

# Nuclear Maintenance Application Center

## Program Overview

### Program Description

Maintenance practices at nuclear power plants play a critical role in a unit's ability to achieve or maintain high reliability and capacity factor levels. To this end, maintenance practices must be continuously reviewed and updated based on industry operating experience and emerging issues. The Nuclear Maintenance Application Center (NMAC) develops maintenance guides and coordinates worldwide technology transfer to drive improvements in nuclear maintenance activities. The program's technical guides, user groups, and workshops reflect best practices and engineering judgment gathered from nuclear plant experience, providing actionable maintenance activities that lead to lower costs and higher reliability.

NMAC also conducts research to identify maintenance advances with the potential to produce substantial plant performance improvements. These activities require accurate assessment of plant needs and effective scoping of tasks. By their nature, these projects tend to be strategic, complex, and longer in duration.

### Research Value

Research results from the Nuclear Maintenance Application Center provide knowledge and guidance that enable nuclear plants to reduce operations and maintenance costs and improve equipment reliability. NMAC participants gain access to the following:

- Industry data and best practices from more than 35 plant visits each year, helping members effectively implement maintenance program improvements.
- More than 180 maintenance guides for nuclear equipment and systems, which provide source documents for improved procedures and training packages.
- A worldwide network of plant engineering and technicians to help participants resolve nuclear plant maintenance issues.
- Quicker identification of failure-related root causes through the use of the NMAC Hotline, NMAC staff, and other members.
- A broader range of maintenance solutions with reduced implementation risks due to collaboration with subject matter experts from all over the world.
- Templates for establishing defensible preventive maintenance practices and intervals for key components and systems.

### Approach

The Nuclear Maintenance Application Center conducts near-term and long-term research to drive maintenance improvements at nuclear plants. Near-term research focuses on maintenance methods and guidance that can help reduce operations and maintenance costs and improve equipment reliability. Long-term research focuses on new methods and approaches that drive sustained improvements to plant equipment, processes and practices.

- Identify maintenance program improvements that can increase equipment reliability and plant performance.
- Provide technical assistance in defining, implementing, and sustaining high-quality maintenance programs.
- Develop practical and actionable maintenance guidelines for various equipment and systems.
- Ensure maintenance best practices are informed by industry experience and sound engineering judgment, leading to more consistent application.
- Leverage worldwide maintenance expertise and experience through user groups, workshops, and databases.

## Accomplishments

Electric Power Research Institute's (EPRI's) Nuclear Maintenance Application Center distills global operations and maintenance experience into actionable guidance for nuclear plant systems and components. Lessons learned from nuclear plants around the world are incorporated into industry- and vendor-specific technical guidance.

- Developed new or revised maintenance and process guides for key plant systems and equipment (including *Woodward Governor Maintenance Guide*, *Materials Handling Application Guide*, *Isolated Phase Bus Maintenance Guide*, and *Maintenance Engineer Fundamentals Handbook*).
- Coordinated industry technical response to emerging issues:
  - Helped develop gas detection methods to mitigate the gas accumulation issue
  - Identified and tested alternatives to the use of wire brushes for maintenance
  - Developed a database of lessons learned from power uprates
  - Developed improved foreign material methods and procedures.
- Sustained industry engagement and critical issue awareness through equipment workshops and user group meetings.
- Developed web-based technical training on emerging and high-priority nuclear maintenance issues (systematic troubleshooting, isolated phase bus maintenance, and expansion joint maintenance).
- Updated the Preventive Maintenance Basis Database (Version 2.0).
- Developed new component data tables for integration into Preventive Maintenance Basis Database (including fluid drives, intake structure equipment, and condenser cleaning equipment).

