

# Castle Peak Power Station

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Joe Chow,  
Plant Manager,  
Castle Peak

## Castle Peak Power Station achieves optimal performance with help from Invensys Operations Management

by Invensys Operations Management

### Goals

- Ensure the availability of spares;
- Empower operators to make additional improvements in plant operation and monitoring;
- Reduce maintenance costs;
- Increase unit thermal efficiency, and lower energy costs during unit startup.

### Challenges

- Update the plants aging boiler control system to a modern distributed control system (DCS) without affecting the plants continued success and maintain continuous performance while reducing costs.

### Solutions and Products

- Foxboro Distributed Control System - I/A Series;
- Wonderware InTouch HMI.

### Results

- Supply continuous power to the more than two million customers in Hong Kong;
- Infrastructure created a system that enables continuous performance improvement;
- New DCS reduced overall maintenance and improved boiler control.

**Hong Kong, China** – Supplying power to more than two million customers, Castle Peak Power Station is Hong Kong's largest, and one of the largest coal-fired stations in the world.

Owned by CAPCO, a joint venture of CLP Power and Exxon Mobil Energy Ltd., the station has a total generating capacity of 4,110 MW in two substations: an A station with four 350 MW generating units, and a B station with four 677.5 MW generating units. Main generating equipment for both is from UK-based GEC Turbine Generators Ltd. (now Alstom) and Babcock Power Ltd. (now Mitsui Babcock Energy Ltd.). Site formation began in 1979. The first 350 MW unit was commissioned in 1982; the last 677.5 MW unit in 1989.

### Management Concerns at Castle Peak

Operators of CLP Power's Castle Peak B power station had been continuously improving plant performance for 15 years, but management was concerned that an aging boiler control system would affect continued success. In order to maintain continuous performance while reducing costs, it was time to move to a modern distributed control system (DCS).

Objectives: to ensure availability of spares, empower operators to make additional improvements in plant operation and monitoring, reduce maintenance, increase unit thermal efficiency, and lower energy costs during unit startup.

After comparing leading vendors, CAPCO management concluded that the Foxboro I/A Series Distributed Control System offered the best combination of a superior technology platform, project implementation approach, and proven expertise.

### Implementation and Measurable Improvements

The new system consists of four DCS networks, one for each unit of the plant. The knobs, dials, and switches of the old control system have been replaced by Wonderware InTouch HMI (Human Machine Interface) Software that includes a new supervisor monitoring station and a new unit control panel with a large screen display.

The new Foxboro I/A Series Distributed Control System will support measurable improvements in the boiler control loop parameters that include final superheater temperature and pressure, drums level, furnace pressure and excess oxygen.

Site mobilization began 45 days prior to the start of the planned three-month outage. The schedule provided time to resolve all loop check issues during the outage.

A detailed cutover procedure was prepared, which included an activity plan, manpower requirement schedule, and safety considerations. In just one example of the plant-wide collaboration essential to success, Castle Peak's integrated DCS project team thoroughly reviewed all procedures prior to the plant outage.

### Better Control and Lower Maintenance

With careful planning and collaboration, CAPCO and Invensys completed the first unit control system refurbishment 12 months after award of the contract. Following the fine-tuning of the control system, the system passed a rigorous site availability test, running with no performance threatening failures in hardware or software. All major control loops were running in auto mode within two weeks of unit startup.

This resulted in better plant control and lower maintenance. The turbine generator unit resumed service successfully without interruption after an outage of 90 days. There were zero hardware failures during installation and commissioning, and the project achieved a SHE (safety health environment) record of zero incidents.



Control room.



Foxboro Distributed Control System - I/A Series will ensure both long-term availability of spares and future expansion of the system.

Joe Chow, Plant Manager, said *“The percentage of time the operators had to devote to regulating and manually intervening with the old control system had been relatively large, leaving them less time to focus on enhancing unit performance.”*

*“Now, with the new Foxboro I/A Series Distributed Control System, the operators can spend more time focusing on other issues for enhancing the performance of the unit. Performance on the parameters is much better than before our retrofit. Our control range is well within — or very near — our target, and deviations are much less than with the old system.”*

According to Chow, maintaining these targets will help Castle Peak achieve the longer-term goals of reducing maintenance costs, improving overall plant operation and monitoring, increasing thermal efficiency, and cutting energy costs during startup and shutdown.

CAPCO management feels that the open architecture of the Foxboro I/A Series Distributed Control System will ensure both long-term availability of spares and future expansion of the system. The Invensys modernization contract calls for the installation of Foxboro based systems in all four units to overcome the maintenance and spare parts problems associated with the prior systems. Modernization for the second of the four 677.5 MW units at the Castle Peak B Power Station was completed on schedule.

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*This document was realized thanks to the support of:  
Castle Peak Power Station.*