DOE/SC-ARM-0502

DOE Review of the Atmospheric Radiation Measurement (ARM) Climate Research Facility

February 3-4, 2005

American Geophysical Union,
Washington, D.C.

June 2005

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Work supported by the U.S. Department of Energy,
Office of Science, Office of Biological and Environmental Research

CONTENTS

1. INTRODUCTION

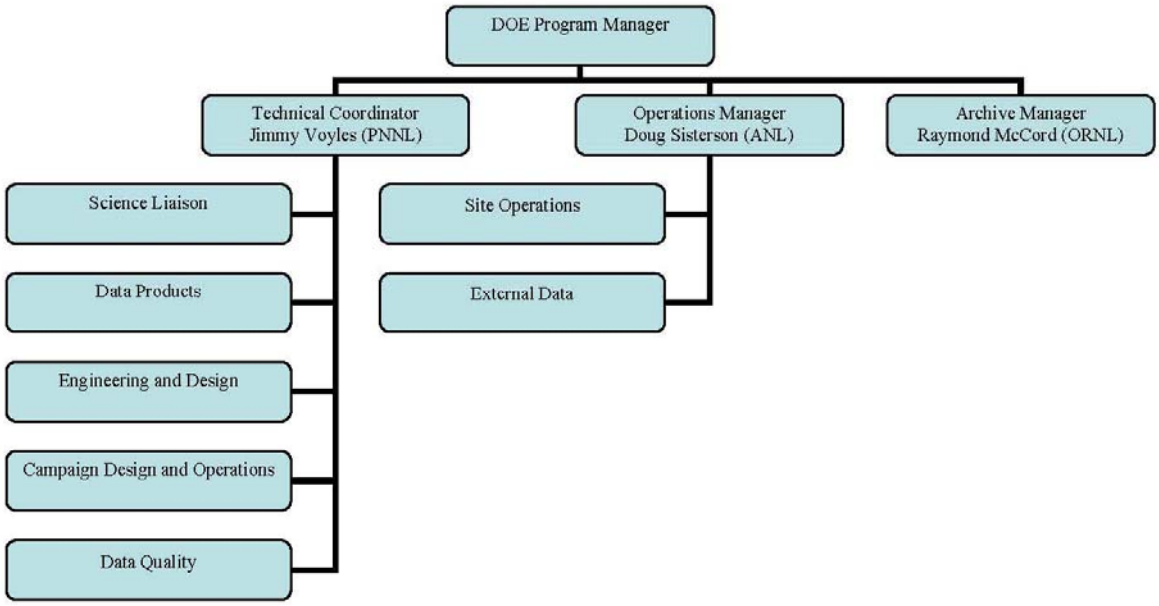
The Atmospheric Radiation Measurement (ARM) Program was created in 1989 with funding from the U.S. Department of Energy (DOE). Sponsored by DOE's Office of Science and managed by the Office of Biological and Environmental Research, ARM is a multi-laboratory, interagency program, and is a key contributor to national and international research efforts related to global climate change. A primary objective of the program is improved scientific understanding of the fundamental physics related to interactions between clouds and radiative feedback processes in the atmosphere. ARM focuses on obtaining continuous field measurements and providing data products that promote the advancement of climate models.

Through the ARM Program, the DOE has funded the development of several highly instrumented ground stations for studying cloud formation processes and their influence on radiative transfer, and for measuring other parameters that determine the radiative properties of the atmosphere. This scientific infrastructure, and resultant data archive, is a valuable national and international asset for advancing scientific knowledge of Earth systems. To provide more research capability for the global scientific community, ARM's field research sites are now being made available for use by scientists worldwide through the ARM Climate Research Facility (ACRF).

The ACRF has been designated a national user facility for the purpose of providing this unique asset for the study of global change to the broader national and international research community. It has enormous potential to contribute to a wide range of interdisciplinary science in areas such as hydrology, ecology, and weather forecasting to name only a few. The ACRF Science Board reviews proposals for use of the ACRF and makes recommendations on scientific research projects to be conducted at its fixed and mobile sites. Research at ACRF sites will include the study of alterations in climate, land productivity, oceans or other water resources, atmospheric chemistry, and ecological systems that may alter the capacity of the Earth to sustain life. Global change research also includes the study, monitoring, assessment, prediction, and information management activities to describe and understand:

- interactive physical, chemical, and biological processes that regulate the total Earth system
- the unique environment that the Earth provides for life
- changes that are occurring in the Earth system and the environment and how these changes are influenced by human actions.

