

Cirata finds powerfully good reasons to use zenon

Dam good control systems at Cirata

The collaboration between COPA-DATA and Malaysian system integrator, PSI INCONTROL, is a high-powered partnership. It is also the partnership behind the control systems for one of the biggest underground hydro-electric stations in the world.



The Cirata hydro-electric power plant in West Java, 100km south-east of the Indonesian capital, Jakarta, is operated by the Indonesian Generation, Utility and Transmission Grid company, PT PEMBANGKITAN JAWA-BALI (PJB). It has a power generation capacity of 1008 MW, making it one of the biggest underground hydro-electric power stations in the world. In 1997, PJB decided it was time to upgrade and modernize the control system at the Cirata complex in order to improve the reliability of supply and facilitate remote control and monitoring.



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Originally conceptualized as a peak-load power development which would improve service reliability in Java, the Cirata site includes a 62km² reservoir. The initial construction took place between 1984 and 1988. The power plant was first commissioned in 1986 with four generating units and, later, extended in 1994 to a total of eight units with a rated output of 126MW each. As a result, the Cirata HEPP forms the backbone of the Java-Bali grid and plays a key role in meeting the huge demand for electricity in the Jakarta area.

Because of Cirata's role in the Java-Bali grid, a robust and absolutely reliable control system is essential. Thanks to its track record of delivering superb technical solutions to this sector, the Malaysian System Integrator, PSI INCONTROL, was selected to deliver the upgraded solution.

THE SCOPE OF MODERNIZATION

The project scope included a replacement of the existing control system for all eight unit controllers, the computer systems in both powerhouses, the dam control room and the central control room, located in the 500kV switchyard. Special functions such as plant black start, line charging, load frequency control, joint control and remote control from the Gandul load dispatch centre also had to be incorporated into the new control system. The project also included the installation of a new 100MB redundant fiber-optic local area backbone network, which provides communication services for the control system, telephone system and camera system.

Based on their experience in the sector, the team at PSI INCONTROL chose to use COPA-DATA's zenon SCADA system to power the replacement control system. Mr. Vijay Cheliah, Tendering Manager - Sales & Marketing at PSI INCONTROL explains why zenon was chosen for the job: "For this application, safety and reliability were paramount. Open connectivity and flexible operation were also vital. Based on our experience, we felt that zenon was the best software to meet these requirements. zenon makes it easy to safely control the generating units and the 20kV powerhouse switch gear and common auxiliaries and equipment in different operational modes." An international project team was created that drew on the experience of staff from the two companies based in Indonesia, Malaysia and Austria.

ROBUST SYSTEMS, RELIABLE ENGINEERING AND RIGOROUS TESTING

The first step in the project was for the control system for the eight 140MW generating units and the 500kV switchyard to be designed, engineered and installed under test conditions. In November 2007, four teams from PJB Indonesia inspected the system at PSI INCONTROL's factory in Kuala Lumpur. Rigorous performance tests designed to simulate the complete system functions were completed and passed to the full satisfaction of the PJB engineers.

Meanwhile, on site, the communication backbone fiber link was installed. The old communication system was based on RS232 serial ports with proprietary protocol.

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**MR. VIJAY CHELLIAH,
TENDERING MANAGER – SALES & MARKETING
AT PSI INCONTROL**

The new system is a fully redundant 100MB/sec Ethernet TCP/IP, using the IEC 60870-5-104 protocol, and stretches over 21km. The network also provides for CCTV over IP and telephone over IP. All four control rooms (powerhouse-1, powerhouse-2, the switchyard and the dam) are fully interlinked (with voice, data, and visualization).

The control systems for the first four generating units were then installed, tested and commissioned within just six weeks. At the same time, the static excitation of the first four units was upgraded from an analogue type automatic voltage regulator (AVR) to a digital type AVR, bringing them in line with the later four generating units.

Mr. Vijay Chelliah was pleased at the speed of progress: “The speed of the roll-out was a fantastic achievement, and in no small way down to the hard work of the entire international team. Of course, the choice to select zenon as our control system software helped with the speed and ease of project development. The zenon Energy Edition includes key pre-configured features specifically created for our industry which save time and effort when designing and configuring such an application.”

“The pre-configured tools, and zenon’s approach of engineering by parameter-setting rather than writing code from scratch, certainly saves time as well as – vitally in this sector – minimizing errors, to ensure reliability, security and safety.”

COMPLIANCE AND SAFETY DOESN’T COMPROMISE SPEED

In fact, the whole project was completed in less than 15 months. This was achieved whilst full operation of the

power plant continued. PJB had insisted on only short outages (only seven days maximum) for each generating unit, during which all the existing equipment was upgraded. This meant that the RTU, PLC, relay logic and mimic were removed. New components such as LAN switches, redundant PLC controllers, touch screens, metering equipment, synchronization, trip-matrix controllers and knock-out relays were installed and wired up to the existing panels.

Mr. Vijay Chelliah adds: “By choosing zenon as our control system software we were given a great deal of freedom in terms of the hardware and communication that we deployed. In addition to its strengths of rapid and reliable configuration, zenon is a very open system.”

OPEN SOFTWARE DELIVERS AN INTEGRATED SOLUTION

zenon supports more than 300 communication protocols, the drivers for which have all been developed and tested in the COPA-DATA labs, including the IEC 61850 and IEC 60870 standards and the DNP3 standard. The IEC 60870-5-104 was used on the Cirata site, as well as to communicate with another site in Gandul, the PJB load dispatch centre. The connection with Gandul is mainly used for Load Frequency Control (LFC) and data exchange, but it also allows for remote or tandem control.

PSI INCONTROL also installed a zenon WEB server and four clients to provide all important plant data to the LAN in PJB’s administrative offices.