## Current Year Activities

NMAC Program R&D for 2010 will focus on updates to key equipment maintenance guides, greater outreach to domestic and international participants, and focused attention to emerging industry maintenance issues. Specific efforts will include the following:

- Develop guidelines on maintenance performance indicators to complement guidelines for assessing nuclear plant maintenance programs
- Provide guidance for cooling tower inspection and maintenance in response to industry failures
- Develop comprehensive guidance regarding seal selection and maintenance of reactor coolant pumps and reactor recirculating pumps
- Develop maintenance guide for control rod drive hydraulic systems
- Develop diagnostics for rotating equipment health monitoring using torsional vibration indicators
- Conduct workshops and manage user group meetings to facilitate knowledge capture and sharing of lessons learned

## Estimated 2010 Program Funding

\$7.1 million

## Program Manager

Martin Bridges Jr, 704-595-2175, mbridges@epri.com

## Summary of Projects

Project Number	Project Title	Description
5.1a	NMAC - Member Requested Support	
P41.05.01.01	NMAC Equipment Issues Maintenance Guidelines (supplemental)	NMAC maintenance guides provide specific technical information and human performance information, contained as component descriptions, failure mode identification, troubleshooting information, preventive and predictive maintenance advice, and detailed specific maintenance tasks. The guides are directed at providing information to power plant personnel to develop training packages, work procedures, and work planning packages. The guidelines collect the best available information from industry subject matter experts and from experienced equipment service personnel. The topics for the guidelines are chosen based on the current needs of the industry.
P41.05.01.02	NMAC Maintenance Process Guides (supplemental)	NMAC process guides provide technical and human performance information -- in the form of process descriptions, process flow, and specific task guidance -- to enable power plant staff personnel to develop training packages, work procedures, and work planning packages. Topics are chosen based on the current needs of the industry
P41.05.01.03	NMAC Users Groups (supplemental)	The NMAC user groups address regulatory issues as encountered. The effectiveness and usefulness of each NMAC user group are routinely reviewed by the NMAC Steering Committee are discontinued if not producing value.
P41.05.01.03a	Foreign Material Exclusion (FME) Industry Issues Group	<p>The industry working group chairperson from one of the represented plants with support of the assigned EPRI project manager will perform the following:</p> <ul style="list-style-type: none"> <li>• Organize activities</li> <li>• Manage group meetings</li> <li>• Coordinate the working group communications and subcommittees</li> <li>• Prioritize issues</li> <li>• Secure resources to accomplish high-priority tasks</li> </ul> <p>Membership of the industry working group is recommended to be the FME coordinator or specialist from each utility. Utilities that can be represented as a fleet should attempt to represent the fleet when at all possible. The individual should have the capability of making changes to their FME program as a result of their involvement in the working group. Individuals from other disciplines or other organizations are welcome to attend meetings as guests, however, recognizing that the FME coordinator/station representative maintains responsibility as the member of the working group.</p> <p><b>The EPRI FME Industry Issues Group will be formed by June 2009, and the first full membership meeting is scheduled for August 17, 18, and 19, 2009.</b></p>
P41.05.01.03c	EPRI MOV Performance Prediction Methodology Users Group (EMPUG) (QA)	The EPRI MOV PPM User Group (EMPUG) provides ongoing code maintenance, user technical support, and training. EMPUG supports users of the EPRI MOV Performance Prediction Methodology and the EPRI MOV Performance Prediction Program (MOVPPP).

Project Number	Project Title	Description
P41.05.01.03d	Maintenance Rule Users Group (MRUG)	The Maintenance Rule Users Group (MRUG) provides a forum for information exchange between participants to resolve technical issues from baseline inspections and ongoing revisions to the maintenance rule. MRUG develops technical guides and compiles good practices that can reduce implementation costs, increase consistency among participants, leverage rule activities to improve plant performance, and reduce vulnerability to regulatory compliance issues.
P41.05.01.04	Preventative Maintenance Database (PMBasis)	The Preventive Maintenance Basis Database (PMBD) User Group serves as the primary source for input to guide new and revised functionality for the database. Members share experience with the database and suggest new component types that may need to be developed. The user group provides input on what interfaces should be developed for the database.
P41.05.01.05	NMAC Equipment Issues and Maintenance Guides (Base)	NMAC maintenance guides provide specific technical information and human performance information, contained as component descriptions, failure mode identification, troubleshooting information, preventive and predictive maintenance advice, and detailed specific maintenance tasks. The guides are directed at providing information to power plant personnel to develop training packages, work procedures, and work planning packages. The guidelines collect the best available information from industry subject matter experts and from experienced equipment service personnel. The topics for the guidelines are chosen based on the current needs of the industry.
P41.05.01.06	NMAC Operations and Maintenance Procedures	This project provides access to NMAC expertise that can be applied to plant operation and maintenance concerns through plant visits, on-site assistance, phone/email interaction, and other mechanisms.