A peer review of operations is critical to assure the success of user facilities such as the ACRF. Although ARM has been reviewed in the past, the ACRF was only designated as a user facility two years ago; thus, there is a need to ensure that the ACRF operations are on track, and that the facility is being operated effectively and efficiently and making a significant difference in climate change research. Participation of expert peer reviewers in these user facility reviews helps ensure that DOE will continue to provide the highest quality user facilities to the scientific community.



Infrastructure Management Board Structure

Following the last review of the operations of the ARM facilities, the management team was restructured into three units: technical coordination, operations, and the archive. The managers of these units form the Infrastructure Management Board (IMB) who report to the DOE Program Manager. The IMB and their areas of responsibility are the focus of this review.

As stipulated by federal and DOE policy the review uses independent reviewers who report to DOE individually in writing. The review panel consisted of seven members (See Appendix A). The reviewers were asked to rate the IMB on the following questions:

- Has the ARM Infrastructure effectively managed the operations and capital equipment funds and the user activities, and provided supporting infrastructure?
- How well is the ACRF providing advanced instrumentation, support for community initiated campaigns, and quality assured data to scientists engaged in climate change research, and is the use of ACRF resources making a significant impact in the climate change research?
- Are the mechanisms for quality assurance of data adequate?
- Are the mechanisms for finding and obtaining data adequate?
- Is the ACRF providing safeguards that ensure the safety of personnel who either work at the sites or visit the sites for research or educational activities?

The reviewers' comments, summarized by the DOE Program Manager, are presented in this document. Most of the reviewers' comments were in agreement, but any differing perspectives that were expressed are also represented in this report. Detailed recommendations were relayed to the investigators but are summarized in this report. The original charge letter sent to reviewers is contained in Appendix A. Appendix B contains the evaluation criteria, and the review panel is listed in Appendix C.

2. SUMMARY OF ACRF INFRASTRUCTURE REVIEW PANEL COMMENTS

The review panel's responses to the five questions listed above are summarized in the subsections below.

2.1 Management

Organization and Structure. Since the reorganization that was prompted by the 1999 Infrastructure Review, major and positive changes have been made. Not only have major changes been made, but they have been in place long enough to have begun to mature. The management team has put in place processes and procedures to control and optimize how resources are allocated, to control the quality and amount of data generated by the ACRF, and to carefully document the status of all the instruments. In short, they have transitioned the ACRF from a facility that operated with a set of ad hoc procedures to a well-managed organization with clearly defined roles and responsibilities, careful configuration control, data quality oversight, and a process for continual improvement.

The standardization of the management structure and tools across the various laboratories and sites is a huge improvement over what was in place before. The strong attention to configuration management for both hardware and software maintenance is to be especially commended and further encouraged. Thought should be given to improving compliance across the infrastructure, but care should be taken not to make the management requirements onerous. The panel also encourages the ACRF to finish its corrective maintenance tool set and suggests that the ACRF investigate other problem reporting tools.

Scientific leadership is needed to develop, sustain, and sell the long-term scientific vision for the ACRF. Leadership is also needed to integrate the long-term vision with engineering development and operations. It is recommended that ACRF institute this functionality into the management structure.

Performance Metrics. The ACRF should develop a broader set of performance metrics that incorporate all important aspects of the goals and mission of the ACRF. The Balanced Scorecard approach is one possibility. It can be used to develop a balanced set of metrics that include leading, current, and lagging indicators of performance. It can also be used to balance investment in ongoing operations with facility renewal. Balance can also be achieved between financial goals, customer-driven goals, people-oriented goals, and process-oriented goals.

