U.S. DEPARTMENT OF ENERGY | Office of Science

DOE/SC-ARM-TR-171

ARM Mentor Selection Process

DL Sisterson

October 2015

ARM
CLIMATE RESEARCH FACILITY

DISCLAIMER

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Office of Science, Office of Biological and Environmental Research

Acronyms and Abbreviations

AAF	ARM Aerial Facility
ARM	Atmospheric Radiation Measurement
ASR	Atmospheric System Research
DOE	U.S. Department of Energy
DQ	data quality
QA	quality assurance
QC	quality control

Contents

1.0 Background

The Atmospheric Radiation Measurement (ARM) Program was created in 1989 with funding from the U.S. Department of Energy (DOE) to develop several highly instrumented ground stations to study cloud formation processes and their influence on radiative transfer. In 2003, the ARM Program became a national scientific user facility, known as the ARM Climate Research Facility. This scientific infrastructure provides for fixed sites, mobile facilities, an aerial facility, and a data archive available for use by scientists worldwide through the ARM Climate Research Facility—a scientific user facility.

The ARM Climate Research Facility currently operates more than 300 instrument systems that provide ground-based observations of the atmospheric column. To keep ARM at the forefront of climate observations, the ARM infrastructure depends heavily on instrument scientists and engineers, also known as lead mentors. Lead mentors must have an excellent understanding of in situ and remote-sensing instrumentation theory and operation and have comprehensive knowledge of critical scale-dependent atmospheric processes. They must also possess the technical and analytical skills to develop new data retrievals that provide innovative approaches for creating research-quality data sets. The ARM Climate Research Facility is seeking the best overall qualified candidate who can fulfill lead mentor requirements in a timely manner.

2.0 Key Roles and Responsibilities

2.1 Instrument Coordinator

The responsibilities of ARM instrument coordinator include the following:

- Select and coordinate instrument mentors for facility instruments;
- Supervise the operational and calibration protocols and documentation for all facility instrumentation;
- Supervise instrument performance and suggest improvements in operating and calibration procedures for all facility instruments;
- Work with the ARM managers to recommend instrumentation based on Atmospheric System Research (ASR) Working Group measurement needs;
- Work with mentors to develop and justify budgets for instrument mentor effort and instrument needs;
- Manage spending progress relative to the established budget;
- Use ARM-wide administrative and business procedures and practices;
- Define the reporting requirements and maintain ARM-wide databases.

2.2 Lead Mentor

The ARM lead mentor has the primary responsibility for the ARM instrument mentorship of a given instrument class. First and foremost, ARM lead mentors have to be recognized by their peers as capable/credible scientists in their respective fields of measurement. They also have to understand the

technical aspects (hardware and software) of the instrumentation to be able to judge the overall quality of the measurements. Although instruments vary by number, location, and complexity across the ARM Facility, the following provides a general guideline of expectation and level of effort for ARM lead mentors:

- **Timely reporting and resolution of instrument issues to the ARM Facility Infrastructure Team and of data quality issues to ARM Facility users.** The ARM Facility has automated processes that are developed by the ARM developers to provide standard collection and processing software for all data collected by ARM instruments. In addition, routine automated quality assurance/quality control (QA/QC) algorithms are developed by the ARM Data Quality (DQ) Office. The ARM DQ Office provides data-quality review summaries every two weeks. The mentor's role is to work with the developers and DQ Office to articulate the highest level of data processing and DQ that can be automated to identify and flag questionable data. Then, the mentor's role becomes one of reviewing instrument performance and DQ issues that can only be determined by the mentor's inspection. The mentor, as the instrument subject-matter expert, has final authority over the quality of the data. The instrument handbook is the most important documentation for the mentor to maintain. This document includes a detailed description of the instrument; theory of operation; descriptions of data processing, DQ review, and instrument uncertainty; calibrations; ARM site locations; etc. **(50%)**
  - They have to be aware of instrument and measurement performance on at least a weekly basis and be available and willing to document performance through ARM processes.
  - When an instrument performance issue occurs, timely action must be taken to identify the problem, provide a pathway forward to correct the problem, and document the problem.
  - They need to work cooperatively with the DQ office to develop automated QA methods and provide definitions of measurement accuracy and uncertainty quantification.

