

# Generation Fleet Optimization Solutions

Balance Your Power Production Scorecard



*Utility executives consistently report that the most significant issues hindering improved profitability in the power generation industry are:*

- ▶ *Increasing environmental concerns*
- ▶ *Diminishing reliability and availability*
- ▶ *Limited asset efficiency and capability*
- ▶ *Aging workforce*

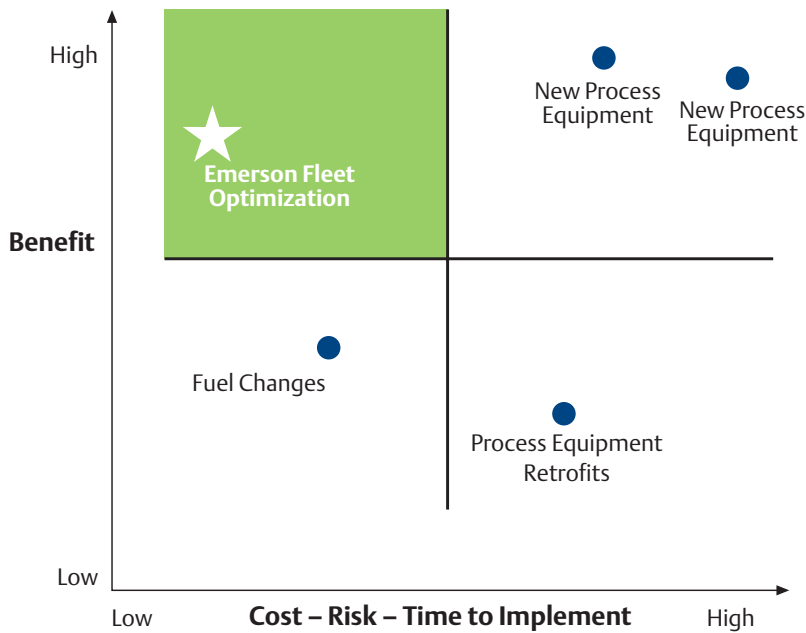
## **Q** What can you do today to address these critical challenges?

**A** You can implement a low-risk, low-cost generation fleet optimization solution from Emerson that will provide an immediate high-return on your investment. Emerson can proactively facilitate a strategy that decreases environmental concerns, improves reliability and availability, and increases asset efficiency and capability with minimal impact on your staff.

Emerson combines innovative technology with industry expertise and comprehensive service to form a solution that drives optimal performance through:

- Proven optimization techniques deployed at both the unit and fleet levels
- Secure enterprise integration that seamlessly incorporates our solution with your existing systems for transferring critical operating and business data
- Easy-to-use real-time visualization tools to monitor and report key generation performance indicators for improved decision making
- Comprehensive training and service programs that promote sustainable benefits through the support of long-term use by operating personnel
- Sequenced implementation throughout the fleet that provides significant economic return during the initial phases to produce positive cash flow

## Emerson's Generation Fleet Optimization Solution— Minimal Capital Investment for Maximum Benefit



Emerson's optimization strategies can be implemented within a short time frame when compared to other available options for addressing today's critical challenges. After installation, your fleet solution will provide immediate operational and financial returns that can offset alternative capital expenditures.

## Examples of Estimated Yearly Economic Benefits for North American Utilities

Utility	Generating Units	Annual Savings (shown in millions USD)
Utility 1	4 load-following units 1 cycling unit 6 peaking units	\$4.1M
Utility 2	6 base-loaded units 6 load-following units 1 cycling unit 1 peaking unit	\$15.1M
Utility 3	51 base-loaded units 8 load-following units	\$43.4M
Utility 4	7 base-loaded units 3 load-following units	\$8.6M
IPP 5	6 base-loaded units 16 load-following units 2 cycling units 9 peaking units	\$15.6M

Emerson's fleet optimization solution can work with any combination of generating assets to produce significant annual savings that contribute to your bottom line.