Budget. The budget allocation process appears to be well structured and effectively handled especially given the pressures of inflation with a level budget. The allocation of 10% for science interactions and value-added products is particularly noteworthy because this provides an integrated and continuing improvement process for supporting research users. The budget also provides nearly 10% for instrument integration and engineering. Such commitment to continued improvement is crucial even in a flat-funding situation. For allocation decisions, the goals of data quality must remain a high priority, since the focus remains on climate research and long-term data integrity and quality (including calibration). Continuing improvements and maintaining data quality are necessary and important for an advancing national research program.

The decision-making process is sufficiently flexible so that money can flow between units as required by the current need. This flexibility resulted in a machine that functions very effectively to produce the data stream needed for climate research as specified by the scientists. This structure will come under greater strain as the budget is eroded by increased labor costs.

The management concept of using local or regional populations to provide much of the on-site support also appears to be cost effective and providing significant dividends in enhancing outreach and capacity building that is often necessary for successful operations in foreign locations.

The archive could look at its archive systems to decrease costs. Although the current archive holdings are large (40TB), using multiple supercomputer-class data storage systems may be more expensive than necessary. Even with the savings resulting from sharing these systems with the supercomputer organization, a different system may reduce some expenses.

Use of Facilities. The scheduling of facility use could use some further review, and alternative methods for offering the use of the facilities should be considered. Because the user facility status may increase the use of the facilities by those who must be base-funded by organizations other than DOE, improved methods should be reviewed for coordinating availability and facility use approval with research funding from other agencies. Possibly scheduling and availability methods used by the integrated research aircraft groups, or even research ship organizations, could be examined as other examples on how best to approach scheduling ACRF assets. The main concern is to allow sufficient time for coordination within the budget cycles of the non-DOE funding organizations.

The process of Science Board review and recommendation to the ARM manager appears appropriate. However, it has to be recognized that scientific users of the facility typically will have to secure their own science funding (for salaries, for instance) from separate sources, and that problems are bound to arise because of incompatible funding cycles and application deadlines. The managers should assess who their most likely applicant community is; which agencies/programs would support them; and coordinate application procedures/time lines with these agencies, if possible. Some flexibility in the ACRF system will probably be needed; however, a well-articulated procedure will be necessary to ensure a fair process.

Outreach. With the new status of national user facility, there may be more responsibility to develop and expand outreach activities to broader areas of the research community. To achieve this goal, it may or may not require greater funding allocation, but all aspects of the outreach program should be revisited to consider the implications of supporting a broader research community. This should include establishing a users group that includes non-ARM members. The chairperson should be a non-ARM scientist with a rotating 2- to 3-year assignment and should be part of the management team

The ACRF facilities appear to engage in significant outreach and education activities, and they are strongly encouraged to continue to do this. Generating a good public awareness and understanding of the relevance of climate research is important in the long run in generating the public's acceptance of government expenditures for science.

As the ACRF continues its outreach to the broader community, "advertising" to a broad range of customers will have to continue and expand. It is important to allocate resources for these user requests apart from routine operations, as is currently done.

2.2 Research Support

Science. The presentations for this review focused on management and engineering issues, as opposed to science, it is therefore difficult to answer questions of direct impact of the facility on the science from this material. However, there is of course significant science output based on the research carried out at ARM sites and with ARM data. The anticipation is that this research will continue and expand, and that especially long-term data sets will continue to be of high interest to the climate community.

A key strength of the ACRF sites and capabilities is the long-term nature of the commitment to the facilities and capabilities, and the move to make them available to the nation as a national user facility. There appears to be growing recognition within the nation of the importance of long-term observational records to resolve critical science questions with significant policy and societal benefit implications. There is a concern, however, that flat funding will translate into a decrease in assets, as well as staffing available for maintenance and archiving, and this should state a case for seeking increases in funding in the future.

The successful and excellent support of the climate research community is very apparent from the strong demand, heavy future schedule, and past successful series of field campaigns that have drawn many groups to the sites beyond those originally sponsored for the campaigns and intensive operational periods (IOPs). Early concerns and difficulties that occur with any developing program seem to have been addressed very successfully over the last 5 to10 years, and now the Nation has a group of sites and supporting activities that have matured into facilities with world class capabilities and reputation. It is anticipated that the ACRF will provide the greatest benefit to global change research over the next 5 to 10 years.