- **Providing instrument documentation to on-site operations teams at each fixed site and mobile facility.** While the ARM site managers have the overall responsibility to provide the day-to-day operation of all ARM instruments, the mentors are required to provide the necessary documentation and training to on-site operations to ensure the safe operation, routine maintenance, corrective maintenance, and calibrations for all instruments. This is a partnership that initially sets the expectations of on-site operations activities that can be performed independent of mentor permission. It is expected that as on-site operations staff become more familiar with instrument operations, mentor involvement with the day-to-day instrument activities will be significantly reduced. **(30%)**
  - Mentors have to work cooperatively with operations for training and documentation.
  - They have to work cooperatively with operations for sparing strategies, maintenance (preventative and corrective), calibration, troubleshooting, and measurement performance.
  - They need to follow established engineering processes (design, specifications, reviews, documentation, training, etc.) for hardware and/or software changes, upgrades, or new instrumentation.
  - They need to establish a relationship with the instrument vendor.

- **Engaging the scientific community about instrument upgrades, new technologies, and unmet measurement needs.** It is paramount that mentors engage not only with the ARM Facility users, but also with the larger research community, to ensure that the ARM Facility is providing the best measurements to achieve ARM Facility goals. This requires not only scientific understanding of data provided by the instrumentation, but also interaction with the ASR working groups where ARM Facility users identify unmet measurement needs to improve understanding of atmospheric and chemical processes used to inform climate model forecasts. Mentors are encouraged to use their instrument data for peer-reviewed journal articles and technical reports. **(20%)**

  - Mentors must stay current and lead their responsible area of measurement science through active engagement with the DOE ASR

  - Mentors must also be engaged with the ARM Facility and the broader science community.

The high-level responsibilities are summarized below, and the detailed responsibilities are provided in Appendix A, which comprises the Statements of Work for contracts. Lead mentors may use their ARM funds for support of associate and/or assistant mentors. The ARM lead mentor shall provide a list of the names of all personnel, their resumes, and brief descriptions of their responsibilities to the ARM instrument coordinator. The updated resumes of the lead mentor and the personnel supported by lead mentor funding shall be provided annually to the ARM instrument coordinator as part of contract renewal of funding.

The ARM instrument coordinator shall be notified immediately by the lead mentor or lead mentor institution in the event that an ARM lead mentor cannot fulfill his/her responsibilities. The ARM Facility has implemented an ARM mentor selection policy that requires all new or replacement ARM lead mentors to be vetted through the ARM mentor selection committee, which is chaired by the instrument coordinator.

Lead mentor high-level responsibilities that must be conducted in a timely manner include the following:

- Develop the technical specifications for instruments and spare components procured as appropriate for the ARM Climate Research Facility;

- Develop procedures for instrument operations (e.g., daily rounds, maintenance, and calibration);

- Assess instrument status and DQ in a timely manner;

- Manage instrument repairs;

- Work with ARM data systems personnel on data product requirements, including the specification of appropriate operating ranges and associated flags when data fall outside of those ranges to provide an indication to the DQ Office, mentors, and science data users regarding obvious DQ problems;

- Use ARM-wide administrative and business procedures and practices.

3.0 ARM Lead Mentor Selection Policy

The ARM Climate Research Facility's policy with regard to lead mentors is to identify, evaluate, and select the best-qualified candidates that have recognized research and/or equivalent demonstrated hardware/software experience with a particular instrument or similar instrument systems and are able to perform the lead mentor duties in a timely manner.

4.0 ARM Lead Mentor Selection

The implementation of the ARM instrument lead mentor is accomplished by the selection process provided below.

4.1 ARM Lead Mentor Selection Process

1. The ARM instrument coordinator has the overall responsibility for the instrument mentorship selection process, except for the ARM radar mentorship selection process and the ARM Aerial Facility (AAF) instruments and instrument support selection process.