## **Q** What are the economic benefits of Emerson's optimization solution?

**A** Emerson's generation fleet optimization solution can deliver financial benefits through:

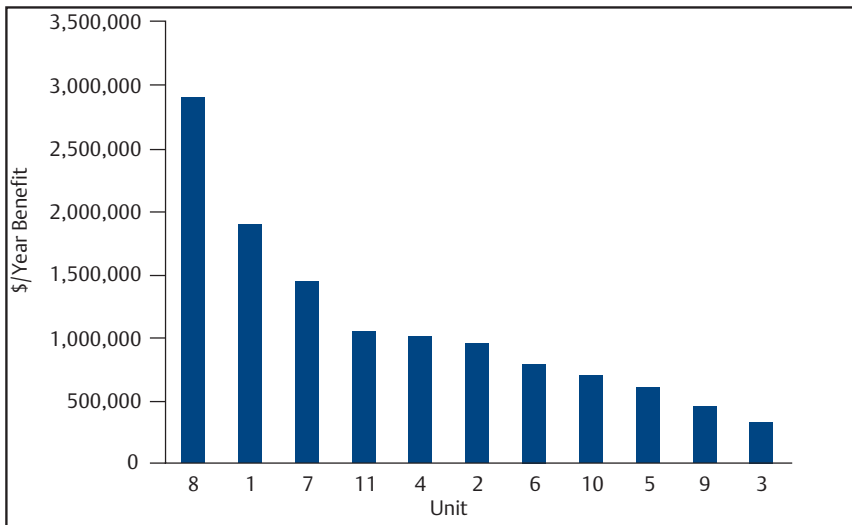
- Increased ancillary services capabilities
- Enhanced ability to economically dispatch the generating fleet
- Decreased NOx credit requirements
- Decreased fuel usage
- Reduced risk of environmental non-compliance
- Reduced EFOR
- Lowered sorbent usage

Emerson begins with a detailed analysis of your current operations. Our team examines various operational characteristics of each generating unit to determine an optimization strategy that will improve operations and increase commercial performance. The resulting benefits are then plotted across your fleet to map a recommended deployment sequence.

Emerson's generation fleet strategy uses a rigorous mathematical construct that determines how to best extract financial gains from your existing assets, while producing a positive cash flow through phased-implementation.

Your solution is self-financed by installing optimization technology on the unit that has the largest potential for savings and following with subsequent installations on units with lower economic gains.

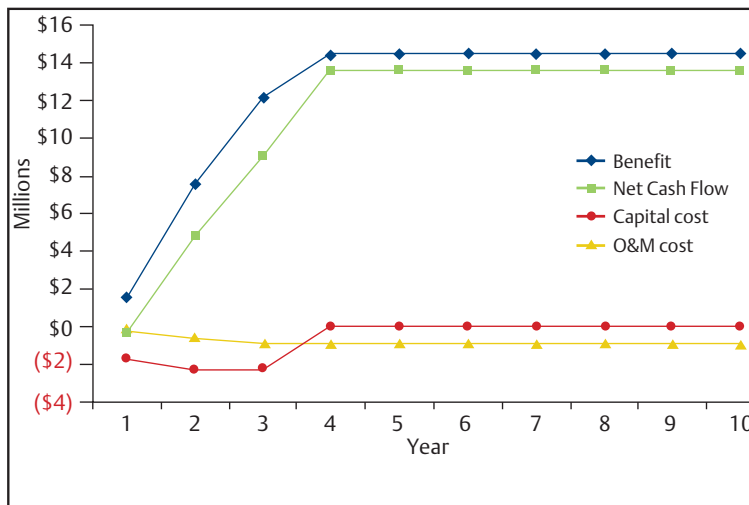
## Sequenced Deployment of Emerson's Generation Fleet Optimization



By following the recommended sequenced deployment of Emerson's fleet optimization strategy, the economic benefits derived from your initial capital investment generates the positive cash flow needed to fund implementation of the optimization solution on other units.

The net present value for the fleet optimization solution shown in the charts to the left is \$75.5 million for 10-years at a 6% discount rate.

