety of solution impregnation methods were developed to catalyze ACNTs with good metal dispersion. A co-CVD process was developed to functionalize ACNT by directly depositing Pt through a gas phase reaction. MEA fabrication method was successfully developed to transfer ACNT to Nafion® membrane. ACNT-MEA showed improved performance over commercial product in single cell tests.
 - Task Title: Fuel Cell Testing. Characterized a 1-kW stack for sensitivity to operating conditions. The maximum power the stack developed was 1332 Watts at ambient pressure, achieving a thermodynamic efficiency of 53.8 percent. At 25 percent of rated power, the efficiency increased to 65.6 percent. ANL characterized two 5-kW complete systems. ANL staff participated in and made technical presentations at the second meeting of the International Standards Organization (ISO) Working Group 11 under Technical Committee 105 of the International Electrotechnical Commission, held on December 17-18, 2007, in Frankfurt am Main, Germany. The goal of this international group is to draft the technical specification of a single-cell test protocol. Representatives from six countries attended. The lab upgraded the test facility by replacing the air supply subsystem to provide clean, hydrocarbon-free air to the fuel cells or systems under test.
 - Task Title: System Level Analysis of Hydrogen Storage Options.
 - Updated the storage capacity of the cryo-compressed Gen 2 system with data from technology developers.
 - Revised analysis of the storage capacity of the cryogenic activated carbon system to reflect 2010 and 2015 delivery pressure targets.

- Determined the intrinsic capacities, thermodynamics, and water and heat management requirements for on-board sodium borohydride hydrolysis (SBH) storage system.
- Evaluated the overall fuel cycle efficiency of SBH regeneration using flowsheets proposed by Millennium Cell and Rohm and Haas, and provided input to DOE and the independent Systems Integrator on DOE's go/no-go decision for SBH.
- Conducted systems analysis to determine the extrinsic capacities, thermodynamics, and decomposition kinetics of alane (aluminum hydride) in slurry form.
- Completed preliminary energy and efficiency analysis of off-board regeneration requirements.
- Conducted preliminary analysis of regeneration of an organic liquid carrier and determined the overall fuel cycle efficiency.
- Performed preliminary energy and efficiency analysis of ammonia borane (AB) regeneration using a scheme developed by the DOE Chemical Hydrogen Storage Center of Excellence.
- Identified processes that consume a significant amount of energy in regeneration and provided feedback to the Center.
- Task Title: Fuel Cell Systems Analysis.
 - Analyzed the performance of stacks with the 3M nanostructured thin film catalysts and determined the optimum operating pressures and temperatures.
 - Analyzed experimental data for Honeywell's integrated compressor-expander module (CEM) and developed a scalable compressor map and scalable expander maps for different nozzle areas.
 - Proposed and analyzed alternative CEM configurations capable of approaching the maximum parasitic power target of 5.4 kW for an 80-kW fuel cell system.
 - Analyzed the performance of advanced radiators with metal foams, high-density louver fins and microchannel plain fins.
 - Identified a compact radiator design with the lowest pumping power.
 - Analyzed the performance of enthalpy wheel humidifiers at part load and at different rotational speeds.
 - Analyzed the performance of a membrane humidifier and determined the conditions of optimum operating temperature and pressures at part load.
 - Compared the performance of two fuel cell systems, one with an enthalpy wheel humidifier and the other with a membrane humidifier.
- Hydrogen Quality Issues for Fuel Cell Vehicles: Conducted a fuel quality modeling workshop to discuss pressure swing adsorption (PSA) and fuel cell impurity effects modeling (August 2007). Participated in ISO Working Group 12 meetings and held in-depth discussions on modeling impurity effects on fuel cell systems (November 2007 and April 2008). Presented and discussed Hydrogen Quality Working Group activities at several FreedomCAR and Fuel Partnership's Technical Team meetings and at other forums (May 2007, June 2007, October 2007, November 2007, January 2008, and April 2008).

Developed PSA performance models for different design and operating conditions and levels of various contaminants in product H₂. Developed methodology to evaluate effect of impurity level on hydrogen production cost, using H₂A.

- Hydrogen Well-to-Wheels Analysis: Supported early market analysis of fuel cell powered fork lifts and distributed power with comparative well-to-wheel analysis of competing technologies. The GREET model was modified to include these early market pathways. The project milestone was achieved. Well-to-wheel analysis was developed for gasoline and hydrogen plug-in hybrids. Various regional electrical supplies and hydrogen production pathways were included in the analysis. The GREET model was updated to include the plug-in vehicle option. The project milestone was achieved.
- Hydrogen Delivery Modeling: The second version of the Hydrogen Delivery Scenario Analysis Model (H₂A Delivery model) was issued in March.

Objective 1.2

- Argonne organized and hosted meetings of DOE's Hydrogen Quality Working Group and a workshop on Hydrogen Fuel Quality with participation from Canada and Japan. Argonne led and coordinated the DOE Hydrogen Storage Systems Analysis Working Group. Argonne organized and hosted a market transformation workshop for the deployment of fuel cells at national lab facilities. As examples of collaborative efforts that enhance the effectiveness and productivity of the Laboratory's efforts, Argonne conducted collaborative hydrogen and fuel cell research with numerous industry and university partners, including Los Alamos National Laboratory, Oak Ridge National Laboratory, NREL, Chevron, BP, Shell, GM, Ford, Chrysler, Caltech, University of Chicago, University of Nevada, Las Vegas, Johns Hopkins University, University of Illinois, Northern Illinois University, Kettering University, Japan Institute of Energy, REB Research and Consulting, American Science and Technology, Chicago State University, General Electric, Taiwan Industrial Technology Research Institute, and International Energy Agency Fuel Cell Annex Participants. Argonne's work has opened new opportunities and changed the direction of research in the hydrogen and fuel cell fields. Argonne attracts the highest quality researchers, Post-Docs, and research partners.

Objective 1.3

- Argonne inventions and patents are indicative of the original and creative outputs resulting from Argonne's EERE-sponsored work. Eight invention disclosures were documented in fiscal year 2008. Five patent applications were filed and two patents were granted in fiscal year 2008. Argonne staff presented invited talks at major national and international conferences that have generated significant interest and awareness in the hydrogen and fuel cell field.

Objective 1.4

- Argonne conducted research under 32 agreements in 18 project areas during fiscal year 2008 for the HFCIT Program. Multiple milestones per agreement were defined in the Annual Operating Plan (AOP). Out of 81 total milestones, 76 milestones were completed on time or are on track to be completed on time. Quarterly technical reports, monthly cost reports, and inputs for the program annual report were submitted in a timely manner.

- **Industrial Technologies Program**

- **Objective 1.1**

- Argonne has demonstrated excellent applied research capabilities in the area of advanced reciprocating engine system R&D through the use of state-of-the art technical capabilities.

- **Objective 1.2**

- Argonne has shown that it is effective in responding to revisions in priorities with respect to the change from the Office of Electricity to EERE. They have established excellent collaboration with the leading private sector engine manufacturers.

- **Objective 1.3**

- Argonne has developed important understandings on elements critical to meeting the challenging goals of the advanced reciprocating engine systems (ARES) effort. Of particular note is the progress made in understanding laser-based ignition processes.

- **Objective 1.4**

- None

- **Solar Energy Technologies Program**

- **Objective 1.1**

- Good work.

