2026 Best Practices of Carbon Neutral Cities in East Asia

Shenzhen: Self-Sufficient Energy System for a Green Government Complex in Longgang District



1. Background

Longgang District in Shenzhen, as China's top industrial district for eight consecutive years (2018-2025), is built on a strong manufacturing base and dynamic innovation ecosystem. However, rapid industrial growth and urbanization have driven up huge electricity demand. Balancing its dense industrial footprint with environmental goals makes a green transition urgent and essential.

Government facilities are important public platforms for carbon-neutrality experiments. Given that conventional government buildings consume significant energy, they serve as a testing ground for evaluating the feasibility and scalability of sustainable building solutions.

In alignment with China's National Dual Carbon Goals and Longgang District's local low-carbon urban development strategy, an **integrated Solar-Storage-Charging project** was officially connected to the grid and began operating on 8 February 2026 at the District Government Compound and surrounding areas, the District Government Compound surrounding areas.

2. Key Components

The project has pioneered an integrated low-carbon development pathway for government institutions, combining the following key components:

Integrated Innovative Financing and Operation Model

A key highlight of the Longgang Project is its financing and operational model. The project is financed through an Energy Management Contract (EMC), under which the energy company covers the upfront costs of infrastructure investment, construction, operation, and maintenance, with zero capital outlay from the government. EMC proves to be a win-win solution: it relieves the public fiscal burden while allowing contractors to monetize their investment through service fees, green electricity, and time-of-use price differentials. In this way, the public-private partnership (PPP) model aligns public sector goals with private sector incentives.

Furthermore, the district is pioneering by opening up its once-restricted administrative compound to the public as a vibrant civic hub. Key areas across the compound now serve as testing and demonstration sites for advanced low-carbon and smart technologies.

Energy Infrastructure Powered by AI-Enhanced Management

This project centers on its own renewable energy system, which includes photovoltaic generation, energy storage, and EV charging infrastructure. The solar array spans approximately 8,200 m², boasts an installed capacity of 1.9 MW, and generates an estimated 1.6 million kWh annually. To maximize grid stability, a 2580 kWh energy storage system capitalizes on peak-valley arbitrage by storing extra low-cost power during low-demand periods and releasing it during peak hours. Outfitted with advanced air- and liquid-cooling technology, the system runs reliably under high temperature and high-load conditions. On the charging front, the facility features eight liquid-cooled ultra-fast chargers (600 kW) and 20 dual-plug fast chargers (250 kW). Additionally, there is one dual-plug Vehicle-to-Grid (V2G) charger that transforms parked EVs into mobile energy storage units.



Photovoltaic System of the Project
Source : Longgang District Government Affairs Management Bureau



HarmonyOS Intelligent Energy and Carbon Management Platform
Source : Shenzhen Longgang Release

To manage the integrated energy system, the HarmonyOS Intelligent Energy and Carbon Management Platform provides an AI-enabled, visualized solution for real-time monitoring of the energy cycle. With smart gateways and sensors, the system connects with hardware infrastructure to maximize the efficiency of energy generation, storage, and consumption.

Citizen-Oriented Design and Approach

The project extends beyond the public-private partnership and delivers tangible benefits to the citizens. With a maximum charging capacity of 600 kW, the ultra-fast charger can add enough range to travel approximately one kilometer in just one second, significantly reducing charging time and making EV use more convenient.

Adding a unique touch to the charging experience, a HarmonyOS Space Capsule Café provides a comfortable space while the vehicles recharge. By integrating public amenities with low-carbon infrastructure, the project makes sustainable technologies more visible and accessible to residents, helping to raise public awareness of the green transition and build broader support for sustainable urban solutions.



The Ultra-fast Charging Station with the HarmonyOS Space Capsule Café
Source : Longgang District Government Affairs Management Bureau

3. Implementation

The integrated Solar-Storage-Charging project marks the latest step in Longgang's near-zero-carbon government initiative, built on an ongoing effort to experiment with low-carbon solutions in government buildings. In June 2024, a pilot photovoltaic project was launched at the Longgang Customs Building, and later connected to the grid in October. As part of the project, a distributed photovoltaic station was constructed at the Customs Building parking garage. The project installed a 0.7 MW rooftop solar PV system covering approximately 3200 m^2 of the parking structure, generating around 690,000 kWh of clean electricity annually. This offsets approximately 226.3 tonnes of standard coal and cuts down emissions and pollution annually by 687.9 tonnes of CO_2, 20.7 tonnes of SO_2, and 10.35 tonnes of NO_2. Beyond environmental benefits, this pilot proved the viability of the EMC model and provided the blueprint for scale-up in 2026.