Instrumentation. The ACRF provides current instrumentation, and has in place mechanisms for incorporating newer and more advanced instrumentation. Development funding is limited, so that new instrumentation has to be nearly ready for deployment. Given current funding limitations and

the priorities of the program, the mechanisms for providing advanced instrumentation are adequate. Consideration should be given to actively identifying and pursuing partnerships within DOE and with outside agencies. Funded efforts to develop new climate-related instrumentation could benefit the ARM Program and benefit the calibration and validation capacity of the ARM sites. Consideration should also be given to revising the instrument development program, if additional funding is available.

The ACRF has developed good processes for moving research instrumentation into an operational environment, and for dealing with many of the issues that arise when instruments make this transition. Less clear are the criteria for deciding when to incorporate new instrumentation that has scientific value for the broader community, but that are not directly tied to the scientific goals of ARM. Currently this process relies on recommendations from the ARM science team, but as a user facility, the input needs to encompass the broader user community. Judgment by a panel of scientific peers is probably the best approach, but this panel should work on describing a consistent process and criteria, recognizing that this will need to evolve as new science questions, technologies, and funding realities arise.

Data. The ACRF is doing a good job in providing quality-assured data to scientists engaged in climate change research. Designation as a national user facility is relatively new. Good, well thought out processes appear to be in place to provide quality assured data to a broad user base. This should be reassessed based upon a few more years of actual experience. Care should be taken now to collect useful measures of data use and usability to support future reviews.

Special data sets are developed by deploying special instrumentation or using existing instrumentation more intensely, (e.g., as in an IOP) to generate special data sets, by adding special data sets from external sources, and by combining multiple ARM data sets. ACRF also develops the research tools to utilize these special data sets. The mechanisms for establishing priorities appear clear for research that is directly related to the goals of the ARM Program. This is less clear for special data sets and research tools for activities that are not directly tied to the scientific goals of the ARM Program. Currently, this appears to be a judgment call by the science team, and there are no policies or criteria that apply. Judgment by a panel of scientific peers is probably the best approach, however this panel should work on describing a consistent process and criteria, recognizing that this will need to evolve as new science questions, technologies, and funding realities arise.

Many research needs that require the use of ACRF data involve integrating the most complete representation of the site land-atmosphere conditions and this may involve using data available from all sources. This means considering providing access to the main three components of representative data: 1) in situ; 2) model; and 3) satellite data. Although the ACRF sites provide excellent access to site in situ data, access to related satellite and model data must be found from other sources; however, it may be very difficult to acquire the matching data sets without significant added work for researchers attempting to work with the ACRF data. While no one expects the ACRF to acquire numerous additional data sets, two procedures should be considered and evaluated: a) investigating the procedures that must be followed for a researcher to acquire basic numerical weather prediction (NWP) model output and satellite data sets specifically correlated (geolocated) with the ACRF sites; and/or b) actually acquiring basic NWP model (site

and surrounding state variables, divergence and profiles that are internally consistent and necessary for flux calculations) and satellite data (IR/Vis/MW/NDVI/ etc.) associated with each site.

The area that may need further review and more attention for climate research support may be in the analysis, determination and reporting of the "errors" associated with value-added products as well as with the basic and raw instrument data. Also, a well-advertised and improved tracking of the instrument calibration processes should be considered. These actions are significant for the research community since 24/7 near real-time data collection systems historically are not considered to be producing "research quality" data and reanalysis of the operationally produced data is often assumed to be required; therefore, greater attention to systematic calibration and production of error statistics should receive greater emphasis with a formal science review of the procedures as they are developed.

Determining the access and use profiles of data from any data center is important to justify the operations and more attention should be given to determining details of the broadening user community. Two areas should be strengthened: a) on initial access sign up, which required gender and age data, adding science discipline, type of use, and other science demographics should not be a problem; and b) periodically survey the people who have accessed the data to determine the use characteristics. Also, to determine the research uses of the data sets, a specific recommendation for a citation that would be seen and recognized by citation survey software should be considered and recommended to each user as an appropriate citation.

