



EPRI Steam Turbine Resource Navigator

P219 – Steam Turbine & Auxiliary Systems

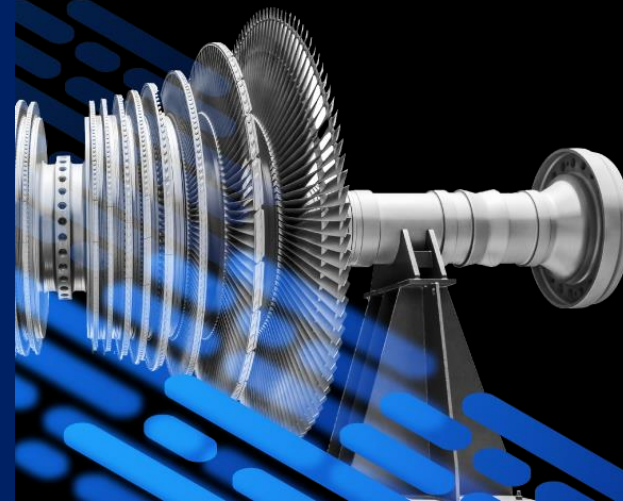
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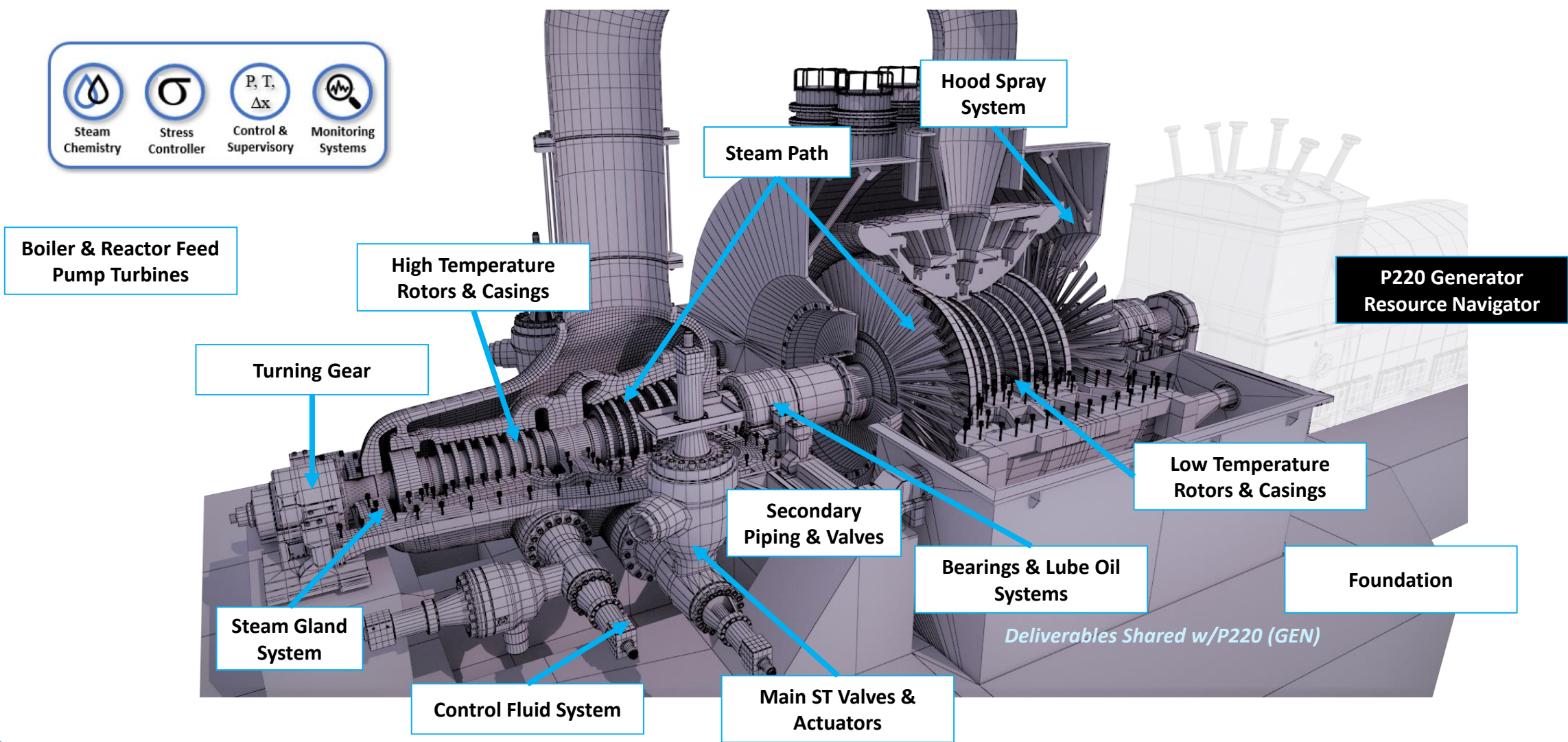