2. The ARM chief operating officer has the overall responsibility for the ARM radar mentorship selection process.

3. The ARM AAF manager has the overall responsibility for the ARM AAF instruments and instrument support selection process.

4. A list of qualified candidates from throughout the research community is identified, resumes obtained, and information distributed to the members of the mentor selection committee for review and approval.

4.2 Selection Criteria

1. Candidates have recognized research and/or equivalent demonstrated hardware/software experience with a particular instrument or similar instrument systems.

2. Candidates are able to perform instrument mentor duties in a timely manner.

4.3 Candidate Replacement

1. At times, mentors will need to be replaced due to retirement, resignation, or, on rare occasions, performance issues.

2. The ARM instrument coordinator shall be notified immediately by the lead mentor or the lead mentor's institution if the lead mentor cannot fulfill his/her responsibilities.

3. The ARM mentor selection process will be used to determine the best-qualified replacement candidate.

5.0 ARM Lead Mentor Selection Committee

The ARM mentor selection committee is composed of the ARM instrument coordinator (chair), the ARM technical director, the ARM chief operating officer, the ARM DQ office manager, and the ARM managers of the fixed and mobile facilities. Additional temporary members may be appointed as needed by the committee chair upon approval by the DOE program manager to serve as subject-matter experts (with full voting rights) in consideration of a specific candidate pool of lead mentor applicants for a specific instrument or instrument system. The temporary members would only serve as needed and not become permanent members of the committee. The ARM instrument coordinator is responsible for assembling resumes of qualified candidates and distributing the documents to committee members for review prior to a meeting. Meetings will be arranged by the instrument coordinator and will be conducted by conference calls or in conjunction with other meetings where members are present. After review and discussion, the lead mentor is selected by simple majority vote of a meeting that achieves quorum. The chair casts the tie-breaking vote, if needed. If the lead mentor candidate is from the institution of the chair, the chair will be disqualified as the tie-breaker, and the technical director will cast the tie-breaking vote.

Current Committee Members (February 2013 to present)

ARM Instrument Coordinator (Chair)	Doug Sisterson Argonne National Laboratory
Technical Director	Jim Mather Pacific Northwest National Laboratory
Chief Operating Officer	Jimmy Voyles Pacific Northwest National Laboratory
Data Quality Office	Randy Peppler University of Oklahoma/Cooperative Institute for Mesoscale Meteorological Studies
NSA Site and AMF3 Manager	Mark Ivey Sandia National Laboratory
ENA Site and AMF1 and AMF2 Manager	Kim Nitschke Los Alamos National Laboratory
SGP Site Manager	Nicki Hickmon Argonne National Laboratory
MAOS Manager	Stephen Springston Brookhaven National Laboratory

Appendix A: Lead Mentor – Specific Responsibilities

The lead mentor has the primary responsibility for the ARM instrument mentorship. The high-level responsibilities are summarized above, and the detailed responsibilities are provided here. The lead mentor may use his/her ARM funds to support associate and/or assistant mentors. The lead mentor shall provide a list of names of the all personnel and a brief description of their responsibilities to the ARM instrument coordinator. The updated resumes of the lead mentor and the personnel supported by his/her mentor funding shall be provided annually to the ARM instrument coordinator as part of contract renewal of funding. The ARM instrument coordinator shall be notified immediately by the lead mentor or the lead mentor's institution if the lead mentor cannot fulfill his/her responsibilities. The lead mentor replacement will be determined in accordance with the ARM mentor selection policy.

The lead mentor responsibilities are critical and given in detail below.

Engineering

- Work with the ARM technical director to develop the technical specifications of new instruments or instrument upgrades and procurements of spare instruments or instrument components.
- Comply with ARM established engineering processes (design, specifications, reviews, documentation, training, etc.) for hardware and/or software changes, upgrades, or new instrumentation.
- Support ARM engineering that is responsible for developing the software to collect, ingest, and automatically process all ARM instrument data.
- Work with the developers of data products in a timely manner to ensure the integrity of the standard data products from each deployed instrument by applying and following the appropriate quality assurance procedures and by correcting problems.
- Work with ARM developers and the ASR working group translators in a timely manner to transition all non-standard data processing codes to the ARM standard collections and ingests.
- Work with Site Data System Team on data communications and cyber security issues with instrument computers.