Proposal Review Procedures. The established procedures for science review of proposals and pre-screening for campaign/IOP requests appears to be appropriate and very effective in allowing proper prioritization. There is absolutely no question that exceptional support and facilitation of advances in cloud and radiative transfer research has been a hallmark of the ACRF. Developing support capabilities for water cycle, hydrology, carbon and broader aerosol research is proving to show great potential and should continue to be a focus area for new capabilities within the ACRF. The commitment to a program of continuing improvements to research support, such as shown by the value-added products program, illustrates an excellent understanding of the research community needs.

User Access. The facility appears well set up to support community initiated campaigns, especially when the any additional instrumentation and research expense is covered by other funds or other funding agencies. It appears that the ARM Infrastructure Management Board (IMB) is currently doing a good job in facilitating user access to or use of the ACRF sites and resources. The IMB recognizes as continuing challenges the integration of infrastructure development with long-term science, the balancing of field campaigns with the baseline program, and accommodating externally funded scientific activities. So far, it does not appear that the demands have exceeded the ability of the facility to accommodate reasonable requests. If the impact is small, it appears from what was presented that the decision authority has been delegated to the appropriate local managers. It might be useful to have in place the ability to track trends in demand in order to anticipate if increased usage may require a more structured approach to deciding how to accommodate community initiated campaigns.

The IMB may not give enough voice to the general science community in making allocation decisions for the operations and for the capital equipment funding. This does not appear to be a problem in the near future, given the current personnel. However, in a multi-decade climate research facility, checks and balances need to be in place to ensure a healthy balance between user requirements, safety, operational concerns, and technical innovation, regardless of who occupies which positions.

The community of users is evolving. The current system is well set up to address the needs of members of the user community who are addressing research related to the goals of the ARM Program. With the designation as a national user facility, mechanisms are now in place to address the needs of a broader scientific community, but the processes and criteria are less clear. It is a challenge for all organizations, and it will be a challenge for the ACRF management to recognize truly new communities of users and allow opportunities for experimental and speculative research.

The ACRF is a very valuable facility that should receive increased acceptance and appreciation by the science community in the future. It is important to look beyond ARM and DOE too, and to seek interactions with other communities through outreach on all fronts. A future goal may be to tie into larger national or international structures. This refers to data archives, but also to other aspects (such as instrumentation assets).

Decision-Making Process. In the current IMB structure, science is represented by the science liaison. This appears to be working well given the current personnel. However, it is not clear if there are adequate checks and balances to ensure that the needs of the science community will be sufficiently represented as personnel change in future decades. Consideration should be given to enhancing this role.

It appears that ACRF decisions are made with a highly distributed decision-making process, with liaisons, site scientists, and science team leaders all contributing. As long as resources are reasonably plentiful, and demands are incremental in nature, this type of decision-making process can be effective. It is however, by nature, tactical, rather than strategic and, in the long run, is not a substitute for more strategic decision making, driven by a vision for ACRF's future. For now, this is not a big problem, given the newness of the ACRF and the big changes that have been made in management and organization; however, it is something to keep in mind. Also, it may have some nearer-term importance as resources become tighter, and additional prioritization is needed between various scientific foci. Here, more centralized decision making is needed, and scientific input is needed to guide/make these decisions.

2.3 Data Quality

Quality Assurance. There are clear mechanisms in place for quality assurance, and they appear adequate. The designers of the system appear to be seriously addressing the challenge of how to capture and provide information on data quality for researchers who may be using these data decades later. However, many of these mechanisms appear to be new or only now approaching deployment. These mechanisms will need to be reviewed more carefully after they have been in use for a few years to assess the success of their implementation.

Configuration Management. Excellent processes appear to have been put in place to manage and continually improve data quality. Examples include the configuration management tools, the Data Quality Office and the on-line data quality monitoring tools. The challenge now is to assure 100% compliance with using these tools and to build more "intelligence" into the automated data screening tools. Now it appears that parameters like min/max and, perhaps gradients, are being used to judge data quality. Although this is a good start, automated tools that are coupled back to the scientifically motivated data quality objectives could be built into the programs over time. This is a big job; however, the hard part is really already done, that is, putting the systems in place. Ultimate scientifically derived data quality objectives, such as resolution and precision, should be used as the test of data quality. This is especially important in light of the broad accessibility of the data and interdisciplinary uses for it. Another benefit of using an automated process for checking data quality objectives is to relieve scientists from this cumbersome and time-consuming task and allow them to spend more time on scientific research, rather than data assessment. Also, automated checks could be developed to either send alert messages, when an error is detected (rather than depending on manual inspection), or update a "master display" showing all the automated error checks. This could replace the manual checks that are presently done.