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Operation, Flexibility, &
Resilience

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RECENTLY RELEASED:

- 3002021591, [Steam Turbine Flexible Operation Scenarios: Technical Guide](#)
- 3002021593, [Low Pressure Turbine Last Stage Blades—Roadmap for Managing Erosion Damage](#)
- 3002019309, [Steam Turbine Flexible Operations Update](#)
- 3002019519, [Nuclear Steam Turbine Flexible Operation](#)
- 3002016242, [HRSG–Steam Turbine Interactions: An Interdependence Study](#)
- 3002019316, [Water Induction in Steam Turbines for Power Generation: Understanding and Preventing Water Damage](#)
- 3002018671, [Concept for Use of Hydrophobic Coating on LP Turbine Stator Surfaces to Mitigate Droplet Erosion Damage to Rotor Blades](#)
- [3002013589](#) Steam Turbine Low Load Operation
- [3002016837](#) Mid-Life Evaluation of F-Class Combined-Cycle Power Plants – Interim Report: Factors Affecting Remaining Life of Critical Components
- [3002003555](#) Turbine Water Induction Protection System: Owner's Guide
- [1021406](#) Short-term Shutdown Guidance for Steam Turbine-Generators and Auxiliary Systems
- [1024903](#) QA/QC Practices for Procurement of Steam Turbine and Generator Equipment
- [1013460](#) Torsional Interaction Between Electrical Network Phenomena and Turbine-Generator Shafts
- 1021483 Routine Performance Test Guidelines for Steam Turbines
- [3002006026](#) Operational and Control Strategies for Reducing Steam Turbine Damage from Cycling Combined Cycle Plants
- [1019657](#) Steam Turbine Performance Engineer's Guide

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RECENTLY RELEASED:

□ 3002021820, [Low-Pressure Turbine Exhaust Hood Spray: Maintenance Guide](#)

□ [1007676](#) Guidelines for Using Synthetic Slings for Lifting and Rigging

□ [1007914](#) Lifting, Rigging, and Small Hoist Usage Program Guide

□ [3002001203](#) Rigger's Handbook

□ [1024750](#) Terminology Alternatives for Steam Turbine Components

□ [1024903](#) QA/QC Practices for Procurement of Steam Turbine and Generator Equipment

□ [3002013931](#) 2018 Guidelines for Reducing the Time and Cost of Turbine-Generator Maintenance Overhauls and Inspections v4.0

✓ <https://turbgenoutageguide.epri.com/>

□ [1016958](#) Steam Turbine Bolting Maintenance Guide

□ [1006617](#) CO2 Blast Cleaning Process

□ [1024593](#) Turbine Steam Path Damage (FIELD GUIDE)

□ [1014137](#) Steam Turbine Blade Failure Root Cause Analysis Guide

□ [1024780](#) Steam Turbine Monitoring, Inspection, and Repair

□ TR-108943 Turbine Steam Path Damage: Theory and Practice ([V1](#) & [V2](#))

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- 3002021593, [Low Pressure Turbine Last Stage Blades—Roadmap for Managing Erosion Damage](#)
- 3002019870, [Program on Technology Innovation: High-Speed Imaging for Visual Inspection of Rotating Machinery](#)
- 3002023447, [High-Speed Flaw Formation Imaging of Crack Growth in Test Samples](#)
- 3002015306, [High Temperature Steam Turbine Rotor Life Management Initiative](#)

