



ABB Ability™ Performance Optimization for power generation

Maintain peak performance
in any market



As the world's leading provider of integrated power and automation solutions to the energy and water industries, ABB helps customers adapt to new market conditions by increasing thermal efficiency, operational flexibility, reducing emissions and expanding capabilities to compete in ancillary service markets.

ABB Ability™ Performance Optimization combines closed-loop optimization with world-class digital technologies that allow power generators to maintain peak performance under any market conditions.

The result reduces fuel costs and emissions, increases revenues with better plant load flexibility and improved ramp rates... at scale.

The benefits of ABB's solutions reach beyond the plant, encompassing fleet and enterprise operations so you can be proactive even in fast changing markets.

Thriving in a time of complexity and change

Today's power producers operate in uncertain times as traditional operating models are disrupted.

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01 By 2020, non-utility players providing ancillary services to the grid, supplying generation flexibility and standby capacity are forecast to seize 20% of the retail energy market.

The result is an increasingly complex operating environment and fragmented marketplace. Deregulation, power trading, decentralized power markets, increased competition from renewables, price volatility, fast-ramping requirements, a loss of institutional knowledge and the constant threat of cyberattack are among the most critical challenges facing the industry.

Yet every challenge is an opportunity.

So, how can you capitalize on these disruptions? How can you mitigate risk, minimize costs, and optimize plant and fleet performance while maintaining profits?

The answer is digital technology. From integrated control systems drawing data from an ever-increasing array of IoT sensors to remote collaborative management of operations from anywhere on the globe, digital is how companies increase profits, reduce costs and improve efficiency.



Introducing ABB Ability™ Performance Optimization for power generation

The days of steam power plants operating continuously at base load are coming to an end.

— 02 The demand for thermal power is barely increasing in most of the western hemisphere. Even Asian countries forecast a flattening demand curve.

In mature markets, many plants now operate as back-up to wind and solar plants causing them to operate inefficiently and below capacity – frequently ramping up and shutting down as peak power demand fluctuates. This makes efficient fast-ramping a bottom-line imperative.

In fast developing markets, optimizing plant and fleet performance to eliminate unplanned downtime, meet regulatory burdens and increase power output offer significant improvements in profitability potential.

In markets where producers participate in intra-day and day-ahead energy trading, providing accurate power generation schedules and ancillary services to energy traders is key to profitability.

To meet these challenges head on, the industry is turning to digitalization.

That is why ABB introduced ABB Ability™ Performance Optimization for power generation – a suite of optimization services that enable power generators to maintain peak performance under any market conditions.



ABB Ability™ Performance Optimization for power generation

The ABB Ability™ Performance Optimization suite of optimization services allows steam power plants to measurably reduce fuel costs and emissions, while increasing revenues through expanded operational flexibility and reduced maintenance budget risk. It consists of two solutions:

• **Increase fuel efficiency and reduce emissions**

The Combustion and Soot Blowing optimization solution ensures operator consistency in counteracting recoverable degradation and minimizing the variability that increases maintenance risks and unplanned downtime.

• **Increase flexibility**

Through Steam Temperature optimization, spinning reserves provide plants the opportunity to sell power into competitive ancillary service markets, expanding revenues from the wholesale market.

Solution	Enabling Technology	Features	Benefits
Thermal efficiency improvement and emissions reduction for steam power generation	Combustion optimization and Soot Blowing optimization	<ul style="list-style-type: none"> Leverages closed-loop optimization to: Expand operational envelope due through use of dynamic models that reflect real and forecasted conditions of plants Advisory on optimal time and sequencing of soot blowing 	<ul style="list-style-type: none"> Typical unit efficiency improved by 0.5% Typical emissions reductions (for a 600MW coal-fired boiler): <ul style="list-style-type: none"> - CO2 - 25,000 tons/year - NOX - 5% – 15% Reduces risk of thermal stresses by ensuring operation within dynamic design limits Reduces risk of forced outage due to plugged flue gas passages and tube erosion Ensure repeatable and optimal operator performance
Increase ramp rate bands	Steam temperature optimization	<ul style="list-style-type: none"> Expanded ramp rates through increased operational temperatures Predictive control to reduce excessive spray valve movement and large temperature excursions 	<ul style="list-style-type: none"> Increased ramp rate and tighter setpoint following. Typical Ramp rate increases of 5MW/min Power generation overshoot or undershoot reductions of 2MW Reduced fatigue of thick-walled components in boilers and turbines