- **Objective 1.2**

- Good work.

- **Objective 1.3**

- None

- **Objective 1.4**

- Argonne has met all its milestones.

- **Vehicle Technologies Program**

- **Objective 1.1**

- **Vehicle Systems:** The ANL Vehicle Systems Group consists of three major functional sections: Powertrain Modeling and Simulation, Component Hardware-in-the-Loop Testing, and Advanced Vehicle Performance Testing. Each element of ANL's testing disciplines is designed to address DOE's mission as stated in the plug-in hybrid electric vehicles (PHEV) R&D Plan. The combination of researcher skill sets, outstanding test facilities, and advanced instrumentation ensures world-class research capabilities. ANL's project design and technical deliverables were highly rated in DOE merit reviews in fiscal year 2008. Project progress reports were submitted regularly. ANL project reviews were presented to DOE management on a quarterly basis. In addition, Glenn Keller scheduled Vehicle Systems Group project updates with the DOE VTP for more in-depth descriptions of project outcomes every five weeks.

In support of DOE outreach and data dissemination requirements, ANL conducted more than 40 presentations on vehicle testing results and computer model simulations at industry gatherings, electric utilities, and to public, private, government and vehicle manufacturer groups. In further support of public dissemination requirements, ANL researchers gave interviews to local and national press organizations including Business Week, Automotive

News, MSNBC, Discovery Channel, Public Television, regional newspapers, and foreign press interests. Laboratory staff also acted as vehicle testing information resources to other government agencies such as the National Science Foundation, California Air Resources Board, Environmental Protection Agency, Department of Transportation, and Department of Defense.

- **Advanced Combustion and Emissions Control:** The funding support from the Advanced Combustion and Emissions Control program was split into the following four agreements: Fuel spray research using X-rays at the Advanced Photon Source, light duty engine combustion research using the GM 1.9 liter diesel engine, hydrogen fueled light duty engine research in collaboration with Ford and Sandia National Laboratories, and a Cooperative Research and Development Agreement (CRADA) effort on diesel particulate filter (DPF) with Corning and Caterpillar. The hydrogen fueled light-duty engine team demonstrated a pathway to achieve the 45 percent thermal efficiency goal of the VT Program. Successful completion of BMW Hydrogen 7 vehicle testing - project was initiated because of ANL's hydrogen engine expertise. Water injection on hydrogen engines was shown to significantly reduce nitrogen oxide emissions (50 percent and more). Exhaust gas recirculation will be implemented as a more practical solution. Joint publications between Sandia National Laboratories and ANL were based on close collaboration and the exchange of hardware (e.g. custom-designed fuel injectors). BMW R&D is interested in joining the Ford/ANL/Sandia consortium for hydrogen engine research. The on-going progress of fuel spray research using X-rays continues to be the large attraction of the worldwide research community and a top researcher from Bosch, the world's largest manufacturer of fuel injection systems, visited and worked with ANL researchers for six weeks. ANL initiated a new collaboration with the Engine Research Center (ERC) at the University of Wisconsin. A Ph.D. student from ERC will spend an extended period at Argonne in 2009 and will participate in spray measurements. The student will then use the data to validate and improve ERC's engine modeling code. Unprecedented assistance was given by GM. The GM engine is operating flawlessly and ANL expects to generate critical data in fiscal year 2009. The engine was extensively baselined to provide a complete stock vehicle-level engine performance map, which matched the GM original map to within 3 percent for power, load, fuel efficiency, and emissions performance. Peak brake thermal efficiency of the stock engine was verified to be 42 percent. Support received from GM includes a complete engine performance map to initiate the programming of an open engine controller, machining of a new cylinder head to accommodate endoscopic combustion chamber access, and machining 36 piston crowns to allow for changing the compression ratio of the engine to four different levels.
- Argonne staff produced ten peer reviewed publications in leading professional journals. Several staff members were invited to give lectures nationally and internationally. Technical lectures were given in India, South Korea, and Japan. This gives positive publicity to EERE/VT programs. For the first time, ANL has entered into a cost-shared CRADA with two major manufacturers, Caterpillar and Corning, to conduct research in advanced DPF. This grew out of the leading edge morphology and chemistry research with the innovative thermophoretic sampling system. The DPF test facility has been developed and integrated with the GM light-duty engine to collect particulate matter (PM) emissions. First observation of PM filtration has successfully been obtained by using a microscopic imaging system. Major international manufacturers such as Toyota, Hyundai, and Honda have

contacted ANL's Principal Investigator on his PM morphology research. Cost shared collaborative research with international sponsors is a distinct possibility.

- **Energy Storage:** In fiscal year 2008, ANL researchers published more than 40 papers related to lithium battery R&D in referenced technical journals and gave presentations at several international and/or national technical meetings and symposia.
- **Lightweight Materials Technology Completion of Plastics Recycling CRADA:** In the VT Lightweighting Material thrust, ANL completed, in August 2008, a five-year CRADA with the Vehicle Recycling Partnership (the automotive-recycling-focused consortium of the United States Council for Automotive Research and the American Chemistry Council Plastics Division (the main trade association of the automotive-plastics supplier industry). In this five-year effort, several technologies have been developed for the economical recycling of post-consumer (i.e., end-of-life vehicle) plastics scrap.
- **Commercialization of Post-Consumer Plastics-Recycling Technology:** A shredder firm in the Midwest has agreed to commercialize technologies developed at ANL for recovering post-consumer plastics scrap usually relegated to land fills. The shredder firm will pay for the bulk of the commercialization with technology-transfer assistance from ANL under VT-LM funding. The significance of the two achievements above is that a long-held perceptual barrier to the increased use of lightweighting polymer-based materials in vehicles may have been removed.
- **Light-Metals Recycling Workshop:** ANL organized and held, on September 24, 2008, a workshop to look at the issue of recycling light metals like aluminum (Al) and magnesium (Mg). Automotive steels have a significant competitive advantage over such light metals because most automotive steels can be melted together, from which base new steels can be made very cost-effectively. The workshop looked at the state-of-the-art for economically recycling the various Al and Mg alloys directly back to their original alloy without melting together. ANL is now developing a roadmap plan for evaluating the current technologies or developing new technologies for this purpose.

Objective 1.2

- **Vehicle Systems:** ANL is recognized as DOE's leading research laboratory for vehicle testing activities for emerging technologies such as PHEVs and major powertrain components. Moreover, ANL has been recognized for its excellence in advanced vehicle research by the automotive original equipment manufacturers (OEMs)--both domestic and foreign), by major component suppliers, and other industry trade groups such as the Electric Power Research Institute, Society of Automotive Engineers, etc. Recently, ANL's programs have been the recipient of several R&D 100 awards for excellence. Argonne closely coordinates vehicle testing activities through its collaboration with Idaho National Laboratory (INL), and provides test results and test vehicle components to NREL and Oak Ridge National Laboratory. ANL/INL collaboration on data acquisition and analysis of real world driving cycles and the comparison of results from standardized lab dynamometer testing with fleet testing demonstrates the synergistic value of cooperative research to enhance the state of knowledge on vehicle testing. The Advanced Vehicle Testing Activity (AVTA) Program utilizes the assets of both ANL and INL for cost-effectively testing advanced vehicles by sharing test scheduling and collaborating on performance data and system depreciation.