## Balanced Costs and Benefits for a Positive Cash Flow



This value is based upon installing the optimization solutions on three units in the first year and on four units in each subsequent year. Total installation time is 36 months.

## Q How are the economic benefits achieved?

**A** Emerson's fleet optimization solution is uniquely tailored to each asset's operational characteristics in order to dynamically realize and improve key performance indicators. Our experienced personnel analyze unit operations, your corporate performance objectives, and state or federal regulatory mandates. The resulting information is used to recommend and prioritize an optimization strategy for improved operation.

Various engineered technologies are applied to optimize unit parameters critical to achieving lower emissions, higher reliability, improved efficiency, and increased availability. The technologies are combined into a single optimization solution that expands the focus from individual plant targets to managing process inter-relationships across your entire fleet. The outcome is optimal profitability given business objectives and operational constraints.

### Emerson Provides Innovative Solutions that Align with Specific Operating Objectives and Targets

Typical Unit Operation	Key Performance Objectives	Key Process Targets
<b>Fleet</b>	Fleet profitability	Performance monitoring Fleet economics Fleet emissions compliance
<b>Base-loaded</b>	Heat rate Availability Maximum load Environmental compliance	Fuel/Combustion Steam temperature Sootblower
<b>Load-following/Dispatched</b>	Minimum load Forced outage rate Ramp rate Environmental compliance	Fuel/Combustion Sootblower Steam temperature Unit response
<b>Cycling</b>	Startup time and cost Reliability Life-cycle cost Ramp rate Environmental compliance	Fuel/Combustion Sootblower Steam temperature Unit response
<b>Peaking</b>	Dispatch to maximize fleet margin Reduce maintenance	Utilization

## Q How does Emerson mitigate your risk of implementing and maintaining a fleet optimization solution?

**A** Each Emerson fleet optimization solution follows a disciplined process that incorporates proven techniques.

Our experienced power generation optimization team follows a systematic approach to create each strategy which includes:

- Collaborating with your process and operational personnel
- Developing a solution that incorporates platform and process standards for long-term sustainability
- Installing the solution using seamless integration with your existing IT infrastructure
- Providing the necessary tools, training, and service for managing continuous operation and sustaining benefits

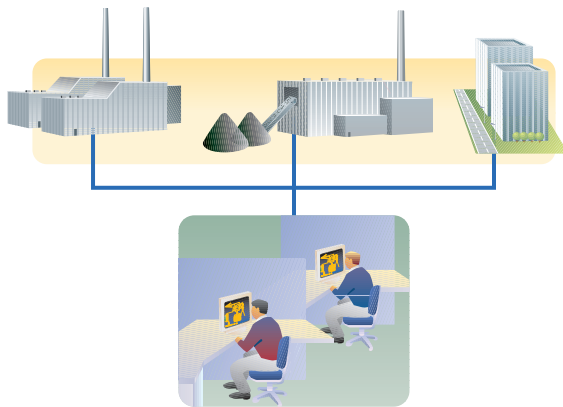
Emerson's implementation approach to each solution generates maximum return with the least amount of risk and impact on your staff.

### Architect



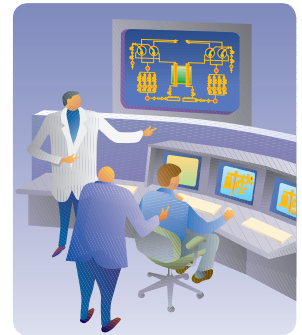
Develop an optimization solution that analyzes each asset's operating characteristics and determines the best approach for optimal financial gain.

### Implement



Implement the optimization solution for rapid, sequential deployment across your fleet to produce positive cash flow.