- [3002001049](#) Early Identification of Steam Turbine Performance Issues via Real-Time Diagnostics: Concepts to Advance the State-of-the-Art
- [1021483](#) Routine Performance Test Guidelines for Steam Turbines
- [1019657](#) Steam Turbine Performance Engineer's Guide
- [3002006026](#) Operational and Control Strategies for Reducing Steam Turbine Damage from Cycling Combined Cycle Plants
- [1024780](#) Steam Turbine Monitoring, Inspection, and Repair
- [3002003495](#) Strain-Based Turbine Generator Torsional Vibration Monitoring System Phase 2: Prototype Development
- [1014143](#) Steam Turbine On-line Blade Condition Assessment
- [1024665](#) Field Demonstration of Low Pressure Turbine Blade Vibration Monitoring
- [3002016244](#) Steam Turbine and Generator Bearing Vibration Diagnostic Guide

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RECENTLY RELEASED:

- 3002019870 , [Program on Technology Innovation: High-Speed Imaging for Visual Inspection of Rotating Machinery](#)
- 3002023447, [High-Speed Flaw Formation Imaging of Crack Growth in Test Samples](#)
- 3002022810, [Operator Technical Tutorial: Steam Turbine - Steam Path Damage Mechanisms](#)
- 3002022800, [Development of Customized UT Inspection For Axial-Entry Turbine Blade Attachments: Application Case Study](#)
- 3002017102, [Phased Array Examination Methodology: In Situ Inspection of Alstom ND56R Blade Roots and Steeples](#)
- 3002016243, [Application of Advanced Ultrasonic Testing Techniques to Axial-Entry Turbine Blade Attachments: Small-Flaw Parametric Study Procedure and Results](#)
- [1021409](#) Steam Turbine-Generator Technical Equipment/Program Condition Self-Assessment
- [1014140](#) Boresonic Inspection Primer
- [3002010534](#) Digital Radiography for Turbine Pin Finger Blade Attachment Cracking Detection
- [3002001318](#) Phased Array Examination Methodology for Curved Axial-Entry Turbine Blade Attachments
- [1006814](#) Remote NDE Technology for Steam Turbines
- [TR-101836](#) Guide for In-Service Ultrasonic Inspection of Bore-less Turbine Rotors and Other Solid Shafts
- [1013459](#) Plant Guide to Turbine Disk Rim Inspection
- [1024780](#) Steam Turbine Monitoring, Inspection, and Repair

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RECENTLY RELEASED:

- 3002018014, [Steam Turbine Casing and Valve Body Repair Guidelines](#)
- 3002014469, [Metallurgical Guidebook for Steam Turbine Rotors and Discs—Volume 2: Materials Property Database for HP-IP and LP Rotors](#)
- 3002019791, [Program on Technology Innovation: A Review of Steel Castings for High Temperature Turbine Applications: Summary and Insights from the Goodwin Technical Supply History](#)
- [3002003504](#) Crack Growth and Arrest in Steam Turbine Casings
- [3002001473](#) Steam Turbine Casing and Valve Body Repair Guidelines
- [1019779](#) Metallurgical Guidebook for Steam Turbine Rotors and Discs Volume 2: Materials Property Database for HP-IP and LP Rotors
- [1017612](#) Metallurgical Guidebook for Steam Turbine Rotors and Discs Volume 1: Chemistry Manufacturing Service Degradation Life Assessment and Repair
- TR-107021 ([V1](#) & [V2](#)) State-of-the-Art Weld Repair Technology for Rotating Components & Repair of Steam Turbine Blading
- [TR-104846](#) Relaxation and Creep of NiCr Bolting Alloys for Application in Steam Turbines of Coal-Fired Power Plants
- NP-2429 Steam Turbine Disc Cracking Experience

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BEARINGS & LUBRICATION SYSTEMS