- **Advanced Combustion Engine Technologies:** ANL received recognition from the European Hydrogen Internal Combustion Engine consortium for doing outstanding research in hydrogen fueled engines. Joint publications in prestigious journals with Sandia National Laboratories resulted from this project. In X-ray based fuel spray characterization, ANL continues to be the recognized leader. Several engine and fuel systems manufacturers have contacted ANL with the prospect of establishing new collaborations. These include Delphi, Bosch GDI, Convergent Science, and Chrysler.
- **Energy Storage:** ANL organized and hosted the 1st International Conference on Advanced Lithium Batteries for Automobile Applications. The objectives of the conference, attended by more than 400 battery researchers representing industries, academic institutions, and governments from around the world, were to enhance the global effort on R&D of advanced lithium batteries for automobile applications; accelerate the discussion and communication of R&D progress, achievement and problems; and further strengthen the global collaboration in this important and challenging field.

Objective 1.3

- **Vehicle Systems:** As DOE's only integrated vehicle systems testing activity, the Center for Transportation Research at ANL designs creative testing methods for emerging technologies that act as benchmarks to DOE and industry alike. It allows DOE to gauge industry advancements of technologies such as PHEVs. Argonne staff conscientiously examines the quality and completeness of their data and reporting practices. The lab maintains an on-line database of test results organized to allow ease of user access and provides hybrid electric vehicle (HEV) auxiliary subsystems testing results to other DOE laboratories in support of developing and changing modeling parameters. ANL also conducts testing of emerging technologies that requires development of testing procedures and unique instrumentation that must creatively balance laboratory and INL field testing constraints.
- **Advanced Combustion Engine Technologies:** The demonstration of 45 percent thermal efficiency in a light duty engine is a major breakthrough for the ANL-Ford-Sandia National Laboratories team. The unique DPF testing facility has successfully been tested in connection with a light-duty diesel engine. More than 10 high quality technical papers of permanent reference value were published by major societies such as the American Society of Mechanical Engineers and the Society of Automotive Engineers. ANL's contribution of deployable technologies was evident from the exchange of personnel with Bosch and a steady stream of invitations to ANL staff to visit and give lectures at prestigious national and international institutions.
- **Energy Storage:** ANL and an industrial partner, EnerDel, Inc., were presented with an R&D 100 award for the joint development of an advanced, high-power lithium-ion battery system, recognized by *R&D Magazine* as one of the year's most significant technological innovations. ANL has developed and licensed a family of advanced, lithiated mixed metal oxide layered composite cathode materials and associated processing technology to Toda Kogyo Corporation, a major supplier of lithium-ion battery materials. The new cathode material possesses enhanced stability compared to conventional cathode materials.

Objective 1.4

- **Vehicle Systems:** ANL meets unscheduled and unanticipated information requests, which are often generated by DOE management, within timelines requested. The Argonne Vehicle

Systems Team met all scheduled milestones with several significant milestones completed early, including the revision of PHEV component R&D goals for the PHEV R&D Plan.

- **Advanced Combustion Engine Technologies:** The delivery of results was good. ANL staff participated in many national and international conferences as authors, organizers and conference chairmen. The demonstration of BMW hydrogen fueled vehicles was a resounding success. The ANL staff took part in DOE's Merit Review and the Combustion Memorandum of Understanding meetings organized by Sandia National Laboratories. Technology transfer to industry by direct participation of industry researchers in ANL's fuel spray experiments was very effective.

NOTABLE ACHIEVEMENTS

- **Biomass**

- **Objective 1.1**

- None

- **Objective 1.2**

- None

- **Objective 1.3**

- None

- **Objective 1.4**

- None

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

- **Objective 1.1**

- **Pressurized Steam Reforming of Bio-Derived Liquids for Distributed Hydrogen Production:** ANL quantified the improvement in yield resulting from the permeation of hydrogen from a reforming zone operating at elevated pressures. The lab demonstrated the effectiveness of the catalyst on the conversion/ suppression of C2 hydrocarbons. They set up and validated a mathematical model of their membrane reactor, which can now be used to predict conditions necessary to meet hydrogen production rates consistent with efficiency targets.

- **Objective 1.2**

- Argonne hosted a meeting of the Hydrogen Production Technical Team under the FreedomCAR and Fuel Partnership.

- **Objective 1.3**

- None

- **Objective 1.4**

- None

- **Industrial Technologies Program**

- **Objective 1.1**

- None

- **Objective 1.2**

- None

Objective 1.3

- None

Objective 1.4

- Although hampered somewhat by the changes involved in the transition from the Office of Electricity to EERE, Argonne has done a good job in resuming research associated with the ARES effort.

- **Solar Energy Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Vehicle Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- Energy Storage: ANL developed in-situ diagnostics techniques and demonstrated that kinetic limitations were the main cause of the degradation in performance seen in lithium-ion cells operating at low temperature. Argonne scientists developed and used new diagnostic tools in unique ways to investigate phenomena that limit the life and performance of lithium-ion cells being developed for use in HEVs. They recently achieved significant progress in understanding factors responsible for the gradual performance loss observed during long-term aging of high-power cells that employ nickel-manganese-cobalt mixed metal oxide cathodes.

Objective 1.4

- Vehicle Systems: Argonne meets DOE expectations for completing testing assignments in agreed to schedules and complies with all reporting deadlines for progress reports and status updates
- Energy Storage: Reviews of the Energy Storage Programs are held every four months and are well regarded by program participants and outside reviewers for their thorough coverage of program activities and accomplishments.

NOTABLE DEFICIENCIES

- **Biomass**
 - Objective 1.1**
 - None
 - Objective 1.2**
 - None
 - Objective 1.3**
 - None
 - Objective 1.4**
 - None
- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**
 - Objective 1.1**
 - None
 - Objective 1.2**
 - None
 - Objective 1.3**
 - None
 - Objective 1.4**
 - None
- **Industrial Technologies Program**
 - Objective 1.1**
 - None
 - Objective 1.2**
 - None
 - Objective 1.3**
 - None
 - Objective 1.4**
 - None
- **Solar Energy Technologies Program**
 - Objective 1.1**
 - None
 - Objective 1.2**
 - None
 - Objective 1.3**
 - None

Objective 1.4

- None

- **Vehicle Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

SIGNIFICANT DEFICIENCIES

- **Biomass**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

- **Industrial Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

<ul style="list-style-type: none">Objective 1.3<ul style="list-style-type: none">▪ NoneObjective 1.4<ul style="list-style-type: none">▪ None• Solar Energy Technologies Program<ul style="list-style-type: none">Objective 1.1<ul style="list-style-type: none">▪ NoneObjective 1.2<ul style="list-style-type: none">▪ NoneObjective 1.3<ul style="list-style-type: none">▪ NoneObjective 1.4<ul style="list-style-type: none">▪ None• Vehicle Technologies Program<ul style="list-style-type: none">Objective 1.1<ul style="list-style-type: none">▪ NoneObjective 1.2<ul style="list-style-type: none">▪ NoneObjective 1.3<ul style="list-style-type: none">▪ NoneObjective 1.4<ul style="list-style-type: none">▪ None
SUPPORTING COMMENTS
<ul style="list-style-type: none">• Biomass<ul style="list-style-type: none">Objective 1.1<ul style="list-style-type: none">▪ NoneObjective 1.2<ul style="list-style-type: none">▪ NoneObjective 1.3<ul style="list-style-type: none">▪ NoneObjective 1.4<ul style="list-style-type: none">▪ None• Hydrogen, Fuel Cells and Infrastructure Technologies Program<ul style="list-style-type: none">Objective 1.1<ul style="list-style-type: none">▪ None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

• **Industrial Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

• **Solar Energy Technologies Program**

Objective 1.1

- None

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

• **Vehicle Technologies Program**

Objective 1.1

- ANL serves as the coordinating laboratory for a multimillion dollar battery R&D program that uses the resources of four other National Laboratories and three universities to address cross-cutting barriers facing the lithium-ion systems that are closest to meeting the technical energy and power requirements for hybrid electric vehicles and plug-in hybrid electric vehicles.