## NMAC - Member Requested Support

### Key Research Question

Products offered under the Nuclear Maintenance Applications Center (NMAC) program have become increasingly complex each year. Therefore, it has become difficult to implement the products without some assistance. NMAC offers assistance to members in evaluating the extent to which these products can provide value to their organization.

### Approach

These services can be provided in the following forms:

- Training
- Implementation of the Electric Power Research Institute (EPRI) Project Manager (PM) Basis Database
- Work package preparation
- Foreign material exclusion (FME) program support, component, or maintenance engineering development
- Sealing technology and bolting techniques
- Implementation support in the area of on-line maintenance
- Work package planning
- Specific component maintenance strategy support
- Providing knowledgeable peers to participate in evaluations and audits, or as consultants for resolving problems

NMAC provides on-site member-requested support (MRS) to participating NMAC- member utilities on a cost recovery basis. The scope of MRS activities should be consistent with the overall objectives of the NMAC program. Examples of typical MRS activities include programmatic and technical review of specific engineering programs, implementation of NMAC products, and response to a plant's technical issues.

The costs of these services vary, depending on the level of support requested. Typical costs of representative services are \$7500 – \$15,000 for EPRI PM Basis Training, \$10,000 – \$30,000 for technology assistance, and \$5000 – \$10,000 for third party participation in site assessments and audits. All or part of these costs can be deferred through the use of MRS.

### Impact

Reduced engineering staffs, aging plants, and dwindling vendor and architect/engineer (A/E) support make solving engineering system and component problems more difficult for operating nuclear plants. In this environment, utility engineers need a variety of tools available to assist them with problem resolution. This program provides utility personnel with information and technology solutions that decrease the time and cost needed to resolve specific technical issues or implement specific programs or products. Improved decisionmaking is the greatest utility benefit delivered by this program. This program is offered in one-week increments of a full-time equivalent (FTE) NMAC representative (\$10,000 per week).

### How to Apply Results

This program will be delivered through on-site technical assistance.

## **NMAC Equipment Issues Maintenance Guidelines (supplemental) (052443)**

### Key Research Question

The performance and reliability of nuclear plant systems and components depend on component design and the effective planning and application of maintenance. Maintenance strategies, fully informed by operating experience and technology advances, can result in improved equipment reliability, lower operating costs, and higher overall plant reliability.

### Approach

The Nuclear Maintenance Application Center (NMAC) concentrates industry efforts aimed at improving nuclear plant maintenance. NMAC produces materials and services that support component engineers, maintenance supervisors, technicians, system engineers, and design engineers. NMAC maintenance guides distill the experience of industry maintenance professionals into practical technical products, providing proven maintenance techniques and methods. NMAC produces numerous guides on priority issues such as circuit breakers, pumps, motors, valves, and other equipment.