Reference studies

For every type of utility in any market, ABB Ability Performance Optimization for Power Generation offers substantial economic benefits and competitive advantages:

For non-profit, publicly owned utilities that sell into regulated markets, Performance Optimization allows them to lower rates, decrease costs, increase usable output and improve reliability.

For investor owned utilities, that also sell into regulated markets but are for-profit, Performance Optimization decreases total cost of operations

and management, improves reliability, net working capital, asset value and plant performance.

For independent power producers that service unregulated power generation markets, selling to utilities, retail customers or wholesale or industrial bids and are penalized for non-performance, Performance Optimization decreases startup costs and lowers downtime risks, increases plant performance, usable output and reliability, and provides increased operational flexibility to sell into the ancillary services market.

Publicly Owned Utilities

Customer Challenge

A fleet owner of 10 steam units faces:

- Increasing emissions requirements and associated abatement costs
- Increased competition from combined cycle units and less opportunities to run at full capacity
- Inconsistent operations due to expert operator retirements

ABB Solution

- Closed-loop control upgrades provide consistent operations that improve thermal efficiency and reduce emissions
- Reduces forced outage risk due to plugged flue gas passages and tube erosion
- Optimized combustion and soot blowing operations reduce operational variance due to operator inexperience

Customer Benefit

- Increased boiler efficiency
- Reduced sootblowing costs
- Reduced maintenance cost
- Reduced emissions.
- Lower rates for end customers
- Reduced emissions and environmental impact
- Minimize operator variability and associated risks of accelerating maintenance costs and intervals

For this fleet of 10 plants, average fuel savings are ~\$7M/year, CO₂ emissions are reduced by a total of 250,000 tons/year and NO_x emissions are reduced by 10%.

Investor Owned Utilities

Customer Challenge

- Renewables providing more MW/hour in its market area
- Limited opportunities in the ancillary services market

ABB Solution

- Steam Temperature Optimization regulates live-steam and re-heat steam temperatures with higher precision, through model-based control, expanding the ramp rate capabilities
- This allows the plant to be run closer to the design limits (at higher steam temperature) and to respond faster to changing load requirements as a result of renewable penetration.

Customer Benefit

- Enhanced ability to follow load demand
- Improved thermal efficiency
- Maximize ancillary services revenues through improved ramp rates to targeted setpoints
- Minimize operator variability and associated risks of accelerating maintenance costs and intervals.

By leveraging closed loop control and advanced optimization, spinning reserves are increased to provide generators the opportunity to sell into competitive ancillary service markets, expanding revenues from the wholesale market up to \$500,000 per year per plant.



Why ABB Ability™ Performance Optimization for power generation?

As the leading global provider of DCS to the power industry — 300 different sites representing 72 GW — we understand your needs and your markets.

With over 40 years of experience developing digital solutions for power customers, ABB understands that markets are changing just as the lines between IT, OT and operations are blurring.

This is a transformational time in which it is critical to move beyond customer-supplier relationships and into trusted-partner relationships. Going through this journey together, ABB invests heavily upfront -- defining the challenges, the success criteria and the business case to support your digital investments.

Together, we determine the ABB Ability™ Performance Optimization capabilities that meet your needs Starting with an Assessment.



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To get started or learn more, please contact your local
ABB sales representative or visit:

abb.com/powergeneration

Let's write the future. Together.

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