

Nuclear Maintenance Application Center

Program Overview

Program Description

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.

Industry Needs and Issues Addressed

- Maintenance program improvements that can increase equipment reliability and plant performance
- Technical assistance in defining, implementing, and sustaining high-quality maintenance programs
- Practical and actionable maintenance guidelines for various equipment and systems
- Consistent application of maintenance best practices informed by industry experience and sound engineering judgment
- Access to maintenance experts and state-of-the-art intelligence through user groups, workshops, and databases

Impact

- Reduced operations and maintenance costs and improved equipment reliability through
 - dissemination of industry data and best practices from more than 35 plant visits each year,
 - availability of more than 180 maintenance guides for nuclear equipment and systems,
 - access to a worldwide network of plant engineering and technicians focused on improving nuclear plant maintenance practices,
 - quicker identification of failure-related root causes,
 - access to a broader range of maintenance solutions, and
 - reduced implementation risks associated with mitigation paths.

Key Accomplishments

- New and revised maintenance and process guides for key plant systems and equipment (22 published in 2007, including *Woodward Governor Maintenance Guide*, *Materials Handling Application Guide*, *Isolated Phase Bus Maintenance Guide*, and *Maintenance Engineer Fundamentals Handbook*)
- Sustained industry engagement and critical issue awareness through equipment workshops and user group meetings
- Web-based technical training on emerging and high-priority nuclear maintenance issues (four technical webcasts in 2007, including webcasts on systematic troubleshooting in both English and Japanese, isolated phase bus maintenance, and expansion joint maintenance)
- Version 2.0 of Preventive Maintenance Basis Database

- New component data tables for integration into Preventive Maintenance Basis Database (12 created in 2007, including Fluid drives, Intake Structure Equipment, and Condenser Cleaning Equipment.)

Current Year Objectives

- Thirteen guides, including the proper handling of failed parts for failure analysis, training packages for maintenance engineers, revision to the NMAC *Foreign Material Exclusion Guideline*, and an updated air-operated valve guideline
- Six workshops, including a Terry Turbine Workshop for foreign members, a Feedwater System Issues Workshop, a Rotating Equipment Issues Meeting, a Pressurized Water Reactor Rod Control Workshop, and a Materials Handling Workshop
- Fifteen equipment group meetings, including the Terry Turbine User Group, Pump User Group, Circuit Breaker User Group, and the Large Electric Motor User Group
- Three technical webcasts, including a materials handling webcast, a compression fitting webcast, and technical webcasts in Japanese and Spanish.

Industry Involvement

Estimated 2009 funding: \$3.4

Program Technical Lead

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Summary of Projects

Project Number	Project Title	Value
	NMAC Equipment Issues Maintenance Guidelines (supplemental)	This program area addresses specific plant equipment reliability and maintenance costs concerns identified through the NMAC program surveys and regional roll-up advisory meetings. Once the NMAC Steering Committee has agreed with the component and approach, a utility technical advisory group (TAG) is identified to advise the NMAC project manager on completion of the guide. This area is only available to participants in the supplemental NMAC program. Application support in this area is offered as part of the NMAC Product-Based Services.
	NMAC Maintenance Process Guidelines (supplemental)	This program area identifies important maintenance and operational process issues by conducting plant visits, compiling surveys, and accumulating Maintenance Rule (a)1 populations. This area is only available to participants in the supplemental NMAC Program. Application support in this area is offered as part of the NMAC Product Based Services.
	NMAC Equipment Issues Maintenance Guides (base)	This program area identifies important maintenance and equipment issues by conducting more than 30 plant visits each year, using industry capacity loss data, compiling surveys, and accumulating Maintenance Rule (a)1 populations. Application support in this area is offered as part of the NMAC Product Based Services.

Project Number	Project Title	Value
	NMAC Maintenance Process Guidelines (base)	This program area identifies important maintenance and operations process issues by conducting plant visits that address issues and program tasks that help companies reduce maintenance-related operation and maintenance (O&M) costs and improve equipment reliability. Application support in this area is offered as part of the NMAC Product Based Services.
	NMAC Assessment Guidelines (Base)	This program area develops methods and documents performance indicators that help identify important maintenance and operations process issues. These methods are validated by conducting plant visits that address issues and program tasks that help companies reduce maintenance-related O&M costs and improve equipment reliability. Application support in this area is offered as part of the NMAC Product Based Services.
	NMAC Assessment Guidelines (supplemental)	This program area develops methods and documents performance indicators that help identify important maintenance and operations process issues. These methods are validated by conducting plant visits that address issues and program tasks that help companies reduce maintenance-related O&M costs and improve equipment reliability. This area is only available to participants in the supplemental NMAC program. Application support in this area is offered as part of the NMAC Product Based Services.
	NMAC Process Guidelines (base)	This program area identifies important operations and support process issues by conducting plant visits that address issues and program tasks that help companies reduce programmatic O&M costs and improve equipment reliability. Application support in this area is offered as part of the NMAC Product Based Services.
	NMAC Process Guidelines (supplemental)	This program area identifies important programmatic and support process issues by conducting plant visits that address issues and program tasks that help companies reduce maintenance-related maintenance O&M costs and improve equipment reliability. This area is only available to participants in the supplemental NMAC program. Application support in this area is offered as part of the NMAC Product Based Services.
	NMAC Users Groups (supplemental)	The user groups address regulatory issues as encountered. The user group membership becomes a ready resource for information and advice as plant problems are encountered. This area is only available to participants in the supplemental NMAC program.
	Website Maintenance	NMAC has found that it is important to have interactive involvement of its members in the development of guidelines and application of the NMAC products. One of the many ways this is done is by providing information and in-process versions of NMAC guides to the NMAC members for their review and comment. This is done through the NMAC website and the NMAC Collaborative Website. These websites require continual maintenance to assure they are fresh and functional.