### Manage

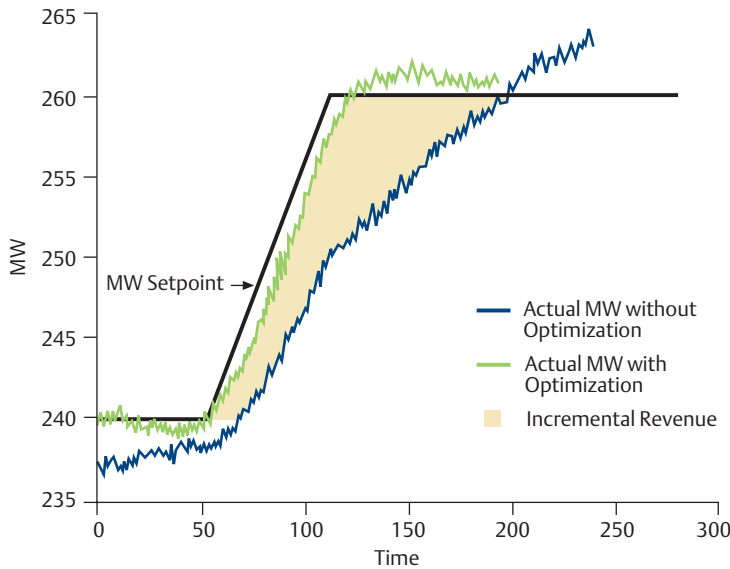


Manage your fleet optimization solution through upgrades, services, training, and performance monitoring for long-term sustainability of benefits.

# Q Why should you choose to implement an Emerson generation fleet optimization solution?

**A** Emerson’s high-value and low-risk solutions have been field-proven to provide sustainable results that address specific needs with minimal impact on plant personnel.

## Conventional Ramp Test



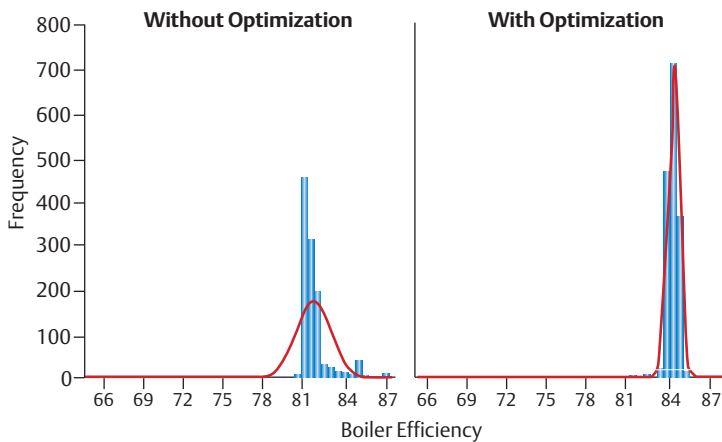
### Expanded Revenue Opportunity

“Emerson’s unit response optimization technology for Young Unit 1 enables quick ramping to setpoint, reduces pressure and megawatt variability, and significantly improves unit response. All of these critical results enhance our capability to operate more profitably.”

#### Dana Stumpf

Milton R. Young Station  
Minnkota Power Cooperative

## Histogram (with Normal Curve) of Boiler Efficiency



### Increased Unit Efficiency

“The results of our sootblowing project were outstanding. Before installation, cleaning the reheater while maintaining temperature was a challenge. Now, the optimizer automatically performs the cleaning while preserving the reheat temperature. Our operators can fully concentrate on improving other operational aspects of the Hugo plant instead of worrying about sootblowing.”