Objective 1.2

- None

Objective 1.3

- None

Objective 1.4

- None

GOAL 2: EFFECTIVE AND EFFICIENT OPERATION OF FACILITIES with the following objective:

- Provide effective and efficient operation of facilities supporting the EERE Program.

SIGNIFICANT ACHIEVEMENTS

- **Biomass**
Objective 2.1
 - None
- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**
Objective 2.1
 - Argonne operates a one-of-a-kind fuel cell test facility, unique among National Laboratories, with capabilities for evaluating full-size automotive fuel cell systems of up to 100 kW in size. Leveraging EERE's previous investment in battery testing capability has allowed Argonne to operate the fuel cell facility with a high level of efficiency and effectiveness. Testing was carried out on cutting-edge fuel cell stacks and systems from industrial developers to benchmark progress in the technology and to identify areas of further research and development needs. Test data and reports were provided to DOE/EERE and to the respective fuel cell developers. ANL upgraded the test facility by replacing the air supply subsystem to provide clean, hydrocarbon-free air to the fuel cells or systems under test. The lab characterized a 1-kW stack for sensitivity to operating conditions. The maximum power the stack developed was 1,332 watts at ambient pressure, achieving a thermodynamic efficiency of 53.8 percent. At 25 percent of rated power, the efficiency increased to 65.6 percent.
- **Industrial Technologies Program**
Objective 2.1
 - None
- **Solar Energy Technologies Program**
Objective 2.1
 - None
- **Vehicle Technologies Program**
Objective 2.1
 - Vehicle Systems: ANL operates and maintains one of the most advanced four-wheel chassis dynamometers in the country and utilizes this facility on a daily basis for the conduct of vehicle and component evaluations for the VTP. The lab minimizes costs to DOE by arranging testing partnerships with outside private and government entities that allow access to private and state of the art test labs and facilities. ANL also interacts with Idaho National Laboratory and Oak Ridge National Laboratory to ensure the Argonne testing facilities are fully utilized. They use non-DOE owned vehicles from the New York State Energy Research

and Development Authority, Environment Canada, PHEV converters, and auto OEMs to minimize testing and facility costs to DOE.

- **Advanced Combustion Engine Technologies:** All the facilities assigned to the combustion and emissions project were available promptly. The test equipment is up-to-date and capable of measuring all criteria pollutants with a high degree of accuracy. The X-ray spray visualization facility is one-of-a-kind and provides data used by many industrial partners.
- **Energy Storage:** ANL maintains a world-class facility for testing advanced batteries under a variety of charge-discharge regimes and temperatures in order to provide DOE, United States Advanced Battery Consortium, and battery developers with reliable, independent, and unbiased performance evaluations of cells, modules, and battery packs.

NOTABLE ACHIEVEMENTS

- **Biomass**
 - Objective 2.1**
 - Argonne has done the best it can with the small program it has with Biomass. ANL's analysis capabilities are significant and they are working toward developing a user facility to accommodate the Biomass Program's hybrid technologies, in particular syngas fermentation. Constructing this facility remains a goal of the management if additional funds are available.
- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**
 - Objective 2.1**
 - None
- **Industrial Technologies Program**
 - Objective 2.1**
 - None
- **Solar Energy Technologies Program**
 - Objective 2.1**
 - None
- **Vehicle Technologies Program**
 - Objective 2.1**
 - None

NOTABLE DEFICIENCIES

- **Biomass**
 - Objective 2.1**
 - None

<ul style="list-style-type: none"> • Hydrogen, Fuel Cells and Infrastructure Technologies Program <i>Objective 2.1</i> <ul style="list-style-type: none"> ▪ None • Industrial Technologies Program <i>Objective 2.1</i> <ul style="list-style-type: none"> ▪ None • Solar Energy Technologies Program <i>Objective 2.1</i> <ul style="list-style-type: none"> ▪ None • Vehicle Technologies Program <i>Objective 2.1</i> <ul style="list-style-type: none"> ▪ None
SIGNIFICANT DEFICIENCIES
<ul style="list-style-type: none"> • Biomass <i>Objective 2.1</i> <ul style="list-style-type: none"> ▪ None • Hydrogen, Fuel Cells and Infrastructure Technologies Program <i>Objective 2.1</i> <ul style="list-style-type: none"> ▪ None • Industrial Technologies Program <i>Objective 2.1</i> <ul style="list-style-type: none"> ▪ None • Solar Energy Technologies Program <i>Objective 2.1</i> <ul style="list-style-type: none"> ▪ None • Vehicle Technologies Program <i>Objective 2.1</i> <ul style="list-style-type: none"> ▪ None
SUPPORTING COMMENTS
<ul style="list-style-type: none"> • Biomass <i>Objective 2.1</i> <ul style="list-style-type: none"> ▪ None • Hydrogen, Fuel Cells and Infrastructure Technologies Program <i>Objective 2.1</i> <ul style="list-style-type: none"> ▪ There have been some safety issues with hydrogen and with the fuel cell test facility, but ANL has taken measures to prevent any damage to personnel or

infrastructure and to correct problems with the facility. ANL management notified DOE appropriately and conducted a thorough safety investigation.

- ***Industrial Technologies Program***

- ***Objective 2.1***

- None

- ***Solar Energy Technologies Program***

- ***Objective 2.1***

- None

- ***Vehicle Technologies Program***

- ***Objective 2.1***

- None

GOAL 3: EFFECTIVE SCIENCE AND TECHNOLOGY RESEARCH PROJECT AND PROGRAM MANAGEMENT with the following objectives:

- Effective program vision and leadership.
- Effective and efficient science and technology project and program planning and management.
- Effective and efficient communications and responsiveness to EERE and PMC needs.

SIGNIFICANT ACHIEVEMENTS

- **Biomass**

Objective 3.1

- [REDACTED] has assembled an excellent team at Argonne to respond to DOE Headquarter (HQ) needs. [REDACTED] and [REDACTED] provide support and complement the GREET activities. [REDACTED] is involved in a report on water requirements for biofuels which has already generated considerable interest among stakeholders. [REDACTED] is involved in a water remediation project involving hybrid poplars. [REDACTED] has supported life cycle assessment activities at EPA, California Air Resources Board, and the U.S. Department of Agriculture. Significant expansion activities are planned for the GREET model to make it more user friendly and to better incorporate direct and indirect land use change impacts.

Objective 3.2

- [REDACTED] has a vast amount of expertise in the life cycle arena and has worked in this area for so long that he knows the technical issues that need to be considered in this type of analysis. This is an invaluable resource for DOE headquarters staff because often they have to respond to analysis and assessments done by others and they utilize [REDACTED] knowledge and expertise to respond to work by the academic community as well as by industry and other government agencies.