Instrument Calibration. Instrument calibration is another issue that needs to be addressed. While it appears that calibration procedures are developed and documented for many instruments, there does not appear to be a common procedure for assuring compliance with instrument calibration procedures. An ACRF-wide calibration data base should be maintained so that researchers can be assured that their data were collected with an appropriately calibrated instrument. This on-line data base could also be used as a management tool for assuring that calibrations are done on the "agreed to" schedule. It is anticipated that research will continue and expand, and that especially long-term data sets will continue to be of high interest to the climate community. Therefore, strong emphasis on data quality, integrity, and calibration is of high priority.

2.4 Finding and Obtaining Data

Data Access. The ACRF data access via the web site appears to be exceptionally complete and well set up. There are significant added capabilities for plotting and browsing with time series and thumbnails provided. Maybe more simply named browse files could be provided for interdisciplinary scientists to find and view, but overall, the access capabilities seem to be some of the best available. Greater ability to crosscut in time to provide all data from all sensors at one time period would be desirable and providing increased browse products could better support the outreach and advertising functions that will be more important for a national user facility. Also, to support new users with marginal network access, ACRF should look at reducing how much access is needed. Using media is probably the best way, but it may be expensive. The ACRF should do a cost/benefit trade study on media and subsetting data sets.

Archive Structure. The current archive structure was designed for high-level users—people who understand the data and are willing to invest effort (and equipment) into using the data. At the moment the only option is to get daily instrument data files. For higher-level products (the most likely to be needed), this often requires the ability to move and process huge data sets, much of which the client does not need. With the transition to a user facility, it is expected that more users

unfamiliar with the instruments and with only specific data requirements will be seeking access to the data. Because the purpose of the ACRF is to provide long-term time series data, specific time-series data should be made easy to access. Perhaps this is an example of a value-added product. If the researchers have to spend inordinate amounts of time generating the products that they actually need for their research, it will lessen the utility of the ACRF data products. This is especially true if huge data sets need to be downloaded before the small fraction of data that is actually needed can be extracted by the scientists. The ACRF should change the entire structure of the archive to one that delivers user-specified data—in a known and consistent format for the entire requested period—so that all data idiosyncrasies are hidden from the user. This change will likely require a large investment of human resources to restructure the archive and develop data delivery software, but may have a potential benefit by actually reducing the demand currently placed on the hardware structure to move large volumes of data (files). It is recommended that additional resources be committed to this task.

Archive Interface. The archive web interface is inadequate for new users and should be redesigned. The panel submitted specific recommendations on the thumbnail browser. The panel also recommended that the thumbnail browser image library should be fully populated. Additional investment is needed for the improvement of the archive. The design should focus on making it faster (fewer clicks) and clearer to get to data and begin ordering. The design should include a feature to retain user-specified information for each request so the user may easily modify the request. The ACRF should consider adding a feature that allows users to select "type of work to be done," and have the system suggest the top 5, or 10, or 20 data sets to order. This allows new users, particularly students, to be able to select from a subset of the entire data holdings; provides help to get started; and encourages new users.

Users of national facilities will probably come from the full spectrum of users, ranging from principal investigators and science team members, who may have built the instruments, to high school students and teachers, who may want to use browse products. The large middle group of users are the interdisciplinary scientists who require research-quality data sets (the best available) and rely on the ACRF to provide that. They do not have the time or expertise to reevaluate the reliability or application appropriateness and must rely on the ACRF for all basic and value-added products with the metadata necessary for documenting their research. Funding allocation may have to be reassessed as it pertains to the combined data quality, calibration, and error determination capabilities of the ACRF.