- [1021780](#) Manual of Bearing Failures and Repair in Power Plant Rotating Equipment
- [1016272](#) Nuclear Maintenance Applications Center: Turbine Oil Compatibility
- [3002005576](#) Remediation of Lost Demulsibility in Turbine Oil

TOOLS:

- Bearing Action Advisor (<https://bearingaction.epri.com/>)
- [3002016244](#) Steam Turbine and Generator Bearing Vibration Diagnostic Guide

CONDITION MONITORING:

- [3002012916](#) Investigation of Oil Sensor Technology for On-line Monitoring

MAINTENANCE:

- [1025331](#) Turbine-Generator Auxiliary Systems Volume 1: Lubrication System Maintenance Guide
- [3002003593](#) Backup Oil System Maintenance Guide





MAIN STEAM VALVES & ACTUATORS

INSPECTION:

- [3002001717](#) Steam Turbine Valve Actuator Condition Assessment: 2013 Update
- [1015674](#) US Steam Turbine Valve Actuator Condition Assessment

CONDITION MONITORING:

- [3002010527](#) Evaluation of Condition Monitoring Methods for Steam Turbine Valves
- [1004950](#) Turbine Steam Valve Diagnostic Testing

MAINTENANCE:

- [3002013931](#) 2018 Guidelines for Reducing the Time and Cost of Turbine-Generator Maintenance Overhauls and Inspections v4.0
✓ <https://turbgenoutageguide.epri.com/>
- [1022388](#) Chemical Cleaning of a Turbine Main Steam Stop/Throttle Valve

REPAIR:

- [3002018014](#), [Steam Turbine Casing and Valve Body Repair Guidelines](#)
- [3002006311](#) Crack Growth and Arrest in High Temperature Valve Bodies
- [1016786](#) US Steam Turbine Valve Metallurgy Guide
- [1023066](#) International Steam Turbine Valve Metallurgy Guide





CONTROL FLUID SYSTEM

RECENTLY RELEASED:

- 3002021594, [Electrohydraulic Control System Sensor Gap Analysis: Identification of Sensors for Fluid and System Components](#)
- 3002021551, [EHC System Sensor Gap Analysis Workbook](#)

INSPECTION:

- [3002003594](#) Electrohydraulic Control (EHC) Fluid Maintenance Guide

CONDITION MONITORING:

- [1022338](#) Steam Turbine Electrohydraulic Control Fluid Monitoring Project

MAINTENANCE:

- [3002003594](#) Electrohydraulic Control (EHC) Fluid Maintenance Guide
- [1019313](#) Steam Turbine Mechanical Hydraulic Control System – Operation, Inspection, Troubleshooting, and Maintenance Guide
- [3002010521](#) Steam Turbine Hydraulic Control System High Pressure Unit Maintenance Guide
- [1000935](#) EHC Tubing/Fittings and Air Piping Applications and Maintenance Guide
- [1011823](#) Electrohydraulic Control Fluid and Elastomer Compatibility Guide



GLAND STEAM SYSTEM

MAINTENANCE:

- [1013462](#) Turbine-Generator Auxiliary Systems Volume 2: Turbine Seal System Maintenance Guide

TURNING GEAR

MAINTENANCE:

- [1019645](#) Turbine-Generator Auxiliary Systems Volume 6: Turning Gear Maintenance Guide



MONITORING, CONTROL & SUPERVISORY

RECOMMENDED:

- [TR-104885](#) Introduction to Nuclear Plant Steam Turbine Control Systems
- [3002001060](#) Steam Turbine Electronic Overspeed Protection System
- [3002016325](#) Process Control Strategies for Low Load Operation: Implementation
- [3002016326](#) Increasing Automation for Fossil Energy Plants: Options, Approaches, and Practices
- [3002008433](#) Advanced Control Series: Concepts, Design, and Tuning Controls, Research in Flexible Operation
- [3002013664](#) Fundamentals of a Digital and Analytics Platform for Data Integration, Analysis, and Actionable Information
- [3002013663](#) Maturity Levels for Key Application Areas Within EPRI's Intelligent Plant Concept

MAINTENANCE:

