SEL

Customer Highlight

CUSTOM-ENGINEERED PROTECTION AND CONTROL

Panamanian utility improves transmission system stability with wide-area protection scheme

REMEDIAL ACTION SCHEMES (RASs) provide integrated wide-area protection and control that improves transmission system reliability and stability. SEL designs protection, monitoring, and control solutions for the system's specific requirements and tests them to the most exacting standards.

Customer problem

In 2017 and 2018, Panama suffered major blackouts that also caused undesirable effects in the other countries that are part of the Central America regional power system.

Demand and generation in Panama have grown quickly, and the development of additional transmission capacity has been delayed. In addition, unique geographical constraints make system operation challenging.

Panama's 230 kV transmission backbone is 400 km (248.55 mi) long. The biggest load centers are in the East, but major generation sources and interconnections to the Central America regional power system are in the West. The load center operates very close to the power voltage curve limit; various contingencies have led to instantaneous voltage collapse, fault-induced delayed voltage recovery, and uncontrolled load shedding.

Solution

SEL developed a high-speed, contingency-based adaptive load-shedding system that uses SEL logic processors, open-line detection algorithms, and wide-area, high-speed communications to ensure system stability.

Engineers at Empresa de Transmisión Eléctrica, S.A. (ETESA), Panama's transmission system operator, collaborated with SEL to model the power system, define and develop the RAS implementation, and commission the system.

SEL built and tested the panels in its own advanced facilities, running extensive simulations of Panama's power system with control hardware in the loop. These tests validated the response of the controllers and the rest of the RAS system in many different scenarios—and made it possible to find and correct for conditions that weren't considered in the initial design, thus reducing commissioning time onsite.

Results

The SEL POWERMAX® RAS system was commissioned in 2021. It has worked as designed, maintaining electrical power system stability in Panama, taking care of the link with the rest of Central America, and reducing the possibility of blackouts, voltage collapse, overload of lines, and slow voltage recovery. Incorporating SCADA information from distribution companies in real time helps optimize load-shedding decision making.

And because the new system has also increased the transmission system power transfer limit, the national utility is now able to reduce operating costs and carbon emissions by using more hydropower and optimizing the operation of its wind and solar resources.

About SEL

SEL is a 100 percent employee-owned company that specializes in creating digital products and systems that protect, control, and automate power systems around the world. This technology mitigates blackouts and improves power system reliability and safety at a reduced cost. Headquartered in Pullman, Washington, SEL has manufactured products in the United States since 1984 and serves customers worldwide.

Cybersecurity philosophy

We build layers of defense and maintain the integrity of each layer's purpose—in other words, we apply the right technology at the right layer. We believe simpler products are easier to defend and that the safety of the power system and availability of the protection and control devices come first.

Reliability

SEL products are designed and manufactured for the world's most challenging environments, exceeding all industry standards for temperature, shock, and electric stress.

Our products have a mean time between returns for repair (MTBR) of more than 250 years, based on observed field performance. This means that if you have 250 SEL products installed in your systems, you can expect to have less than one unscheduled removal from service per year for any reason, whether it's a defect or an external factor such as overvoltage, overcurrent, wildlife damage, or environmental exposure.

Warranty

SEL backs our products and commitments with a ten-year warranty, no-charge diagnostic and repair services, local support, and a variety of test procedures and certifications.

Support

SEL support teams are stationed in regional offices around the globe and staffed with application engineers who are experts in our products and in power system applications. We offer free, 24/7 emergency technical support for the life of your SEL products, even if they're outside of our ten-year warranty.

Contact us

To learn more about partnering with SEL Engineering Services, contact **esinfo@selinc.com** or visit **selinc.com/engineering-services**.

Read the technical case study: *Voltage Collapse System Protection Increases Power Transfer Limits at the Panama Transmission System*, Alonso Castillo and Rodrigo Palacios (ETESA-CND), and Aaron Esparza, Ulises Torres, and Jean León Eternod (Schweitzer Engineering Laboratories, Inc.), April 2022.

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