Project Number	Project Title	Value
	Newsletters	NMAC communication with its members is critical to the success of the organization. NMAC now has members on virtually all continents and around the world. This requires that information be provided in multiple languages and that periodic communication of NMAC projects and their progress be made. This is done by the NMAC Memo newsletter, which is provided in English and three other languages.
	Hotline Support	NMAC offers its members the service of a hotline so they can ask and receive answers at all hours of the day or night. This hotline averages 1000 calls or emails per year.
	Site Visits	NMAC has found that it is vital for NMAC personnel to be engaged with its members. To accomplish this, it is imperative that NMAC staff visit the members at their plants so that the staff can fully understand the issues and concerns of the members. NMAC is committed to visiting the sites of our domestic members every 2-3 years and the plants of our international members every 3-4 years. This means that NMAC staff will visit on average 35 plant sites per year.

Project Descriptions

NMAC Equipment Issues Maintenance Guidelines (supplemental) (052443)

Issue

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.

Description

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.

Value

- 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
NMAC Equipment Issues Guidelines	12/18/2009	Technical Report

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
NMAC Equipment Maintenance Guides: 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.	2010	Technical Report

NMAC Maintenance Process Guidelines (supplemental) (052444)

Issue

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.

Description

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 NMAC guides that address industry best practices for improving the maintenance processes.

Value

- 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. Members can also access NMAC staff through a phone and email hotline to respond to emergent plants questions and needs. The NMAC portion of EPRI.com contains all NMAC guides in full text, downloadable, and word searchable.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
NMAC Maintenance Process Guideline: NMAC process guidelines concentrate input from a utility technical advisory group (TAG), vendors, and other industry sources to define critical maintenance issues and provide practical intelligence to guide maintenance actions.	12/18/2009	Technical Report

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
NMAC Maintenance Process Guideline	2010	Technical Report

NMAC Equipment Issues Maintenance Guides (base) (052441)

Issue

This program area identifies important maintenance and equipment issues by conducting more than 30 plant visits each year and compiling surveys. Data from vendors, Institute of Nuclear Power Operations (INPO), and other industry sources on the issue/component are assembled into guides that provide problem identification, troubleshooting information, preventive and predictive maintenance advice, and detailed specific maintenance tasks.

Description

This 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, applications concerns and advice, and failure modes. NMAC equipment issues guides typically represent industry consensus positions on important items and occasionally provide technical and tactical support for accomplishing strategic industry initiatives.

Value

- Reduce operations and maintenance costs
- Improve equipment reliability
- Improve access to technical and human performance information

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. NMAC staff members travel to more than 30 plants each year to discuss recent guides and enhance understanding of plant maintenance problems. Members can also access NMAC staff through a phone and email hotline to respond to emergent plants questions and needs. The NMAC portion of EPRI.com contains all NMAC guides in full text, downloadable, and word searchable.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
NMAC Equipment Issues Guidelines: 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 specific maintenance tasks.	12/21/2009	Technical Report

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
NMAC Equipment Issues Guidelines:	2010	Technical Report

NMAC Maintenance Process Guidelines (base) (061521)

Issue

Nuclear power plant maintenance personnel often encounter situations where expert assistance and guidance could facilitate a more effective solution. This program area enables plant maintenance personnel and engineers to access the NMAC staff, which is comprised of persons with extensive power plant and equipment experience and education. This expertise is applied to plant maintenance concerns through direct phone and e-mail interaction, routine plant visits to talk with maintenance and engineering personnel, assistance with selected plant assessments/evaluations, and specific field response for immediate plant needs.

Description

NMAC staff members travel to more than 30 plants each year to discuss recent guides and enhance understanding of plant maintenance problems. Through its network of primary contacts in more than 100 domestic and international nuclear facilities, NMAC gathers insights across a wide range of nuclear plant designs and operating conditions. Members can also access NMAC staff through a phone and email hotline to respond to emergent plants questions and needs. The NMAC portion of EPRI.com contains all NMAC guides in full text, downloadable, and word searchable.

Value

- Reduce maintenance costs
- Improve equipment reliability through specific information and advice on specific plant problems
- Access to worldwide expertise to support issue resolution and to supplement member companies' in-house staffs
- Move more quickly to root cause identification
- Identify a broader range of solutions
- Reduce implementation risks associated with selected corrective action paths

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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
NMAC Maintenance Process Guides: NMAC process guidelines concentrate input from a utility technical advisory group (TAG), vendors, and other industry sources to define critical maintenance issues and provide practical intelligence to guide maintenance actions.	12/21/2009	Technical Report

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
NMAC Maintenance Process Guides	2010	Technical Report

NMAC Users Groups (supplemental) (061649)

Issue

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.

Description

This project documents the ongoing development and support of equipment-specific user groups and forums where more experienced plant and 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.

Value

- 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.

2009 Products

Product Title & Description	Planned Completion Date	Product Type
Users Groups Meetings: 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.	12/21/2009	Technical Resource

Future Year Products

Product Title & Description	Planned Completion Date	Product Type
Users Groups Meetings	2010	Technical Resource