- [1017486](#) Turbine-Generator Auxiliary Systems Volume 5: Main and Feedpump Turbine Trip Systems

OPERATION:

- [3002001060](#) Steam Turbine Electronic Overspeed Protection System
- [3002016316](#) Steam Temperature Control for Combined-Cycle Units: Survey and Testing of Advanced Strategies

CONDITION MONITORING:

- [3002001060](#) Steam Turbine Electronic Overspeed Protection System
- [3002014436](#) Continuous Online Monitoring Guidebook
- [1014143](#) Steam Turbine On-line Blade Condition Assessment
- [1024665](#) Field Demonstration of Low Pressure Turbine Blade Vibration Monitoring
- [3002003495](#) Strain-Based Turbine Generator Torsional Vibration Monitoring System Phase 2: Prototype Development



High Energy & Small Bore Piping

SEE PROGRAM 215 FOR ADDITIONAL RESOURCES:

Program 215: Power Plant Piping

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Overview

Power plants typically have many piping systems; if not properly maintained, these systems may pose a risk to reliability, availability, and in severe cases, personnel. The Power Plant Piping program relies on EPRI's Integrated Life Management (ILM) strategy to enhance safety, reduce risk, and maintain availability for power plant piping systems and components. EPRI's ILM strategy utilizes the institute's decades of research towards the development of a well-engineered, rigorous approach to life management. EPRI's ILM strategy can be summarized into the seven parts listed below:

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MAINTENANCE:

- [CS-3239](#) Recommended Guidelines for the Operation and Maintenance of Feedwater Heaters



PRE-WARMING, COOLING & HUMIDITY CONTROL SYSTEMS

RECENTLY RELEASED:

- 3002021820, [Low-Pressure Turbine Exhaust Hood Spray: Maintenance Guide](#)

RECOMMENDED:

- [3002006630](#) Fossil Power Plant Layup Resource Guide
- [3002003972](#) Layup for Cycling Units: Requirements, Issues, and Concerns
- [3002008147](#) Alternative Dry Storage Techniques

OPERATION:

- [1014195](#) Shutdown Protection of Steam Turbines Using Dehumidified Air



STEAM CHEMISTRY

RECENTLY RELEASED:

- 3002021820, [Low-Pressure Turbine Exhaust Hood Spray: Maintenance Guide](#)

RECOMMENDED:

- [1017612](#) Metallurgical Guidebook for Steam Turbine Rotors and Discs, Volume 1: Chemistry, Manufacturing, Service Degradation, Life Assessment, and Repair
- [3002001381](#) Comprehensive Cycle Chemistry Guidelines for Combined Cycle
- [1015677](#) Effect of Organics and Amines on Steam Turbine Performance
- [1020671](#) Low Pressure Steam Turbine Corrosion Mechanisms and Interactions
- [1003997](#) Steam Turbine Efficiency and Corrosion: Effects of Surface Finish, Deposits, and Moisture
- [1006283](#) Turbine Steam Chemistry and Corrosion: Electrochemistry in LP Turbines
- [1000557](#) Corrosion of Low Pressure Steam Turbine Components

INSPECTION:

- [1023064](#) Guidelines for Turbine Deposit Collection and Analysis

MAINTENANCE:

- [3002000996](#) Chemical Cleaning Guidelines for Fossil Fuel Power Plants
- [1003994](#) Guidelines for Chemical Cleaning of Conventional Fossil Plant Equipment

OPERATION:

- [3002003490](#) Control of Corrosion in the Steam Turbine Phase Transition Zone
- [1014195](#) Shutdown Protection of Steam Turbines Using Dehumidified Air
- [3002006105](#) Operator Guide: Cycle Chemistry

MATERIALS:

- [1017612](#) Metallurgical Guidebook for Steam Turbine Rotors and Discs, Volume 1: Chemistry, Manufacturing, Service Degradation, Life Assessment, and Repair



BOILER/REACTOR FEED PUMP TURBINE

RECOMMENDED:

- [1016782](#) Boiler/Reactor Feedpump Turbine End of Life
- [TR-100980](#) Rotor Dynamic Modeling and Testing of Boiler Feedpumps
- [GS-7405](#) Rotor Dynamic and Thermal Deformation Tests of High-Speed Boiler Feedpumps
- [CS-1512](#) Recommended Design Guidelines for Feedwater Pumps in Large Power Generating Units
- [FP-1274](#) Development of Advanced Rotor/Bearing Systems for Feed Water Pumps

OPERATION:

- [TR-104292](#) Boiler Feedpump Operation and Maintenance Guidelines: Volumes 1 and 2
- [TR-102102](#) Feedpump Operation and Design Guidelines

MAINTENANCE:

- [TR-104292](#) Boiler Feedpump Operation and Maintenance Guidelines: Volumes 1 and 2
- [1025237](#) Nuclear Maintenance Applications Center: Feed Pump Turbine Maintenance Guide
- [1013462](#) Turbine-Generator Auxiliary Systems Volume 2: Main and Feedpump Turbine Trip Systems
- [1003094](#) Feedwater Pump Turbine Controls and Oil System Maintenance Guide

REPAIR:

- [1026667](#) Feedpump Turbine Blade Life Assessment: Component Fatigue Testing



FOUNDATION

RECOMMENDED:

- [1024579](#) Guidelines for the Uprate Design of Turbine-Generator Rotor Support Systems
- [CS-2111](#) Dynamics of Low-Tuned Turbine Generator Foundation Systems



Steam Turbine System

Information Resources

Interactive Learning Resources:

- ❑ 3002022809, [Operator Technical Tutorial: Steam Turbine–Main Design Types, Applications, and Main Components Description](#)
- ❑ 3002022810, [Operator Technical Tutorial: Steam Turbine - Steam Path Damage Mechanisms](#)

RECENTLY RELEASED:

- ❑ 3002018670, [Last Stage Blade Erosion Investigation](#)
- ❑ 3002019310, [Turbine Supervisory Instrumentation Systems: Principles, Design, and Operation](#)

Recommended Reading for New Engineers:

- ❑ 3002019316, [Water Induction in Steam Turbines for Power Generation: Understanding and Preventing Water Damage](#)
- ❑ 3002019312, [Journal Bearings in Turbine and Generator Systems: Principles, Design, and Operation](#)
- ❑ 3002019314, [Stress Corrosion Cracking in Steam Systems: Characteristics, Susceptibility, and Prevention](#)
- ❑ 3002019320, [Nondestructive Evaluation Methods: Application to Power Plant Steam Turbine Systems](#)
- ❑ TR-108943 Turbine Steam Path Damage: Theory and Practice ([V1](#) & [V2](#))
- ❑ [1024749](#), Locations and Mechanisms of Turbine Steam Path Damage
- ❑ [1024750](#), Terminology Alternatives for Steam Turbine Components
- ❑ [1026557](#), Reference Poster: Turbine Bearing Damage Mechanisms
- ❑ [3002001060](#), Steam Turbine Electronic Overspeed Protection System





Steam Turbine System

Program Tools

- ❑ *Asset Integrity Management Benchmarking*(3002010529)
- ❑ *Turbine Generator Risk Management Resource* (<https://tgrisk.epri.com/>)
- ❑ *Bearing Action Advisor* (<https://bearingaction.epri.com/>)

- ❑ 3002020670, [Equipment Reference Interface \(ERI\) v1.0](#)
- ❑ 3002014759, [Steam Turbine Blade Corrosion-Fatigue Calculator v1.0](#)
- ❑ 3002018083, [2020 Lubrication Wiki](#)



Steam Turbine System

Program Contacts



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PROGRAM 219

Fossil & Nuclear Steam
Turbines and Auxiliary
Systems Research



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Customer Assistance

Phone Options

800-313-3774 or 650-855-2121

2 - Product Orders

4 - Customer Assistance Center

Email Options

Product Orders: orders@epri.com

Event Registration: events@epri.com

Privacy Inquiries: askepri@epri.com

Training Inquiries: epriu@epri.com

All Other: askepri@epri.com

Customer Assistance Specialists are available Monday -
Friday 8:00 AM - 6:00 PM Eastern Std. (GMT-5)