### Impact

- Directly addresses day-to-day plant maintenance activities and a wide array of priority issues
- Reflects an industry consensus approach to in-plant problem-solving
- Distills nuclear plant maintenance expertise and experience into practical technical products
- Provides multiple dissemination channels to members, including technical reports, newsletters, conferences and workshops, user groups, webcasts, hotline support, and the NMAC website
- Focuses input from broad domestic and international participation

### How to Apply Results

NMAC guides and services are used by members as the basis for craft training, the detailed instructions in maintenance procedures, and the foundation of troubleshooting plans and general references.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<p><b>NMAC Equipment Maintenance Guides:</b> Nuclear Maintenance Application Center (NMAC) maintenance guides provide specific technical information and human performance information, contained as component descriptions, failure mode identification, troubleshooting information, preventive and predictive maintenance advice, and detailed specific maintenance tasks. The guides are directed at providing information to power plant staff personnel to develop training packages, work procedures, and work planning packages. The guidelines collect the best available information from industry subject matter experts and from experienced equipment service personnel. The topics for the guidelines are chosen based on the current needs of the industry.</p>	12/20/10	Technical Report

### NMAC Maintenance Process Guides (supplemental) (052444)

#### Key Research Question

Nuclear power plant performance can fluctuate due to personnel turnover and inconsistent industry guidance for maintenance. Early identification of important maintenance process issues and corresponding best practices can help achieve and maintain plant performance.

#### Approach

This project documents strategic and tactical maintenance standards by capturing industry best practices and operating experience. Maintenance process guidelines define improved maintenance processes at existing and new generation plants through process descriptions and tutorials, implementation concerns and advice, troubleshooting information, industry perspective, and detailed insights. Information is collected by conducting plant visits, using industry capacity loss data, compiling surveys, and accumulating Maintenance Rule (a)1 populations. All data available from vendors, the Institute of Nuclear Power Operations, and other industry sources are assembled into Nuclear Maintenance Application Center (NMAC) guides that address industry best practices for improving maintenance processes.

#### Impact

- Continuously improve industry performance through proven maintenance methods and processes
- Reduce operation and maintenance (O&M) costs
- Improve access to technical and human performance information

#### How to Apply Results

NMAC maintenance guides, workshops, and user groups are used directly by member maintenance and engineering staffs. Plant equipment of all types is treated in specific and practical detail. Guidelines are sent directly to the maintenance manager, the NMAC site coordinator, and the technical library at each NMAC member plant. NMAC staff members travel to more than 30 plants each year to discuss recent guides and enhance understanding of plant maintenance problems. The NMAC portion of [www.epri.com](http://www.epri.com) contains all NMAC guides in full text, downloadable, and word searchable.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<p><b>NMAC Maintenance Process Guideline:</b> Nuclear Maintenance Application Center (NMAC) process guides provide specific technical information and human performance information, contained as process descriptions, process flow, and specific tasks guidance. The guides are directed at providing information to power plant staff personnel to develop training packages, work procedures, and work planning packages. The guidelines collect the best available information from industry subject matter experts and from experienced power plant personnel. The topics for the guidelines are based on the current needs of the industry near the beginning of the work year. The topics are chosen based on member surveys that are reviewed and discussed with the industry advisory group.</p>	12/17/10	Technical Report

### NMAC Users Groups (supplemental) (061649)

#### Key Research Question

Data taken at several industry meetings indicate that plant maintenance personnel rotate frequently, making it more difficult for newly assigned personnel to grasp the essentials of their new responsibilities. Frequent and regular interaction with industry colleagues can facilitate education, training, and staff productivity.

#### Approach

This project documents the ongoing development and support of equipment-specific user groups and forums where more experienced plant and Nuclear Maintenance Application Center (NMAC) staff can help newly assigned individuals more quickly and competently satisfy their new responsibilities. The user group membership becomes a ready resource for information and advice as plant problems are encountered. The effectiveness and usefulness of each NMAC user group is routinely reviewed by the NMAC Steering Committee to ensure ongoing value.