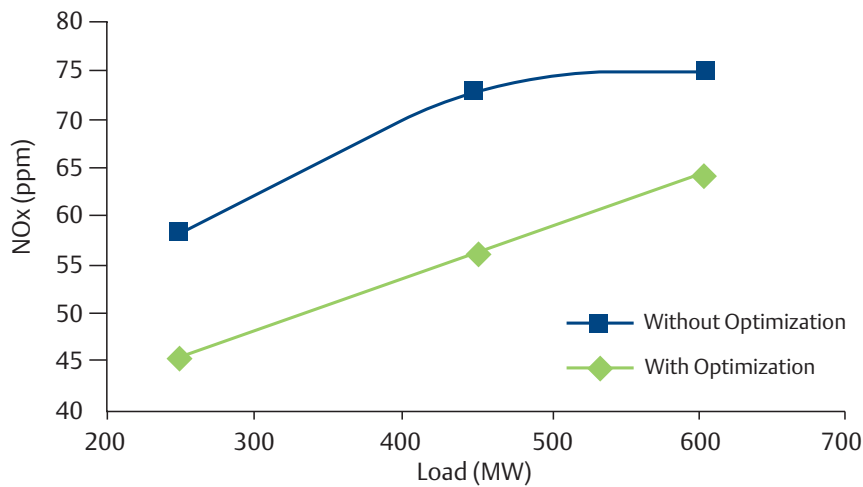
#### Torry R. Wise

Western Farmers Electric  
Cooperative

	Without Optimization	With Optimization	Improvement
Mean	81.66	83.95	2.29
Standard Deviation	1.274	0.4463	.8277
Number of Samples	1,119	1,067	-----



## Reduced NOx Emissions Over Load Range

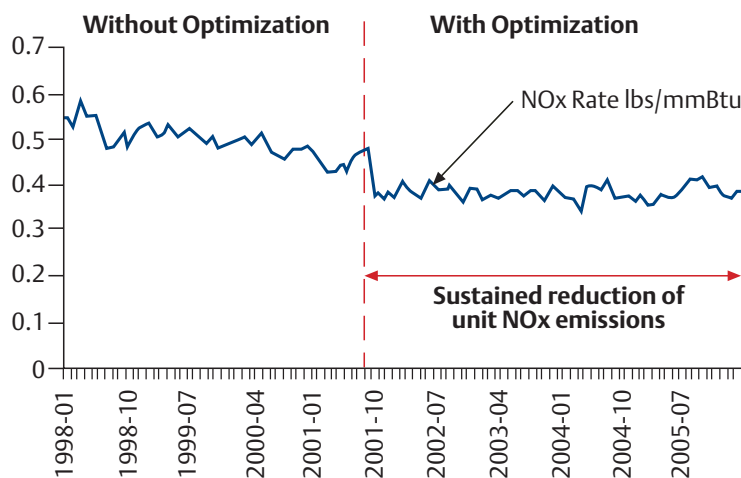


### Decreased Emissions

*“Our investment in combustion optimization has provided us continuous savings since it was first installed in 2000. We have seen a 99.9% availability of Smart-Process which has contributed to a sustained 10% NOx reduction.”*

**Tom Ventiniglia**  
We Energies

## Sustained NOx Emissions Reductions



Emerson’s approach combines optimization technology, proven implementation methods, and long-term support into a single solution that promotes realization of sustained benefits.

# Why Emerson?

## **Unparalleled Industry Expertise**

For over a century, Emerson has energized the power industry with new and revolutionary ideas. We understand the complexity of power generation operations, unique plant application requirements, and stringent industry performance criteria better than anyone else in the business. This knowledge is embedded in every Emerson generation fleet optimization solution.

## **World-class Technology**

Using advanced technology, Emerson has been helping customers to control and optimize critical power generation processes for decades. Our superior technologies coupled with a broad array of services provides a comprehensive solution that can help to overcome environmental, availability, reliability, and aging workforce challenges.

## **Collaborative Approach**

Emerson's power implementation team is not complete without the expertise and skill provided by your staff. We encourage your personnel to be involved throughout the optimization solution process to provide effective results.

## **Long-term Support**

Emerson has a long history of providing our customers with the highest level of service. Our commitment to long-term support for your fleet optimization solution will help you achieve business objectives and reduce or contain operating and service costs.

## **Strength and Stability**

When executing critical projects, you need to know that the partners you select are strong and stable, and will continue to be a solid corporate presence far into the future. Emerson has a long history of designing, implementing, and supporting automation and optimization technologies. We have an unparalleled portfolio of growth and success, even in years characterized by a lean market place. Our clear technology leadership and fiscally stable operations make Emerson the logical choice to optimize the performance of your generation fleet.



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