Objective 3.3

- The program provides an adequate level of input to HQ and the Project Management Center. ANL is often asked to perform analysis and provide responses to upper level management, Congress, the White House, and other stakeholders. The lab relationship manager, [REDACTED], maintains a good level of communications through attendance at staff meetings and e-mail to technical managers.

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

Objective 3.1

- Argonne staff participated as members of the Fuel Cell Technical Team and the Hydrogen Storage Technical Team under the FreedomCAR and Fuel Partnership. This joint planning with partners, collaborators, and stakeholders was successful in more effectively focusing the research and enhancing EERE program efforts. Argonne displayed scientific and technical leadership as the operating agent and key participant in two annexes under the International Energy Agency's Advanced Fuel Cells Implementation Agreement. Argonne displayed scientific and technical vision by presenting its research results at major hydrogen and fuel cell conferences (Fuel Cell Seminar, National Hydrogen Association, Electrochemical Society, inter alia) to maximize the value of the research and development results and to gain appropriate recognition for DOE, EERE, HFCIT, and the Laboratory.

Objective 3.2

- Argonne prepared and submitted high-quality R&D plans, i.e. Field Work Proposals (FWPs) and AOPs, which identified the technical risks and proposed approaches to minimize the technical risks. With regard to safety, experimental safety reviews were written, reviewed, and approved prior to the beginning of any experimental project. The

safety reviews are based on and fully implement the principles of Integrated Safety Management. Argonne staff provided technical evaluation and support in the planning, development, and execution of EERE roadmaps and program plans, including documenting the progress of the EERE programs towards meeting the long-term performance, cost, and durability targets.

Objective 3.3

- Argonne promptly reported to DOE program managers a safety-related incident involving a major hydrogen leak in a vendor-supplied hydrogen gas storage tank. Oral and written reports were provided.

- **Industrial Technologies Program**

Objective 3.1

- Argonne has established itself as a lead organization in the development of advanced reciprocating internal combustion engines. They have enabled the Industrial Technologies Program to resume the important Advanced Reciprocating Engine Systems effort following transfer from the Office of Electricity.

Objective 3.2

- Argonne has effectively resumed pursuit of the important technical issues associated with high efficiency reciprocating engines following transition from the Office of Electricity to EERE.

Objective 3.3

- Argonne has proven sensitive to the needs of the Industrial Technologies Program with relation to the transfer of their activities from the Office of Electricity to EERE. Through their efforts they have enabled the Advanced Reciprocating Engine Systems effort to resume with minimal disruption.

- **Solar Energy Technologies Program**

Objective 3.1

- Good work.

Objective 3.2

- None

Objective 3.3

- None

- **Vehicle Technologies Program**

Objective 3.1

- Vehicle Systems: ANL effectively plans new research programs with an eye towards predicting the industry's and DOE's needs for advanced technology development. The lab consults multiple stakeholders, and monitors technology introductions in Europe and Asia, to help us develop our vision. Many examples exist (like the ANL designed robust PHEV data acquisition recorders) where ANL efforts had a new process or testing methodology in-place in advance of the DOE's needs.
- Advanced Combustion Engine Technologies: Top quality research staff, 90 percent with Ph.D.s in engineering, are available at ANL for this program. ANL invests significant

laboratory directed research and development funds to promote EERE programs. All projects have major industrial partners to commercialize our technologies. X-ray spray diagnostics were conceived at ANL and numerous industrial partners have used this facility. ANL started the Hydrogen Internal Combustion Engine R&D project with Ford, which has produced significant results.

Objective 3.2

- **Vehicle Systems:** ANL designs testing methodologies and procedures for vehicle technologies, such as PHEVs and unique alternative fuels, and makes tradeoffs between costs, technical risks, and information requirements when designing testing programs. ANL also provides all FWP's and annual reports to Congress as requested. ANL highly leverages DOE testing funding with other entities, such as the AVTA/Idaho National Laboratory PHEV demonstration and testing fleets, in order to create research synergies.
- **Advanced Combustion Engine Technologies:** ANL kept current the AOPs and FWP's and followed strictly DOE guidelines. The lab makes a deliberate effort to bridge the gap between basic science disciplines and applied engineering research. ANL provided timely inputs to the Corporate Planning System at EERE. ANL management took an active part in interacting with the Office of Science's Basic Energy Sciences Program in building a bridge between basic and applied research.

Objective 3.3

- **Vehicle Systems:** ANL provides responses to requests for information from DOE and Congress that range from PHEV fuel efficiency surveys, to PHEV and other advanced vehicles' impacts on petroleum displacement and greenhouse gas abatement, to technology assessments. Specific requests have included information for the General Accountability Office and the House Ways and Means Committee on various aspects of PHEV performance and cost on extremely short response deadlines. ANL generates weekly updates to headquarters on all positive and negative testing events and industry interactions. The lab supports the DOE PHEV Technology Acceleration and Demonstration Activity selection process with technology proposal reviews.
- **Advanced Combustion Engine Technologies:** DOE has a single point of contact at ANL regarding this program. All results were timely, and concerns were promptly resolved. Through active participation with the external research community, ANL provided quick and accurate responses to inquiries.

NOTABLE ACHIEVEMENTS

• **Biomass**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

Objective 3.1

- None

Objective 3.2

- Argonne project managers undertook training and achieved proficiency with the EERE Corporate Planning System for tracking projects and agreements.

Objective 3.3

- High-quality quarterly technical progress reports and monthly cost reports were prepared and submitted to HQ in a timely manner. Well-written technical contributions were prepared for the Hydrogen Program Annual Progress Report. Numerous high-quality technical research results were presented at the Hydrogen Program's Annual Merit Review & Peer Evaluation, in both oral and poster presentations. Argonne staff responded to EERE and Project Management Center needs by providing high-quality reviews of technical proposals submitted in response to DOE solicitations. Argonne kept HQ fully informed regarding high-profile visits to Argonne (by Assistant Secretary [REDACTED], [REDACTED], et al.) and by various members of Congress and their staff.

- **Industrial Technologies Program**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

- **Solar Energy Technologies Program**

Objective 3.1

- Argonne has been responsible, under the joint management directives of DOE and the Bureau of Land Management (BLM), for the development of a Solar Programmatic Environmental Impact Statement (PEIS). This includes several notable achievements, including arranging and facilitating 11 public scoping meetings, establishing and populating a SOLAR PEIS web site, and coordinating activities with the DOE and BLM (co-leads in the PEIS).

Objective 3.2

- None

Objective 3.3

- None

- **Vehicle Technologies Program**

- **Objective 3.1**

- Energy Storage: ANL spearheaded a multi-institutional effort, involving four National Laboratories and two universities, to develop and apply novel diagnostic tools to identify factors that contribute to the degradation in battery cell performance that takes place as the cells are cycled. Researchers from ANL and NREL collaborated on the conduct of vehicle analyses and battery sizing studies that were the basis of the battery performance requirements used when soliciting proposals from potential battery developers and for benchmarking progress in the various development programs.

- **Objective 3.2**

- None

- **Objective 3.3**

- Vehicle Systems: ANL keeps headquarters informed of unusual events to avoid headquarters being caught off-guard.
 - Energy Storage: The ANL Energy Storage Program maintained a very high level of agreed milestones being either on track or completed on schedule. In addition, the program's management has consistently responded to DOE guidance and to requests for information or clarification regarding program direction, industry trends, and other related information.