Operations

- All work must be performed in a safe manner. Site managers have the responsibility to effectively communicate local site safety expectations for on-site visits, and mentors have the responsibility to follow local safety policies and procedures.
- Supervise the operation of instrument systems at the ARM fixed sites and mobile facilities and work with local on-site operations technical support and the ARM Data Quality Office to ensure that consistently high-quality data are archived.
- Use and respond to the weekly data quality assessment report to provide timely (preferably weekly) reviews of data quality.

- Respond to site operations technicians' requests for guidance with the operation and maintenance of the instrument system. Operations and maintenance expectations are identified in the new instrument process that uses the Baseline Instrument Support Request (BISR), the Operational Readiness Report (ORR), and the Instrument Readiness Review (IRR). Changes to procedures and documents are the responsibility of the instrument mentor.

- Use the Data Quality Problem Report (DQPR) process to alert the Data Quality Office, site scientist, and site operations team to problems with the instrument in a timely manner.

- Carry out site visits as necessary and practical for inspections and service that are beyond the scope of site operations technicians. Enter visit and instrument-related information in the Site Access Request (SAR) system and Operations Support System (OSS).

- Use the BCR process to document any baseline changes to instrument hardware or software or operating procedures. If changes must be made in the field immediately, discussing the proposed changes with local site operations must occur and concurrence be obtained before the changes are made.

- Keep current the ARM instrument handbook for the instrument system(s) following the established format.

- The mentor will either 1) perform calibrations as needed, recognizing that more frequent calibrations may be needed than recommended by the manufacturer, working with the local site and mobile facility site operations; or 2) provide calibration information, schedule, and procedure to site operations for implementation. The calibration results and relevant metadata will be recorded in the OSS under the relevant system/component/site category. Regardless of who does the calibrations, the mentor is responsible for ensuring that the information is entered into the OSS.

- Identify, confirm, and document (in the OSS) classifications of all export sensitive {International Traffic in Arms Regulations (ITAR) and Export Control Classification Number (ECCN)} components and systems related to areas of instrument responsibility. Coordinate with the research site operations team to manage export issues related to instrument systems and components.

- Submit Data Quality Reports (DQR) in a timely manner to alert ARM Facility data users to problems with the instrument measurements.

Data Quality

- Write and/or complete and/or update all documentation for the instruments in the ARM instrument handbook. The handbook serves as ARM's "statement of expectation" for the instrument. To ensure data quality, this documentation includes the quality control procedures and applicable visual displays developed by the mentor and provided to the Data Quality Office for inclusion into the ARM Facility data quality web-based tools area (http://dq.arm.gov/).

- Assess the data quality for the instruments in a timely manner (preferably weekly but no later than monthly), and report problems through the DQPR process. Report changes to data quality assessment practice or procedures to the Data Quality Office, or make the data quality assurance methodology for

the instrument available to the Data Quality Office so that its personnel may properly assess the data. Changes to data quality assessment must be updated in the Instrument Handbook.

- Conduct data quality analysis and assessment based on information, if possible, beyond min/max/delta checks. This information includes assessments provided by the Data Quality Office and/or the site scientist. Information may include inter-comparisons with data from other instruments or with higher-level ARM Facility data products such as value-added products (VAPs). Information may include data quality color designations (green, yellow, red, white, or black) to be displayed for data users within Data Quality Reports. The mentor will have final approval, or is the final arbiter, on all data quality issues. This information must be included and updated in the Instrument Handbook.

- Use the ARM data quality web-based tools (at http://dq.arm.gov/) to inspect, assess, and report on data quality for his/her instrument(s) and provide feedback on the information contained in these tools. The Data Quality Explorer, DQ Plot Browser, and Interactive Plots portions of this web area can be used to display the quality of most ARM Facility-generated data. The responsibility of who provides the routine assessment of data quality can be negotiated individually between the Data Quality Manager and the mentor.

