

# EMAE CUTS THE NUMBER OF SCREENS CONTROLING THE HENRY BORDEN PLANT BY 90% THANKS TO ELIPSE POWER

Retrofitting and implementing Elipse Software's platform allows EMAE to control its plant via 30 screens instead of the previous 475, thus optimizing the operation

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#### Needs

<u>EMAE - Empresa Metropolitana de Águas e Energia do Estado de São Paulo</u> (Metropolitan Water and Power Company of the State of São Paulo) controls the volume of water from Pinheiros River and Guarapiranga, as well as the Billings dams and the power generation from Henry Borden hydropower plant. Located at Serra do Mar (Sea Mountains) in Cubatão, the Henry Borden HP complex comprises two high drop power plants (720m) called External and Underground, with 14 generating groups activated by Pelton turbines whose installed capacity is 889MW for an outflow of 157m3/s.



Figure 1. Henry Borden hydropower plant



The External plant comprises eight generating groups, with an installed capacity of 469MW. The Underground plant comprises six generating groups installed inside Serra do Mar's rocky massif, whose installed capacity is 420MW. In May 2022, EMAE hired <u>Energia Automação (EA)</u> to retrofit the SCADA system used in the Henry Borden HP complex.

According to Hélio Max Parpinelli, head of EMAE's supervision and measuring department, this update was long overdue since the company's former SCADA was obsolete and didn't support the more current technological requirements of both software and hardware. Another drawback was its excessive number of screens, which could impair the operation and cost the company fines by ONS (Operador Nacional do Sistema, the National System Operator).

"The large number of screens that comprised the previous system made any failure more difficult to spot, which in time delayed the response time. This situation could lead to the company being fined for delayed response time, a situation that might make data unavailable to ONS for a time longer than what was acceptable,", said Parpinelli.



Figure 2. To the right, Elipse Power's GU screen, which gathers crucial information that used to be scattered through several screens in the previous solution (to the left)

To change this scenario, EMAE opted for <u>SCADA EA</u>, a solution developed by Energia Automação with <u>Elipse Power</u>, the platform by <u>Elipse Software</u> that is ideal for optimizing the supervision and operation of processes in the energy sector. Through Elipse Power's features and resources, EMAE now operates with a modern, more reliable, intuitive technology, which can be controlled via only 30 screens, as opposed to the 475 screens in their old system.



## Solution

All screens and objects in the solution were designed following the principles of High Visual Performance, in accordance with the guidelines of ISA-101 standard, in order to maximize operational efficiency and decrease human error, featuring critical information in a clear, efficient way. Implementing Elipse Power allowed EMAE to optimize, in a simple, safe, intuitive way, the control of generating units, valve rooms, water reservoirs, and electrical quantities measured in the plant.

On Portfolio screen, it's possible to monitor both active and reactive power generated not only at the whole Henry Borden HP complex but also at External or Underground individually. The screen will display the water flow and the active and reactive power of each generating unit in the plant; it will also allow following the water levels recorded at Henry Borden's water intakes and barrages.



Figure 3. Portfolio screen

By clicking the window of either the External or the Underground Plant on the above screen, Elipse Power provides another screen to monitor statuses and the main analog measurements: power, voltage, current, and frequency, as read from each respective generating unit (GU). Additionally, other windows will pop up with further information about the GUs equipment and their alarms.





Figure 4. External Plant general control

The substations feeding each plant are also controlled by Elipse Power. Via a screen, the software allows monitoring all measurements of current, voltage, and power in transmission lines, bars, single-line diagrams, and generators. Single-line diagrams will feature the equipment's status, possible maneuvers, and alarms identification.



Figure 5. External Plant's SE 88kV control



Regarding alarms, if a piece of equipment, such as a transformer, presents a technical issue, Elipse Feature will feature a triangle around it that is colorcoded according to the alarm's severity level. In addition, Elipse Power will allow accessing further information about main and backup protections in the substations.

At the Valve Room, Elipse Power allows verifying alarms, and the status of main and secondary valves associated with each plant's generating units' pipelines. Water tanks, rectifiers, hydraulic units, and semiautomatic mechanisms can also be monitored with this screen.



Figure 6. External Plant's Valve Room control

As for the plants' generators' control, Elipse Power allows monitoring the capability curve, that is, the chart that sets up their operational limit. It's also possible to access further information about cooling, drainage, ventilation, and excitation systems, as well as the data regarding the hydraulic units and transformers banks.

Furthermore, the platform allows monitoring voltage and speed regulators, detecting slot temperature in stators and bearings, as well as firing "stop" and "go" commands. Finally, it displays alarms and statuses of synchronizers and pumps.





Figure 7. Generators control

However, having access to a platform full of modern features and intuitive screens is only the starting point; learning how to properly operate it to achieve the highest possible performance is just as crucial. In order to capacitate its staff to correctly use Elipse Power in a safe, controlled environment, with no impacts to the operation, EMAE has hired Energia Automação to train them on how to operate and maintain the platform. Real simulated system scenarios were also played with Elipse Software's OTS system.



Figure 8. At the center, with their training crew: Luis Henrique Ramalho Biscuola – Energia Automação's SCADA systems analyst, and Hélio Max Parpinelli – head of EMAE's supervision and measuring department



Another technology employed in this project to optimize monitoring and analyses of the plant's equipment and substations is <u>Elipse Plant Manager</u> (<u>EPM</u>). EPM is an Elipse platform, in the "Industrial DataOps" format, which offers better availability and usability of industrial data, in order to detect opportunities for improvement, lower costs, increase product quality, and get better efficiency overall.

## Benefits

- Modern, intuitive, easy-to-operate software that allows EMAE to comply with ONS's requirements.
- The system is now monitored via 30 screens, as opposed to the 475 screens before retrofitting it, which makes the plant's operation easier and more agile.
- Thanks to the training courses, operators are now better acquainted with the software operation.
- Real-time access to alarms leads to faster diagnoses and troubleshooting, and less spending on equipment maintenance.
- Detailed control of electrical quantities, generating units, and other equipment and variables involved in energy generation by the Henry Borden HP complex
- The design of screens and objects follows the principles of high visual performance, which optimizes the application.

### Datasheet

Client: EMAE - Empresa Metropolitana de Águas e Energia Solution provider: Energia Automação Elipse products: Elipse Power, Elipse Plant Manager, and OTS Platforms: Windows Server 2019 and Windows 10 Number of copies: 5 Number of I/O points: 60,000 Drivers: Modicon Modbus Master, IEC 870-5-101/104, IEC 61850, DNP 3.0 Master, DNP 3.0 Slave, and ABNT NBR14522