NOTABLE DEFICIENCIES

- **Biomass**

- **Objective 3.1**

- None

- **Objective 3.2**

- None

- **Objective 3.3**

- None

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

- **Objective 3.1**

- None

- **Objective 3.2**

- None

- **Objective 3.3**

- None

- **Industrial Technologies Program**

- **Objective 3.1**

- None

- **Objective 3.2**

- None

<ul style="list-style-type: none">Objective 3.3<ul style="list-style-type: none">▪ None• Solar Energy Technologies Program<ul style="list-style-type: none">Objective 3.1<ul style="list-style-type: none">▪ NoneObjective 3.2<ul style="list-style-type: none">▪ NoneObjective 3.3<ul style="list-style-type: none">▪ None• Vehicle Technologies Program<ul style="list-style-type: none">Objective 3.1<ul style="list-style-type: none">▪ NoneObjective 3.2<ul style="list-style-type: none">▪ NoneObjective 3.3<ul style="list-style-type: none">▪ None

SIGNIFICANT DEFICIENCIES

<ul style="list-style-type: none">• Biomass<ul style="list-style-type: none">Objective 3.1<ul style="list-style-type: none">▪ NoneObjective 3.2<ul style="list-style-type: none">▪ NoneObjective 3.3<ul style="list-style-type: none">▪ None• Hydrogen, Fuel Cells and Infrastructure Technologies Program<ul style="list-style-type: none">Objective 3.1<ul style="list-style-type: none">▪ NoneObjective 3.2<ul style="list-style-type: none">▪ NoneObjective 3.3<ul style="list-style-type: none">▪ None• Industrial Technologies Program<ul style="list-style-type: none">Objective 3.1<ul style="list-style-type: none">▪ NoneObjective 3.2<ul style="list-style-type: none">▪ None
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<ul style="list-style-type: none">Objective 3.3<ul style="list-style-type: none">▪ None• Solar Energy Technologies Program<ul style="list-style-type: none">Objective 3.1<ul style="list-style-type: none">▪ NoneObjective 3.2<ul style="list-style-type: none">▪ NoneObjective 3.3<ul style="list-style-type: none">▪ None• Vehicle Technologies Program<ul style="list-style-type: none">Objective 3.1<ul style="list-style-type: none">▪ NoneObjective 3.2<ul style="list-style-type: none">▪ NoneObjective 3.3<ul style="list-style-type: none">▪ None

SUPPORTING COMMENTS

<ul style="list-style-type: none">• Biomass<ul style="list-style-type: none">Objective 3.1<ul style="list-style-type: none">▪ NoneObjective 3.2<ul style="list-style-type: none">▪ NoneObjective 3.3<ul style="list-style-type: none">▪ None• Hydrogen, Fuel Cells and Infrastructure Technologies Program<ul style="list-style-type: none">Objective 3.1<ul style="list-style-type: none">▪ NoneObjective 3.2<ul style="list-style-type: none">▪ NoneObjective 3.3<ul style="list-style-type: none">▪ None• Industrial Technologies Program<ul style="list-style-type: none">Objective 3.1<ul style="list-style-type: none">▪ NoneObjective 3.2<ul style="list-style-type: none">▪ None
--

Objective 3.3

- None

- **Solar Energy Technologies Program**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

- **Vehicle Technologies Program**

Objective 3.1

- None

Objective 3.2

- None

Objective 3.3

- None

GUIDANCE FOR THE NEXT PERFORMANCE PERIOD

PERFORMANCE EXPECTATIONS FOR ARGONNE NATIONAL LABORATORY FOR THE NEXT PERFORMANCE PERIOD (for example, anticipated accomplishments and level of work, areas of concentration and remedial actions).

- **Biomass**

- Argonne should continue to provide the quality analysis support and maintain the leadership role it has established. Increased capabilities in conversion technologies would be ideal. Continued pursuit of the syngas fermentation capability would be a good addition to the program portfolio and distinguish Argonne with this capability. Continued improvement in communications is desirable, including being proactive in bringing new ideas and capabilities or partnerships to the headquarters program staff to assist in formulation of future directions for the biomass program.

- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**

- Keep up the good work. Continue to focus on meeting milestones and deliverables in the Annual Operating Plans and provide prompt feedback to DOE Technology Development Managers, particularly with respect to critical analysis work.

- **Industrial Technologies Program**

- We anticipate that the Argonne team working with ITP will improve on their excellent performance in the next period, since they won't have to revise the focus

of their work to accommodate a change in program goals. The switch from the Office of Electricity to EERE required a major change in the drivers for the work they were doing. They responded to the change very well, but there was a learning curve.

- **Solar Energy Technologies Program**
 - During the next performance period, Argonne is expected to conduct the analysis which identified which BLM-managed land is most appropriate for solar projects. This will require close cooperation with NREL, BLM, and DOE.
- **Vehicle Technologies Program**
 - Vehicle Systems: ANL will increase its efforts to evaluate advanced plug-in hybrid electric vehicle drivetrains and components, will work with industry partners on developing an industry standard vehicle modeling and simulation tool based on the Powertrain systems Analysis Toolkit modeling tool developed by ANL, and will complete development and validation of new efficiency testing procedures for PHEVs. In the next performance period, ANL will concentrate on advancing fuel spray research and increase the power density of the light-duty engine under low temperature combustion conditions. Visioscope images will be obtained at high speeds and loads. In the hydrogen engine project, a multi cylinder, direct injected engine will be evaluated for efficiency and emissions.

INPUT ON CONCERNS FOR LABORATORY MANAGEMENT (discussion of potential problem areas):

- **Biomass**
 - None
- **Hydrogen, Fuel Cells and Infrastructure Technologies Program**
 - HFCIT recommends that ANL support the existing effective Principal Investigators' communications and interactions with HFCIT teams through stronger corporate coordination and communications between ANL and HQ. Examples include coordinated and timely submittal of quarterly and annual reports, and at least quarterly visits of a corporate ANL relationship manager to meet with HFCIT leads to discuss project progress, program priorities, and challenges. Bring Hydrogen Production projects to a logical conclusion in FY2009 with sufficient production data for H₂A analysis of the technologies' cost and performance potentials.
- **Industrial Technologies Program**
 - None
- **Solar Energy Technologies Program**
 - None

- ***Vehicle Technologies Program***

- No potential problem areas could be identified.



Laboratory Year-End Performance Assessment Report

Date:

11/14/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of UChicago Argonne, LLC
for Management and Operation of the Argonne National Laboratory

Agency:
Department of Energy

Program Office:
Office of Nuclear Energy

FY Funding Level: (Budget Authority)
\$12,900,000

Evaluator:

Phone Number:

E-mail Address:

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 4.03

Goal Grade: A

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 1.0 Performance Summary Statement:

Develops advanced aqueous/solvent extraction flowsheets and electrochemical separations technologies for separation of key components in used nuclear reactor fuel for transmutation in thermal and fast reactors with the resulting waste in a form for safe disposal.

Leads and manages fast reactor, and advanced waste forms Research and Development campaigns

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

Score: 4.0

Grade: A

Weighting: 30

Objective 1,1 Performance Summary Statement:

Both the advanced aqueous/solvent extraction flowsheets and the electrochemical separations technologies developed and demonstrated by ANL have provided the baseline for all current aqueous and electrochemical development projects in the U.S. and have significantly influenced those in other countries.