#### Impact

- Accelerate ability of newly assigned individuals to contribute to plant maintenance issues and fulfill new responsibilities
- Provide a ready resource for information and advice as plant problems are encountered

#### How to Apply Results

Members participate in NMAC user groups through annual issues meetings. Action items are addressed through working groups via phone, e-mail, and small meetings. Products are distributed and posted to the NMAC website.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<b>Users Groups Meetings</b>	12/20/10	Technical Resource

## Foreign Material Exclusion (FME) Industry Issues Group

### Key Research Question

Over the last several years, the number of fuel and equipment failures caused by foreign material intrusion into plant systems and components has not significantly decreased. Some station organizations have not had appropriate standards for the prevention of foreign material intrusion, or they have relied on the recovery of foreign material rather than prevention. Sometimes, insufficient measures are taken to eliminate the introduction of foreign materials.

This has resulted in a lack of sensitivity by some station and supplemental personnel to the damage foreign material can cause in systems, components, and nuclear fuel. Fuel and equipment failures because of foreign material intrusion have often been attributed to "legacy" debris, and corrective actions have been limited to removal of the debris that caused the failure. As a result, failures continue to occur because some legacy foreign material is left in the system.

The current Foreign Material Exclusion (FME) Industry Working Group (IWG) first met in 2003. This group acts as the industry's primary method to develop standards and communicate FME issues and best practices. However, this group has not had sufficient support to make significant improvements in the FME area to ensure zero fuel failures by 2010.

### Approach

EPRI's Nuclear Maintenance Application Center (NMAC) will facilitate the activities of the FME IWG by providing additional structure, identification, definition, prioritization, and resources for FME initiatives so that significant improvements in the area of FME can be implemented quickly.

Project focus includes the pursuit of excellence in foreign material exclusion by establishing industry standards, best practices, and key attributes of an excellent FME program with a focus on prevention.

### Impact

- Clearly defined FME work practices and effectively trained station and supplemental personnel
- Clearly defined FME zones with increased controls on open primary components and systems and critical secondary systems
- Guidance on use of FME tools, logs, and materials good housekeeping
- Effective work package and pre-job briefing guidance
- Guidance on control of cranes and other devices over open components and systems
- Training on internal and external operating experience as well as methods for installing barriers, dams, covers, and other FME tools and methods of exclusion
- Training on the kinds of foreign material that can lead to fuel failures or steam generator tube degradation
- Training center labs, classrooms, and instructors that model the desired FME control behavior needed at the station
- Methods to control foreign material from entering components that enter and exit the warehouse

### How to Apply Results

Participants will apply the standards, best practices and key attributes developed through the FME Industry Issues Group into individual plant FME programs. The work practices, technical guidance, training, and control techniques can be directly incorporated at the plant to prevent and mitigate FME.

## EPRI MOV Performance Prediction Methodology Users Group (EMPUG) (QA) (004433)

### Key Research Question

The Electric Power Research Institute's (EPRI's) Motor-Operated Valve Performance Prediction Methodology (MOVPPM) provides a low-cost alternative to prototype (or in situ) design basis differential pressure testing of motor or air-operated valves. MOVPPM software (QA) provides a validated capability for assessing the thrust/torque requirements under design basis flow and differential conditions of gate, globe, and butterfly valve designs commonly found in both motor and air-operated valve service. In addition to the code, several hand calculation methods have been developed to address specific designs not covered by the code. The methodology has been approved by the U.S. Nuclear Regulatory Commission (USNRC). Feedback and dialogue among software users lead to functional improvements and more effective application.

### Approach

The EPRI MOV PPM User Group (EMPUG) provides ongoing code maintenance, user technical support, and training and fosters user interaction. EMPUG supports users of the EPRI MOV Performance Prediction Methodology and the EPRI MOV Performance Prediction Program (MOVPPP) by providing a forum for the exchange of information pertaining to utilization of the methodology and by providing a vehicle for maintaining and modifying the EPRI MOV Performance Prediction Methodology (MOVPPM) code.

### Impact

Use of this methodology obviates the need for differential pressure testing either as an initial demonstration of or periodically verifying design basis capability. Not only does MOVPPM greatly decrease downtime for valve testing in general, it can significantly reduce valve failures due to insufficient torque or thrust.