Data Products. The ACRF appears to deliver high-quality specialty data products for cutting-edge scientific research in cloud physics, model parameterization, carbon-cycle science, and others. Because the ACRF is now in the "business" of generating long-term (time-series) climate data products, it would be very valuable to have one or more "signature" products (e.g., Keeling Curve and Vostok Ice Core data) that are uniquely associated with the facility. These data products could demonstrate to scientists and non-scientists alike the purpose and value of the ACRF. It would strengthen the rationale for continuing the effort long into the future. Specialists and non-specialists would come to anticipate the additional data.

To guide new investments in data management, products, ACRF should review data access patterns. ACRF should determine what data are actually being used, by whom, and how often.

This information will be extremely valuable in allocating resources for the future. Data products with little or no use could be curtailed. Those with high demand could be enhanced. ACRF should establish a review process to address the need to discontinue existing measurements or add new ones.

Data Storage. Continued funding must be assured—level funding may be insufficient in times of increasing cost, exponentially growing data volumes, the requirements to periodically upgrade storage media, and occasional reprocessing of the entire data record. The question of very long-term viability of the data storage should be of concern to DOE management, especially if the overarching goal relates to climate—by its nature a long-term issue.

2.5 Safety

As part of the overall panel review of operations, a site review of the ACRF was also conducted. The purpose of the visit was to review safety procedures for the Southern Great Plains site at Lamont, Oklahoma. This site covers a 55,000-square-mile area, which serves university, DOE, and other federal agency researchers. Concerns from the review included extensive travel schedules for maintenance personnel working in remote areas and a variety of users working in areas exposed to tornadoes, insects, and snakes. Findings were as follows: a very good safety program is in place; concern for fellow employees is evident; safety equipment is used, inspected, in place; and safety practices are strictly enforced by fellow workers and management. Typical examples of safety practices were: a safety program in place and updated; electrical plugs and cords that are protected by a ground fault circuit interrupter (GFCI) system, excellent stairs and ladders; user stations with sufficient space for equipment, proper electrical wiring, special access, loading dock area designed to handle users; and research equipment, emergency contact procedures, safety rules were enforced.

The site safety director and assistant manager, who tracks the maintenance people in the 55,000-square-mile operating grid, is a certified laser safety officer, driving instructor, CPR and emergency defibrillator instructor. The site management also has successfully incorporated Lessons Learned into safety and operations. The safety program is viewed as very impressive and complete. The occupational safety program appears to be a reasonable compromise between safety and efficiency. It appears that the teams are fully committed to ensuring safety at all sites, and they should be commended for their efforts as well as encouraged to continue along this path. The record of accomplishments is impressive.

The panel recommends that workers and users at the sites be questioned about their understanding of the safety approach and systems. In this way, the ACRF will learn if all of their great safety procedures and information are really getting to front-line workers. This could be done by using a questionnaire, quiz, or exit interview. The panel also recommends that safety references on the ARM website be updated to facilitate locating the information.

Appendix A

Department of Energy Review of the ACRF: Charge Letter

Appendix A

Department of Energy Review of the ACRF: Charge Letter

Charge
XXX
Institution
Address
City, State

Subject: DOE Review of the Atmospheric Radiation Measurement (ARM) Climate Research Facility, February 3-4, 2005, American Geophysical Union, Washington, DC

Dear Dr. XX:

Thank you for agreeing to participate in the peer review of the Atmospheric Radiation Measurement (ARM) Climate Research Facility (ACRF), at the American Geophysical Union (AGU), 2000 Florida Ave, Washington, DC, on February 3 & 4, 2005. The review will begin at 8:30 AM. A continental breakfast will be available at 8:00AM.

The purpose of the review is to examine the current operations at the ACRF, including the management of facility operations, data management, allocation of funding, facility use and user activities, and to obtain an understanding of the contributions and importance of the ACRF to climate change research. The ACRF has been designated as a DOE user facility, and the ARM Infrastructure Management Board (IMB) is responsible for ACRF management. Thus, while the review is being done for DOE, the results will be shared with the IMB, but anonymity of the reviews will be ensured. The evaluation criteria are given in Attachment 1.

A copy of the draft agenda is included as Attachment 2. The review has been organized by staff from the DOE Office of Biological and Environmental Research (BER), but you will be part of a team of independent reviewers who will perform the review. See Attachment 3 for the list of reviewer names. The format for the review will include a close out session on February 4, where the team will provide a verbal debriefing of the review to the ARM Program Manager.