- In a timely manner, file Data Quality Problem Reports (DQPRs, http://www.db.arm.gov/DQPR2/) to document instrument performance issues or provide the information to the Data Quality Office to do so. The mentor will also file Data Quality Reports (DQRs, template created when a DQPR problem is deemed solved). The site manager, site scientists, and Data Quality Office will monitor the DQPRs until the problem has been resolved. Weekly teleconferences chaired by the ARM Facility instrument mentoring and data quality management coordinator will track DQPR status. Included within the DQPRs will be recommendations and/or instructions by the mentor for prescribed corrective maintenance and/or troubleshooting activity to resolve the problem. These DQPRs may result in the issuance of DQRs to ARM data users. The Data Quality Office will be copied when DQPRs are submitted and then closed.

- Ensure that instrument calibration procedures are properly designed for the specific system and that they are carried out. This information is used to validate measurement confidence.

- Instrument mentors are responsible for identifying the end-to-end performance of their instruments. The mentors need to identify the complete loop of measurement traceability for their instruments. This includes instrument uncertainties as well as data logger uncertainties and test equipment. The mentors will work with the ARM Facility instrument mentoring and data quality management coordinator to ensure that ARM measurement uncertainty is reported in a consistent and uniform manner.

Travel

ARM mentor funding includes travel. The mentor's budget should include sufficient funds to perform necessary tasks to maintain instruments in proper working order that cannot be performed by site operations staff. Suggested travel for mentors are listed here:

ARM Operations (each year)

Topics:

- Instrument training
- Instrument calibrations
- Instrument team meetings.

ARM Facility and ASR Program Joint User Group/Principal Investigators' Meeting (as relevant)

Topics:

- Instrument and measurement performance (poster)
- Science working group participation.

Relevant ARM Science Working Group Meeting (as relevant)

Topics:

- New instruments to address unmet measurement needs
- Instrument upgrades to maintain or improve performance life cycle
- Supplemental engineering effort (new instrument development, upgrades, maintenance, etc.)
- Supplemental operations effort (calibration, reprocessing, maintenance, etc.)
- Analysis to support retrievals and value-added processing.

One Domestic Professional Development Meeting (as relevant; foreign travel requires pre-approval)

Topics:

- Science related to ARM instruments
- Improved performance and/or capabilities of ARM instruments
- Improved algorithms used by ARM instruments.

ARM Climate Research Facility Guidance for Procurements and Contracts:

- Obtain appropriate management approvals through the Engineering Change Request (ECR) process. Doug Sisterson and Jim Mather approve investments.
- During the ECR, and when approved as an Engineering Change Oder (ECO), the assignee is asked to provide purchasing and subcontracting specifications. This information is to be provided to Luci Walker, Kelle Smith, and/or Laurel Chapman.
- In cases where instruments and components are required, a procurement specification is necessary. If only a single vendor is qualified to supply the instrument/component, a sole source justification is required.
- In cases where subcontracts are required, a statement of work must be developed to define the tasks, deliverables, period of performance, and cost constraints.
- For small parts purchases (related to maintenance), if there is not an approved ECO, an Engineering Work Order (EWO) or Baseline Change Request (BCR) is required to communicate and approve the purchasing action.
- Provide early notification to Luci Walker and Kelle Smith (PNNL) and Laurel Chapman (ANL) so they can initiate required actions with their Contracts staff.
- Lead mentors or their designees must contact Laurel Chapman (ANL) to make commitments and negotiate, establish, and modify contracts with vendors or subcontractors for repairs.
- Work must not begin prior to a formal contract being established. Only contracts can authorize work to begin.

Points of Contact

Technical	Doug Sisterson
	Jim Mather
	Jimmy Voyles
Engineering Administration and Procurements	Kelle Smith
Engineering Procurements and Subcontracts	Luci Walker
	Laurel Chapman
All ARM Instrument Repairs	Laurel Chapman

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