### How to Apply Results

MOVPPM is Windows™-based and runs on personal computers and comes with support documentation. Use of the method requires the utility to obtain valve internal design information from valve vendors, which requires about one man-week per valve.

## Maintenance Rule Users Group (MRUG) (006893)

### Key Research Question

The Maintenance Rule Users Group (MRUG) develops solutions to generic technical issues associated with implementation of the maintenance rule. High-priority issues identified by MRUG members have included guidance on (a)(3) maintenance effectiveness assessments, guidance on component "run-to-failure" justification, and clarifying unavailability times for standby equipment. Feedback and dialogue among members can identify project opportunities to improve maintenance rule application.

### Approach

The purpose of the group is to perform the following:

- Provide an information exchange among participants through periodic meetings, newsletters, and website and email communications
- Provide information exchange between participants and the Electric Power Research Institute (EPRI) to resolve technical issues from baseline inspections and ongoing revisions to the rule
- Develop technical guides and documentation of good practices that can reduce costs of implementation, increase consistency among participants, leverage rule activities to improve plant performance, or reduce vulnerability to regulatory compliance issues

## Impact

The MRUG has provided guidance on (a)(3) maintenance effectiveness assessments, guidance on component “run-to-failure” justification, and clarifying unavailability times for standby equipment. MRUG also has identified best practices for issues such as balancing availability and reliability, monitoring of structures, improving timeliness of (a)(1) actions, coordination with the Equipment Performance Information Exchange (EPIX), and uses of condition monitoring for performance criteria. These efforts do not aim to “ratchet” plants to a single approach, but rather to identify cost-effective options, foster discussions of the strengths and weaknesses of the various options, and provide guidelines on their effective utilization.

## How to Apply Results

Membership in MRUG allows plants to participate in the development of implementation guidance and to provide comments and feedback to the process.

## Preventative Maintenance Database (PMBasis) (068039)

### Key Research Question

Effective industry use of preventive maintenance strategies relies on widespread availability of component-specific maintenance data and information. The primary focus of the Preventive Maintenance Basis Database (PMBD) is the design and maintenance of a comprehensive repository of preventive Maintenance (PM) basis information for power plant equipment. Feedback and dialogue among database users leads to functional improvements and more effective application.

### Approach

The Preventive Maintenance Basis Database collects data from worldwide industry sources to develop a comprehensive repository of PM basis information for power plant equipment. The PMBD contains the data tables that are integral to the Client/Server versions of the EPRI PM Basis Database, which will include available PM tasks, task intervals, and the technical bases of these tasks for all defined failure and degradation mechanisms. The foundation of this repository was the Electric Power Research Institute (EPRI) 38-volume *PM Basis Reports and Handbook* (TR-112500) and subsequently PM Basis Database Client /Server Version 2.0 and subsequent versions.

### Impact

The PMBD User Group members serve as the primary beta testers for new versions of the database. This group also serves as an EPRI PM Basis Database Advisory Group. The group will serve as the primary source for new or revised functionality for the database. The group will also suggest new component types that may need to be developed, and the group will provide input on what interfaces should be developed for the database.

### How to Apply Results

Members in the PMBD User Group receive copies of the current version of EPRI PM Basis Database containing information on the preventive maintenance programs recommended for some 130+ component types. Updates to the existing component data tables and the addition of data tables for new component types will be communicated to members so they can download the new data if they so desire.

## NMAC Equipment Issues and Maintenance Guides (Base) (052441)

### Key Research Question

The performance and reliability of nuclear plant systems and components depend on component design and the effective planning and application of maintenance. Maintenance strategies, fully informed by operating experience and technology advances, can result in improved equipment reliability, lower operating costs, and higher overall plant reliability.