Federal and Department of Energy policy stipulate that we use independent reviewers who report individually in writing to the Department of Energy. I would appreciate receiving your report within three weeks of the review. We will provide an electronic system, PeerNet, for this purpose. The PeerNet system can be accessed only with a user name and password; this information will be provided to you at the meeting.

You will be receiving a separate communication from Mr. Jimmy Voyles, the ARM Technical Director, who will provide the following background information:

- ARM Infrastructure Review Report
- ACRF Management Plan

- Science Board Charter
- Self Assessment of the Management and Operations of the ARM Climate Research Facility
- Web links for Data Quality Program and Safety Policy

For further information, you may wish to visit the ACRF web site at http://www.arm.gov/acrf/.

Your travel expenses will be reimbursed through the Oak Ridge Institute for Science and Education (ORISE), in Oak Ridge, TN. ORISE will also provide an honorarium, if you are eligible to receive one. Rooms have been reserved at the Courtyard by Marriott, 1900 Connecticut Ave, NW, Washington, DC. Mikki Prater will contact you with further information on the travel reservation and reimbursement process. Her contact information is (865) 576-9278 and praterm@orau.gov.

Peer review of user facility operations is critical to assure the success of user facilities such as the ACRF. Although ARM has been reviewed in the past, the ACRF was only designated as a user facility two years ago; thus, there is a need to ensure that the ACRF operations are on track, and that the facility is being operated effectively and efficiently and making a significant difference in climate change research. Participation of expert peer reviewers in these user facility reviews helps ensure that DOE will continue to provide the highest quality user facilities to the scientific community.

I look forward to your assistance in this review process and hope that through it you will gain a greater appreciation of the capabilities of the ACRF. Should you have any questions, please contact me at (301) 903-0043, or by email: wanda.ferrell@science.doe.gov.

Sincerely,

Wanda R. Ferrell, PhD
ARM Program Manager
Climate Change Research Division

cc: Jerry Elwood, SC-74
Mikki Prater, ORISE

Appendix B

Department of Energy Review of the ACRF: Evaluation Criteria

Appendix B

Department of Energy Review of the ACRF: Evaluation Criteria

Reviewers are requested to examine the current operations of the ARM Climate Research Facility (ACRF) including the management of facility operations, budget, user activities, and to obtain an understanding of the contributions of the ACRF to climate change research.

Management Issues:

Reviewers are requested to determine whether the ARM Infrastructure has effectively managed the operations and capital equipment funds and the user activities, and provided supporting infrastructure. Please include comments on the following questions:

- How does the ARM Infrastructure Management Board (IMB) make allocation decisions for the operations and for the capital equipment (CE) funding, and how have those decisions benefited ARM scientists or climate change research in general?

- Could the operations and CE funding of ACRF be managed more efficiently, and if so, how?

- How well have the needs of the user community been met, and are there specific areas where improvements or investments should be made?

Support of Research:

Reviewers are requested to determine how well the ACRF is providing advanced instrumentation, support for community initiated campaigns, and quality assured data to scientists engaged in climate change research, and whether the use of ACRF resources is making a significant impact in the climate change research. Please include comments on the following questions:

- How well does the IMB facilitate user access to or use of the ACRF sites and resources, and how well does the IMB assign priorities when multiple requests for resources are submitted?

- Are the mechanisms for establishing priorities for developing special data sets and other research tools adequate?

- Are the mechanisms for quality assurance of data adequate?

- Are the mechanisms for finding and obtaining data adequate?

– What are the current strengths of the ACRF facilities/capabilities, and where are there opportunities for improvement?

– In what ways has the use and facilities/capabilities of the ACRF advanced climate change research?

Occupational Safety:

Reviewers are requested to determine whether the ACRF is providing safeguards that ensure the safety of personnel who either work at the sites or visit the sites for research or educational activities.

– What are the current strengths of the ACRF occupational safety and health procedures and where are there opportunities for improvement?

Appendix C

Department of Energy Review of the ACRF: Review Panel

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