

# CEM

## Powering up Macau with smart grids

“Using smart grid technologies, we’ve improved the stability and quality of Macau’s power supply,” says Evan Liu, the Director of Power and Networks Dispatch for Companhia de Electricidade de Macau (CEM). “Our power supply reliability rating has been at globally leading levels for a long time, with average service availability hitting 99.9998% and an average power outage time of just 2 minutes.” Liu explains how CEM arrived at this exemplary point and where the company plans to go next.

By Xu Shenglan, Xue Hua



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## The current state of play

Imbued with a unique and vibrant mix of Chinese and Portuguese culture, Macau enjoys a rich 450 years of history and remains a popular tourist destination.

Today, its power industry continues to make an outstanding contribution to the city's prosperity and will form a key aspect of its transition into a smart city.

With the Macau grid connecting to the China Southern Power Grid (CSG), CEM is a public utility company with the exclusive rights to transmit, distribute, and sell electricity in Macau.

Covering just 32 square meters, Macau has a very high load density, exceeding 1 million kilowatts. Over the past decade, the city's total electricity consumption has increased by nearly 55 percent, in large part due to the completion and commissioning of a succession of large-scale infrastructure projects and casinos coupled with the rise in smart tech used by homes and businesses. As Macau's

power supply network consists of underground cables, road excavations are a necessary part of supplying these large-scale projects with power and reconstructing aging infrastructure. "It's inconvenient for the general public and a challenge for CEM," explains Liu.

Another challenge, he says, is meeting the public's increasing demand for electricity under a development model that considers the next generation and protects the environment. As an international city, Macau has very high requirements for power supply quality and service quality. CEM needs advanced technologies to provide users with high-quality power and services and meet its commitment to sustainable development.

## Smart power

In 2000, CEM began automating its distribution network in 2000, completing the project in 2005. In 2007, it began constructing digital substations; a year later, it piloted medium-voltage closed-loop control technology and

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deployed its power outage management system. By phasing in these smart grid technologies, CEM has improved the stability and quality of the city’s power supply, enabling it to achieve globally leading metrics.

To consolidate its current position, CEM is implementing various asset management projects, such as smart metering and real-time equipment monitoring, and a clutch of new applications, including electric vehicle charging management systems, distributed photovoltaic systems, common pipelines, and smart street lights.

Even so, Liu knows that a successful company can’t just take things for granted, “Although CEM leads the world’s advanced regions in terms of all types of data on power supply reliability, improving the quality of CEM’s electricity service is still our main goal each year.” And that, he says, includes expanding its technology portfolio, “We’re experimenting with IoT applications, such as electricity meters and street lights to quickly understand real-time power use, respond more quickly to potential issues and failures in electrical devices, and use the data collected to form dedicated big

data for intelligent management.”

Smart grids integrate sensory measurement, communication, and information technologies into existing physical grids. To respond to current needs, Liu states that, “We need to constantly research, plan, and improve our services to solve problems with grid reliability, bandwidth, grid security, multi-system interconnection, IT/OT convergence, and the emergence of all kinds of application requirements and new technologies.” He points out that this planning needs to cover multiple dimensions, including internal communications in power systems, IT network architecture, and third-party service provision.

## New challenges

According to Liu, “ICT infrastructure challenges occur in the deep integration of architecture, infrastructure, and industry application software. Architecture has a huge impact on service format.” If CEM develops new services in the future, Liu predicts that the company will need to consider additional factors when developing CEM’s ICT infrastructure.

To overcome challenges in planning and

managing smart grids, Liu mentions that the company updated its smart grid roadmap in 2016, announcing its IT/OT system architecture and processes and cementing its commitment to cyber security.

During the construction of the smart grid, Huawei provided a reliable and easily expandable and manageable power communications and transmission network for CEM. The overall capacity and service capability of the network were greatly improved to meet the current and future needs of various service departments. At the same time, the risk of service interruptions caused by the old network was eliminated, and security and reliability were greatly enhanced. Isolation and self-recovery capabilities of each service within the same network were optimized, and the management and monitoring capabilities of the network continue to improve.

## New energy, new possibilities

CEM is determined to become Asia's leading energy service provider, and a large of part of doing so revolves around sustainability. CEM believes that adequate stability, affordability, and clean efficiency are the three core elements of the new energy ecosystem. Given Macau's high cost of land and mature economy, the SAR Government formulated an energy supply strategy with CSG as the main supplier, supplemented by local power generation.

CEM has deployed renewable energy as part of its medium- and long-term strategy, despite the difficulty in implementing such initiatives due to Macau's finite land and sea resources.



However, Liu states that ensuring a clean power supply and reducing emissions will ensure that electricity remains affordable to Macau's citizens. In Macau's Dawan District, CEM is currently involved in constructing renewable energy sources such as offshore wind power and solar photovoltaic power generation. It's also involved in building hydropower renewable energy, such as pumped storage and natural gas combined-cycle power generation projects.

CEM's goal is to replace the power capacity Macau imports from CSG with CEM's installed capacity from clean energy in Dawan District by 2030. To this end, Liu says, "Huawei and CEM are cooperating in a power data transmission network, OT system infrastructure construction, and a medium-voltage communication network. I hope that Huawei can provide CEM with its excellent services in more areas, so we can combine our strengths to develop Dawan District."

Looking to the future, the development of CEM's smart grid will be a key feature in Macau's transformation into a smart city, ensuring that the city continues to be an outstanding place to live, do business, and have fun. [www.cem.com.mo](#)