The 2026 launch was far more than an isolated facility upgrade; it was the result of aligned, cross-departmental policy collaboration. Guided by Shenzhen's ***Implementation Plan for Advancing the Pilot Program for Near-Zero Carbon Emission Zones in Shenzhen*** (issued on 12 December 2025), Longgang integrated its district-wide ***All in AI*** strategy and ***HarmonyOS District*** initiative to drive smart urban governance. This policy stream flows through the newly established AI (Robotics) Bureau and Industry and Information Technology Bureau. Seizing this momentum, the Bureau of Government Affairs Management opened up civic facilities to host the AI-powered energy management platform.

Transitioning from a standalone solar project to an integrated Solar-Storage-Charging system, Longgang again leveraged the EMC model, selecting long-term industry partners through open bidding to lead end-to-end execution, technology integration, and maintenance. Beyond energy, the open public civic complex now doubles as an urban experimentation hub. For example, ultra-thin asphalt technology has been implemented in the compound's roads the second-floor corridor has been transformed into a high-tech product exhibition hall; the lake becomes a testing site for collecting water quality data; and the conference lounge transforms into an area for smart device exhibition. Through cross-sector collaboration and continuous innovation, Longgang has created a high-impact, replicable model for municipal green transformations.

4. Impacts

This project was accredited as one of Shenzhen's first near-zero-carbon emission zones in February 2026, in recognition of its significant impacts.

Significant Carbon Emission Reduction

Increased use of renewable energy reduces dependence on conventional energy sources in government buildings, thereby generating substantial environmental benefits. With an annual generation capacity of 1.6 million kWh, the power produced already exceeds the building's energy demand by 20%. According to project design estimates, the project is expected to generate approximately 40 million kWh of green electricity over its full life cycle, cumulatively saving 13,000 metric tons of standard coal and reducing carbon dioxide emissions by 35,000 metric tons, which is equivalent to planting 180,000 trees. Additional reductions include approximately 3.65 tonnes of sulfur dioxide and 6 tonnes of nitrogen oxides.

Improved Energy Efficiency and Flexibility

In addition to reducing pollution, the project significantly improves the efficiency and flexibility of the energy system. With an annual regulated electricity volume of approximately 1.54 million kWh, the storage system helps balance electricity demand by shifting energy consumption from peak periods to lower-demand periods. This mitigates grid strain during high-demand periods while optimizing overall operational efficiency and lowering energy expenditure.

Enhanced Energy Infrastructure Resilience

Moreover, the project strengthens the resilience and security of government operations. Through intelligent energy management and storage capabilities, the system can provide emergency power support for critical facilities when necessary. This is particularly important for cities as they adapt to increasing climate risks and challenges.

5. Conclusion

The Longgang case demonstrates that public institutions can serve as catalysts for accelerating urban low-carbon transition when technological innovation is supported by appropriate financing mechanisms, cross-sector collaboration, and real-world demonstration projects. By transforming government facilities from energy consumers into active living laboratories, clean energy solutions and innovative governance approaches can be tested on the ground. Longgang's solution shows that the combination of the EMC model, digital energy management, and public-private collaboration offers an innovative, inclusive, and financially viable pathway for cities seeking to decarbonize public infrastructure.

Building on the achievements of the Solar-Storage-Charging integrated demonstration project, Longgang District plans to further scale these systems across additional public facilities to accelerate the transition towards near-zero-carbon government institutions. The district will continue to enhance its digital Energy and Carbon Management Platform to support data-driven operations, intelligent energy dispatch, and district-wide energy coordination.

Looking ahead, the district will further open up government facilities to accommodate innovative demonstration, providing opportunities for enterprises to test and commercialize low-carbon technologies while encouraging wider replication across industrial parks, communities, and other urban areas.

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Acknowledgement

Author | **Yuan Yuan** Editor | **Zhenyi Zhang**

The case study was conducted by the ICLEI – Local Governments for Sustainability East Asia Secretariat. The views expressed in this report remain those of the authors and do not necessarily reflect the official positions of the respective governments.

With special thanks to the Longgang Authority of Shenzhen Municipal Ecology and Environment Bureau for providing background materials for developing this case.