

Your world isn't steady-state, it's dynamic. Market and operating conditions in today's thermal power plants are constantly changing with a staggering number of variables to juggle. Why settle for a steady-state optimization system that simply can't deal with these minute-to-minute changes? Close the loop with the CLOC system from GE Energy, an advanced supervisory control solution that delivers the full benefits of dynamic, closed-loop optimization – continuously and automatically adapting to changing conditions and operating constraints to maximize plant profitability.

### The Opportunity

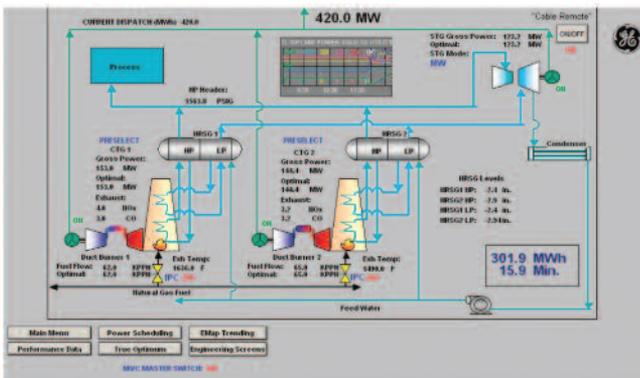
Basic regulatory control systems are designed to keep a plant at established control setpoints; however, they are not able to determine the optimal setpoints necessary for maximum advantage in today's highly competitive power generation environment. The more dynamic and complex the plant's operation, the more difficult this optimization becomes – involving many simultaneous operating and regulatory constraints along with real-time fluctuations in prices, costs, and equipment degradation. But within this complexity are significant profit-enhancing opportunities, waiting to be unlocked by a system that can take your basic control to a higher level of performance.

While the competitive advantages that can be realized with optimal setpoints are considerable, the secret of true plant optimization goes further. Simply delivering optimal setpoints to your operators for manual implementation is impractical – they would need to make multiple setpoint changes every three to five minutes, while simultaneously ensuring that power and steam generation meet contractual and regulatory requirements, irrespective of host load and steam demands. To gain the full benefit of optimization, it is necessary to “close the loop.”

### Potential Benefits

- Saves fuel costs – typical annual fuel reductions exceed 0.5% and payback is typically less than one year
- Enhances stability and safety by significantly reducing process variations
- Ensures generating schedules are met and minimized
- Maintains control of power bought or sold at the tie-line and provides real-time generating costs and capability to power marketing
- Schedules power contracts and allows for tie-line control of instantaneous interval target sales and purchases; automatically transfers dispatched generating targets to the control system
- Reduces operator workload – the system can automatically perform hundreds of setpoint changes per hour, far exceeding an operator's capability to maximize profitability while meeting all operational and regulatory requirements
- Prevents unwanted surprises – predicts effects of measured disturbances to the plant and takes corrective action before the plant is affected
- Empowers personnel with useful process and economic knowledge





## The Solution

GE's CLOC system is the answer. It functions as a supervisory controller that automatically determines optimal setpoints and passes these to the plant's underlying regulatory control system. The CLOC system is not only smart, it also maintains full functionality of your plant's safety system.

At the heart of the CLOC system are GE's EfficiencyMap\* and MVC\* software modules. GateCycle\* is the modeling and performance calculation engine embedded within the EfficiencyMap software. GateCycle now has a direct connection to GE Energy's proprietary Application for Packaged Power Solutions (APPS)\*\* software resulting in extremely accurate modeling and performance calculations for GE aeroderivative gas turbines. These products work in tandem — with EfficiencyMap algorithms determining optimal setpoints, and the MVC multivariable control software taking these setpoints and passing them to the plant's underlying regulatory control system. This moves the plant in real time to its optimal operating point while ensuring that operational demands and regulatory constraints (such as NO<sub>x</sub> limits) are dynamically and continuously controlled.

## Applications

- Combined cycle power plants
- Industrial power plants
- Cogeneration plants
- District heating plants
- and many others

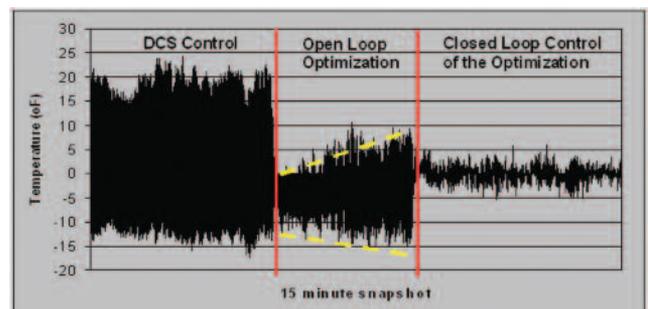
## Supporting Services

A Supporting Services Agreement (SSA) is an integral part of any CLOC installation. Once commissioned, your CLOC system provides optimum performance, but to keep it that way, our service engineers will access the system on a regular basis, remotely or via on-site visits, to check system health and usability, and to produce reports covering:

- Plant performance
- Equipment performance
- Performance impact on plant operating cost
- Optimization potential and gains

The SSA also includes system customization, ensuring that the models in your CLOC system will be updated as required to reflect changes you may make to plant controls, equipment, and sensors.

Finally, we provide training for your people, ensuring they understand how to use the CLOC system and derive maximum benefit from it.



Contact your GE Energy representative today for complete product specifications and ordering information at 775-782-3611; at the prompt ask for CLOC.

\* CLOC, EfficiencyMap, MVC, and GateCycle are trademarks or registered trademarks of General Electric Company.  
\*\* APPS is proprietary to General Electric Company and its distribution is for approved customers only.

