CASE STUDY

MICROGRID ENABLES FUTURE-READY PUBLIC TRANSPORTATION

How one municipal transit authority used solar power, battery storage, and advanced power control systems to modernize public transportation and advance sustainability goals.

When the transit authority of a mid-sized American city that draws millions of tourists each year decided to replace its aging monorail with a flexible network of autonomous electric shuttles, they called on ABB to support the transition and the city's broader electrification goals. To enable that shift, ABB designed and delivered a microgrid solution that combines onsite solar generation, battery energy storage, and advanced microgrid control systems.

The resulting microgrid strengthens operational resilience for critical transit operations, advances the city's sustainability objectives, allows for future cost savings, and creates ready-to-scale infrastructure for the fleet of autonomous electric vehicles (EVs).

MODERNIZING MOBILITY INTRODUCES NEW CHALLENGES

The city historically relied on an elevated monorail system, managed from a centralized maintenance and operations hub at the edge of the downtown core. Serving a metropolitan area of roughly 2 million residents and welcoming an estimated 8 million visitors each year, safety, flexibility, and accessibility were key concerns.

As the system aged and demand patterns changed, transit authority leaders began exploring a shift to autonomous EV shuttles as the backbone of the city's public transportation systems.

THE TRANSITION

The authority's vision included:

- Offering greater routing flexibility to serve more neighborhoods and more day-to-day needs while making transportation easier and more flexible for visitors
- Supporting the city's sustainability goals by lowering emissions and creating a pathway to power public transportation with cleaner energy sources over time
- Simplifying maintenance by allowing individual vehicles to be taken out of service without shutting down the entire line
- Reducing exposure to the monorail's high-voltage infrastructure and the need to maintain extensive physical barriers

While autonomous EVs offered a more flexible and scalable alternative to a fixed monorail, they also introduced new challenges for the transit authority. They needed the ability to charge the fleet without overtaxing the local distribution grid, and should grid disruptions occur, to maintain reliable power so that vehicles and critical operations could continue running.

SOLUTION REQUIREMENTS

The new solution had to:

- Integrate onsite solar generation and battery energy storage
- Operate in both grid-connected and islanded modes
- Enable time-of-use billing strategies to lower costs
- Meet stringent physical and safety constraints in a dense urban area

MICROGRIDS MEET THE NEED

A microgrid is a localized energy system that can generate, store, and distribute electricity for a defined set of facilities, while operating alongside the main utility grid or independently during power disruptions. By combining onsite generation, storage, and intelligent controls, a microgrid gives operators far more control over when and how they use energy, improving reliability and enabling greater use of renewables.

For this project, the transit authority envisioned a microgrid that combined rooftop solar with a containerized lithium iron phosphate (LFP) battery energy storage system, all managed by an on-site centralized control platform. The solar array would supply clean electricity during the day, while the battery system would store excess and off-peak rate energy to support vehicle charging and building loads. Together, this design would enable the transit authority to achieve several core objectives:

Resilience
Maintain critical transit operations during outages by seamlessly switching between grid-connected and island modes.

Cost control
Scheduling energy usage based on time-of-use rates to control costs and improve budgeting and financial planning.

Renewables
Prioritize onsite renewables for daily operations to reduce emissions and achieve sustainability goals.

Scalability
Create a scalable pathway to power a growing autonomous EV fleet.

While the transit authority had a clear vision for a safer, more flexible, and more sustainable transit system, they needed partners who could turn that vision into a functional reality. Working with the local electrical contractor, channel partner, and consulting engineer, ABB provided system design consulting, a turnkey microgrid controller, and sourcing support for the battery energy storage system. This collaborative model allowed the city to tap into ABB's microgrid and automation expertise while leveraging local partners who understood local permitting, codes, and construction practices.

TECHNICAL ARCHITECTURE OF THE MICROGRID

The transit authority's microgrid is built around a centralized digital control platform that coordinates solar generation, battery energy storage, building loads, and EV charging from a single maintenance facility. At the heart of the system is an ABB microgrid controller housed in a digital cabinet with a human machine interface (HMI) that provides real-time visibility and control for operators.