## Approach

This program area identifies and addresses important maintenance and equipment issues by conducting more than 30 plant visits each year and compiling data from vendors, the Institute of Nuclear Power Operations (INPO), and other industry sources. The project develops guides to aggregate relevant diagnostic and mitigating technical advice for addressing key maintenance issues. These guides include problem identification, troubleshooting information, preventive and predictive maintenance advice, and detailed specific maintenance tasks, contained as applicable component descriptions and tutorials, application advice, and failure modes. Nuclear Maintenance Application Center (NMAC) equipment issues guides typically represent industry consensus positions on important items and occasionally provide technical and tactical support for accomplishing strategic industry initiatives. NMAC staff members travel to more than 30 plants each year to discuss recent guides and enhance understanding of plant maintenance problems.

## Impact

- Reduce operations and maintenance costs
- Improve equipment reliability
- Improve access to technical and human performance information
- Develop maintenance guidelines that represent industry consensus
- Provide technical support for strategic industry initiatives

## How to Apply Results

NMAC produces four to six equipment issues guides each year. These are sent directly to the maintenance manager, the NMAC site coordinator, and the technical library at each NMAC member plant. Members also can access NMAC staff through a phone and email hotline to respond to emergent plants questions and needs. The NMAC portion of [www.epri.com](http://www.epri.com) contains all NMAC guides in full text, downloadable, and word searchable.

## 2010 Products

Product Title & Description	Planned Completion Date	Product Type
<p><b>NMAC Equipment Issues Guidelines:</b> Nuclear Maintenance Application Center (NMAC) equipment guides provide specific technical information and human performance information, contained as component descriptions, failure mode identification, troubleshooting information, preventive and predictive maintenance advice, and detailed specific maintenance tasks. The guides are directed at providing information to power plant staff personnel to develop training packages, work procedures, and work planning packages. The guidelines collect the best available information from industry subject matter experts and from experienced equipment service personnel. The topics for the guidelines are chosen based on the current needs of the industry and validated by the Integration Committee members.</p>	12/21/10	Technical Report

## NMAC Operations and Maintenance Procedures (065807)

### Key Research Question

Operations and maintenance practices constitute one of the three principal areas that drive nuclear plant performance, along with equipment and structures and processes. Bringing essential information to the point of decisionmaking can drive successful plant and fleet performance. Access to equipment information and personal knowledgeable in operations and maintenance practices from outside one's immediate plant or company can provide useful perspective and insight.

## Approach

The Nuclear Maintenance Application Center (NMAC) staff is comprised of persons with extensive power plant and equipment experience and education. This expertise is applied to plant operation and maintenance concerns through direct phone and email interaction, routine plant visits to talk with maintenance and engineering personnel, assistance with selected plant assessments/evaluations, and specific field response when plants face emergent issues. Additionally, Electric Power Research Institute (EPRI) staff use this expertise and their many contacts to develop reports and guidelines that address new or improved methods and processes to accomplish tasks necessary to successful operation of nuclear power facilities. NMAC staff members travel to more than 30 plants each year to discuss recent NMAC guides and plant maintenance problems. NMAC maintains a (1-800) hotline to respond to plant questions and needs.

NMAC staff members pursue plant needs through interaction with the broader NMAC network of member plant personnel and industry vendors. NMAC has primary contacts in more than 100 domestic and international nuclear facilities. The NMAC portion of [www.epri.com](http://www.epri.com) contains a significant amount of maintenance-related information including all NMAC guides in full text, downloadable, and word searchable. Additionally, NMAC members share the collective knowledge and the information obtained through their interactions in newsletters, webcasts, and user group meetings.

## Impact

This program area enables utilities to perform the following:

- Reduce maintenance costs
- Improve equipment reliability by providing specific information and advice on specific plant problems
- Access expertise and resources that serve as a complement to member companies' in-house staffs
- Move more quickly to root-cause identification, identify a broader range of solutions, and target implementation risks associated with selected corrective action paths.

## How to Apply Results

Members apply expertise and guidance recommended by NMAC experts to specific operations and maintenance issues. Guidance may include problem identification, troubleshooting information, preventive and predictive maintenance advice, and detailed specific maintenance tasks, contained as applicable component descriptions and tutorials, applications concerns and advice, and failure modes.