Research and Development conducted by ANL provides important information to support Advanced Fuel Cycle Initiative activities in the areas of fast reactors, particularly sodium fast reactors, and advanced waste forms.

Objective 1.2 Provide Quality Leadership in Science and TechnologyScore: 3.9

Grade: A

Weighting: 30

Objective 1.2 Performance Summary Statement:

Whenever senior technical expertise in separations technology, fast reactors technology, or waste forms is sought in the United States, the principal investigators at ANL are routinely identified as leaders in their areas.

Objective 1.3 Provide and Sustain Outputs that Advance Program Objectives and GoalsScore: 3.8

Grade: A

Weighting: 20

Objective 1.3 Performance Summary Statement:

Advanced aqueous flowsheet information has been incorporated in the latest version of AMUSE (Argonne Model for Universal Solvent Extraction) code which allows both steady-state and dynamic profiles of chemical component concentrations to be predicted throughout a separations plant. The adaptation of the code to safeguard applications is being actively pursued. In electrochemical separations, pioneering work has been carried out on the conversion of used LWR and fast reactor oxide fuel to metallic form and its subsequent partitioning to various metallic products with the bulk of the fission products in molten salt. This development has potential future applications to very short-cooled fuel processing with substantial benefits in terms of reduced minor actinide content requiring multiple recycle.

Support program planning and other headquarters information needs in the areas of fast reactors and advanced waste forms.

Objective 1.4 Provide for Effective Delivery of ProductsScore: 4.0

Grade: A

Weighting: 20

Objective 1.4 Performance Summary Statement:

The products of NE's Advanced Fuel Cycle Initiative (AFCI) program are progress reports and open literature publications. The ANL AFCI staff has provided on a timely basis clear and articulate summaries of their R&D programs and been aggressive in publishing their results in the open literature (within the limitations imposed by export control, sensitive nuclear technology and Applied

Technology restrictions).

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

Goal Score: 0.00

Goal Grade: NA

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

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: ~~1.05~~

Goal Grade: ~~C-~~

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 3.0 Performance Summary Statement:

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

Score: 0.0

Grade: NA

Weighting: 20

Objective 3.1 Performance Summary Statement:

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

Score: 3.5

Grade: A-

Weighting: 30

Objective 3.2 Performance Summary Statement:

During a significant portion of FY-08, ANL provided "campaign" leadership for both separations and waste form R&D projects at ten national laboratories. That leadership was reasonably effective.

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

Score: 0.0

Grade: NA

Weighting: 50

Objective 3.3 Performance Summary Statement:



Laboratory Year-End Performance Assessment Report

Date:

11/25/2008

Headquarters Program Office Fiscal Year 2008 Evaluation of UChicago Argonne, LLC
for Management and Operation of the Argonne National Laboratory

Agency:

Department of Energy - National Nuclear Security Administration

Program Office:

Office of Defense Nuclear Nonproliferation

FY Funding Level: (Budget Authority)

\$27.7M for FY2009 in AFP f...

Evaluator:

Phone Number:

E-mail Address:

Goal 1.0 Provide for Efficient and Effective Mission Accomplishment

Goal Score: 4.00

Goal Grade: A

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 1.0 Performance Summary Statement:

In 2008 Argonne National Laboratory has provided outstanding support in furthering the goals of the NNSA Global Threat Reduction Initiative, (GTRI) and thereby furthering U.S. goals in nonproliferation and prevention of nuclear terrorism.

Support from Argonne has been technically outstanding, timely, and relevant to both the technical and policy objectives of GTRI.

Global Threat Reduction Initiative– Reactor Conversion Program

The GTRI Reactor Conversion Program contributes to the U.S. government's nonproliferation policy by supporting the minimization, and to the extent possible, elimination, of the use of highly enriched uranium (HEU) in civil nuclear applications worldwide. The Program develops the technologies needed to substitute low enriched uranium (LEU) for HEU fuel in research and test reactors and also in the production of the medical isotope molybdenum-99 (^{99}Mo) without significant penalties in experiment performance, economic, or safety aspects of the reactors or ^{99}Mo production. Many of these research reactors are located in regions of proliferation concern.

The Program has set an aggressive goal to complete conversion of all targeted research reactors by 2018. The Program has identified 129 research and test reactors around the world, including in the United States, with which the program will cooperate convert. Of these 129 reactors, 62 have already fully or partially converted or closed down before conversion, 40 more can convert with available LEU fuels, and the final 27 cannot convert with available LEU fuels. To date, the United States has converted 16 domestic research reactors — the largest number in any single country. Two other additional domestic reactors are currently scheduled for conversion in FY2009.

Several noteworthy milestones have been recently completed this year: conversion to LEU fuel of the Russian-supplied research reactor in Uzbekistan, conversion of the Argentinean RA-6 research reactor; conversion of the SAFARI-1 research reactor in the Republic of South Africa; conversion of the U.S. domestic reactors at the Oregon State University (OSU), Washington State University (WSU); and the final shutdown and initiation of de-inventory of the ZPPR reactor at INL. Technical cooperation with the International Atomic Energy Agency (IAEA) with China, Nigeria, Ghana, Pakistan, and Syria regarding the conversion of the Chinese-designed MMSR reactors to LEU fuel has progressed and an agreement in principle to proceed with fuel demonstration in China in a collaborative manner has been reached and will be implemented in FY2009. A breakthrough with Russia has led to Rosatom accepting collaboration to initiate the feasibility studies for converting six of their domestic research reactors. Progress in the demonstration of LEU targets for the production of ^{99}Mo in Indonesia, with demonstrations available to a broader community through cooperation with the IAEA have been accomplished. A demonstration of LEU-based the Mo-99 domestic production is being carried out at the University of Missouri-Columbia and the program has initiated technical support for the domestic production of Mo-99 using a homogeneous solution reactor. Significant progress has been made in the continued development of monolithic UMo high density fuel, as well as in extruded dispersion UMo fuel development in Russia. The project for the establishment of a capability for the fabrication of UMo high density LEU fuel for the conversion of the 27 High Performance reactors has also been initiated in FY2008. A Request for Information (RFI) process has been conducted to gather commercial interest and capability to establish this capability. Significant progress has been made in initiating the process to convert the high performance research reactors in Belgium (BR-2) and France (RHF), as well significant technical process in qualification plans for fuel for the MARIA reactor in Poland and the WWR-K reactor in Kazakhstan. The bulk of the safety analysis for converting the reactors in Hungary (BRR) and Bulgaria (IRT-200) has been completed. Full core conversion analysis for Vietnam has been initiated. Finally, the RERTR-2008 (30th Anniversary) International Meeting was organized and successfully held in Washington in early October 2008.

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

Score: 4.0

Grade: A

Weighting: 40

Objective 1,1 Performance Summary Statement:

Significant Achievements:

- In collaboration with the Institute of Nuclear Physics of Uzbekistan, Conversion to LEU of the fifth Russian-supplied reactor in Uzbekistan, WWR-SM.
- In cooperation with INL and in support of the Universities, conversion to LEU of the research reactors in the US at Oregon State University and Washington State.
- Completion of the preparations for the irradiation of an LEU Mo-99 production target at the MURR reactor. The foil target was fabricated at ANL.
- Successful organization of the RERTR International Meetings.
- Initiation of the Fuel Fabrication Capability project for UMo fuel to convert the 27 High Performance reactors.
- Rosatom agreed to the initiation of feasibility studies for conversion of 6 Russian domestic research reactors. Initiated scope of work discussions with Russian organizations to perform the studies.
- Initiated conversion analysis for BR-2 (Belgium) and RHF (France) research reactors.
- Neared completion of the feasibility studies (conditional to current UMo monolithic fuel parameters) for US High Performance reactors.

