MPR’s pump engineering services can be seen across the energy landscape, including nuclear, fossil, and renewable power generation applications. Our industry recognized experts are involved throughout the project, from initial pump design and manufacturing to field installation and during service to resolve operational and maintenance issues. From pump selection, manufacture, quality assurance, testing, installation and acceptance, MPR applies a strategic perspective to move the project forward.

We work as an integrated member of the Owner’s team, delivering resources that are flexible to the specific needs of each issue. Understanding the commercial challenges of our clients - MPR provides the commercial justification to support implementation of our technical recommendations. MPR’s experience and technical expertise in pump services is met by a range of disciplines and capabilities:

### Specification and Design Review
- Development of system and pump construction, operating and performance requirements
- Preparation of pump technical specifications for purchase or refurbishment
- Commercial and technical evaluation of vendor proposals, including conforming bid specification to purchase specification
- Review of First-of-a-Kind designs and design features against common failure modes

### Rotordynamics
- Lateral and torsional rotordynamic modeling and analysis using proprietary and commercial software packages
- Pump bearing load calculations
- Troubleshooting, root cause analysis and recommendations to address existing rotordynamic problems

### Bearing Analysis
- Bearing selection, design review, evaluation of load carrying capability, thermal performance and stability
- Troubleshooting and root cause analysis of bearing damage, overheating and high vibrations
Stress Analysis
- Component evaluation including impellers, diffusers, shafts, coupling, keys, casings and interconnecting piping

Maintenance and Testing Support
- Developing test plans and procedures, overseeing testing, and evaluating test results for consequences on in-plant operation
- Review and development of maintenance procedures
- Application of predictive and performance based maintenance programs

Seal Evaluation and Analysis
- Troubleshooting, data analysis, and failure modes evaluations
- Seal design reviews and installation package review
- Thermal-hydraulic analysis of seal leakoff flow rates and temperatures
- Extensive experience with nuclear reactor coolant pump seals

Owner’s Engineering
- Providing multi-disciplinary technical design reviews, manufacturing and shop test oversight, installation and testing oversight on behalf of the Utility or Supplier

Materials Expertise
- Material evaluation and selection
- Crack propagation analysis and acceptability for continued operation
- Forensic investigation of failed components, fatigue analysis

Foundation Evaluation
- Analysis of pump foundation designs for structural strength and natural frequencies
- Condition assessment for continued operation and repair option evaluation

Thermal / Hydraulic Analysis
- Parallel / Series pump operation dynamics
- Startup and shutdown operating dynamics
- Waterhammer, voiding, air binding and NPSH analyses
- Minimum load operation analyses

Pump Driver Analysis
- Electrical / Mechanical transient analysis modeling (determine transient speed, torque, and motor operation characteristics)
- Motor/ turbine/ gearbox troubleshooting and failure nodes evaluations
- Turbine driver controls, design review, and evaluation