Notable Achievements:

- In support of the Argentinean Atomic Energy Commission, conversion to LEU of the research reactor in Bariloche, Argentina (RA-6).
- Initiation of the full core conversion studies for Vietnam's Dalat reactor.
- Continued progress and technical support in the fuel qualification for the MARIA (Poland) and Kazakhstan (WWR-K) research reactors.
- Two domestic organizations are in contact with Argonne for technical in studying ⁹⁹Mo production. Numerous studies regarding the recovery and purification of ⁹⁹Mo from irradiated targets have been done here. Argonne's expertise is viewed as a valuable resource to these potential producers.
- Significant progress in the development of UMo fuel, domestically and in Russia.

Objective 1.2 Provide Quality Leadership in Science and Technology

Score: 4.0

Grade: A

Weighting: 20

Objective 1.2 Performance Summary Statement:

Argonne's leadership is widely recognized by the international research reactor community and the International Atomic Energy Agency. This is shown by the following accomplishments:

Significant Achievements:

- Provided overall technical leadership for the GTRI-Convert program. Directly supported the Program Office with HQ support, particularly in the second half of the fiscal year.
- Led the establishment of a group for the study and fuel qualification for the conversion of two European high performance reactors.
- Led US High Performance reactor group toward interaction with fuel development group and completion of the feasibility studies.
- Provided technical expertise and leadership in the Coordinated Research Project (CRP) at the IAEA for the LEU-based production of ⁹⁹Mo. Led technology demonstration workshops.
- Argonne provided leadership in the coordinated research project (CRP) at the IAEA for studying the conversion of Miniature Neutron Source Reactors (MNSR) of Chinese design. ANL provided leadership in seeking technical scope for the demonstration of LEU fuel for MNSR reactors.
- Trained analysts from Vietnam and Uzbekistan in analysis methods for the conversion of research reactors to LEU fuel.

Notable Achievements:

- Leadership in IAEA research reactor fuel qualification guidelines project.
- Participation IAEA procurement project for LTA fuel for MARIA reactor in Poland.
- Provided leadership for the technical scope of the fuel qualification for WWR-K in Kazakhstan.
- Provided leadership for the scope for the Russian UMo fuel development and the PIE analysis for the domestic UMo fuel development.

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

Score: 4.0

Grade: A

Weighting: 20

Objective 1.3 Performance Summary Statement:

Significant Achievements:

Organized the 30th Annual International Meeting on the Reduced Enrichment for Research and Test Reactors held in October in Washington DC, with about 250 participants and about 90 scientific papers.

- Organized Global Initiative Workshop in Sydney, Australia on the production of Mo-99 with LEU technologies.
- Provided technical data and expertise in support of a National Academy of Science Study on the production of ⁹⁹Mo medical isotope.

Notable Achievements:

- Numerous scientific papers and presentations to RERTR International meetings, technical journals, IAEA, and sponsors.

Objective 1.4 Provide for Effective Delivery of Products

Score: 4.0

Grade: A

Weighting: 20

Objective 1.4 Performance Summary Statement:

Significant Achievements:

- Supported the safety analysis and regulatory review for meeting the Washington State University and Oregon State University reactor conversion milestones.
- Support for the safety analysis and regulatory review for meeting the University of Wisconsin University reactor conversion milestone (ongoing).
- Support and training of Uzbekistan's INP scientists in mixed HEU-LEU core burnup calculations.
- Support and training of Vietnam scientists in mixed full core conversion calculations.

Notable Achievements:

- Met enhanced sponsor goals on program reporting, both technical as well as administrative.

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

Goal Score: 0.00

Goal Grade: NA

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

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: 4.00

Goal Grade: A

Please complete the Objective fields then click the Calculate button to get the final Score and Grade.

Goal 3.0 Performance Summary Statement:

Argonne has provided effective and efficient program management as demonstrated by its ability to support an increasing rate of domestic and international reactor conversions and by its timely and appropriate response to GTRI program requirements and headquarters tasking. This includes expert analysis, technical consultations, and deployment of staff and resources to successfully address changing program priorities

Significant Achievements:

- Provided overall technical leadership for the GTRI-Convert program. Supported directly the Program Office with HQ support, particularly in the second half of the fiscal year.
- Maintained competency in fuel development and performance (analysis and modeling) by enhancing cooperation with Russia.

Notable Achievements:

- Supported development of the program vision by providing the technical expertise for expansion plans.

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

Score: 4.0

Grade: A

Weighting: 20

Objective 3.1 Performance Summary Statement:

Because of the involvement of Argonne National Laboratory with the reactor conversion program dates back to the late 1970s, it is the repository of technical, policy, and management issues pertaining to research reactors use of LEU and the conversion program. It's long term commitment to this program and it's technical expertise provides the basis for its stewardship and its vision regarding next steps towards the ultimate goal of eliminating and minimizing the use of HEU in research and test reactors.

Significant Achievements:

- Provided overall technical leadership for the GTRI-Convert program. Supported directly the Program Office with HQ support, particularly in the second half o the fiscal year.
- Maintained competency in fuel development and performance (analysis and modeling) by enhancing cooperation with Russia.

Notable Achievements:

- Supported development of the program vision by providing the technical expertise for expansion plans.

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:

Planning and project management requires clear understanding of the ultimate goal, the technical and procedural steps necessary to achieve the goal, and a commitment to overcome barriers, whether technical, regulatory, or political. Argonne uniquely meets these requirements, which are necessary for effective and efficient project and program planning. This has been demonstrated in it's management of an increasing number of sites and conversions.

Significant Achievements:

- Fully implemented sponsor's enhanced project/program management system.
- Fully contributed to lifecycle and budget development for the program.
- Coordinated all periodic reporting within the program as well as ad hoc reporting to support specific meetings.
- Supported establishment or enhancement of international collaborations in conversion program: IAEA, Russia, China, Japan, European High Performance reactors.

Notable Achievements:

- Developed and maintained project management documentation, including project work plans, Gantt charts, schedules, work packages, and work package budget tracking.

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

Score: 4.0

Grade: A

Weighting: 50

Objective 3.3 Performance Summary Statement:

Communication with Argonne on program goals is constant, and effective, taking the form of phone calls, email, and frequent face-to-face discussions. Argonne has shown agility and foresight in responding to the concerns of GTRI headquarters as well as to many sites which are conducting or planning conversions. Because of their long experience working with sites, Argonne can emphasize with the concerns of operators, anticipate them, and better respond to them. This is demonstrated in the excellent personal working relationships that Argonne staff maintain with both GTRI headquarters and with staff at individual sites.

Significant Achievements:

- Accurately responded to frequent sponsor requests for technical information and support.
- Implemented an enhanced technical and programmatic reporting system, making sponsor aware of positive as well as negative developments.

Notable Achievements:

- Routine technical and scientific information is provided to sponsor for program direction and tracking — daily updates are normally provided on technical events.