On the power side, the microgrid architecture links the utility service, photovoltaic (PV) system, battery energy storage system (BESS), and site distribution through ABB low voltage switchboards, and power and lighting panels. The controller manages power flows so that solar and the BESS supplement building load during the day, cost-saving applications like peak shaving are managed, and the system is optimized to avoid unnecessary grid export. At night, the utility supplies power and recharges the BESS in preparation for the next day's operations.

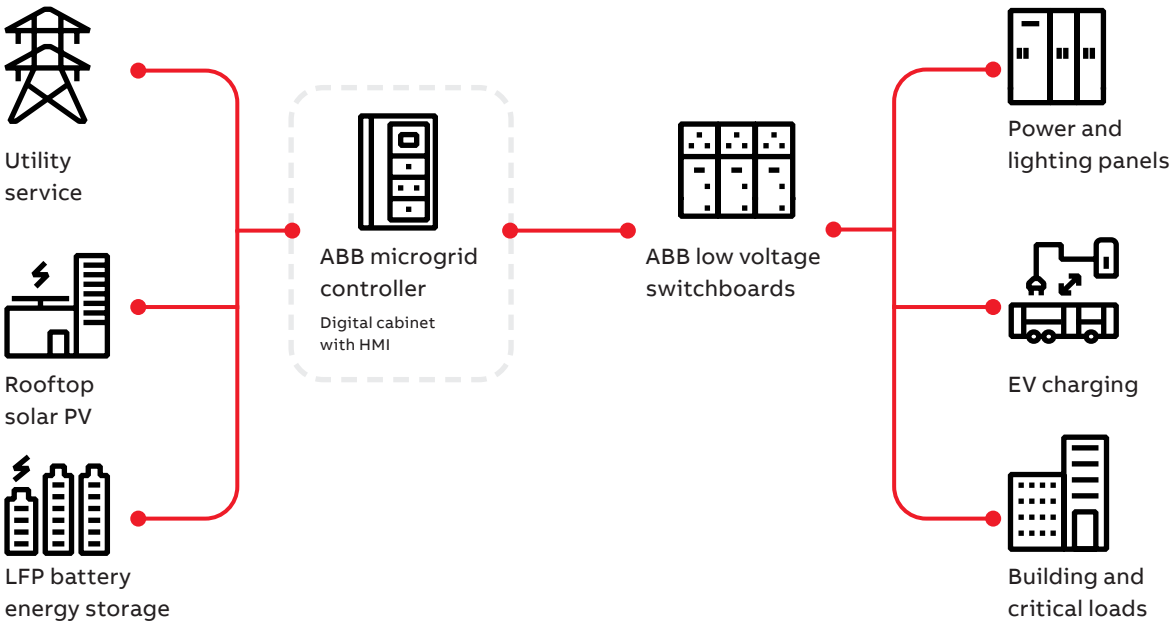
Control logic is organized around clearly defined operating modes. During normal operation, the microgrid optimizes use of solar and storage against the time-of-use utility schedule to minimize costs. In the event of a grid outage, the microgrid automatically islands, sheds non-critical loads, and relies on the BESS and solar to serve critical operations and equipment.

When grid power is restored, the controller synchronizes and reconnects to the utility, then gradually brings non-critical loads back online. This architecture gives the transit authority a compact, integrated system that balances resiliency, cost optimization, and support for autonomous EV charging.

At the system level, all protection, control, and switchgear were sourced from ABB, giving the project a unified platform for monitoring and control. At the same time, the solution remains vendor-agnostic, integrating seamlessly with third-party PV inverters, meters, and other field devices over open communication protocols.

Consistent with the goal of leveraging the existing structure, the upgraded maintenance facility now serves as both a vehicle maintenance and storage facility and a command-and-control center for the autonomous shuttle fleet. Microgrid equipment occupies a compact footprint, with batteries and low voltage switchboards arranged in a linear layout for clear access and operations. Placing the microgrid adjacent to the garage and operations center shortens cable runs, simplifies wiring, and keeps key operators close to the systems they rely on every day.

Microgrid architecture



OPERATING MODES

Grid-connected
Normal operation with utility, solar and storage

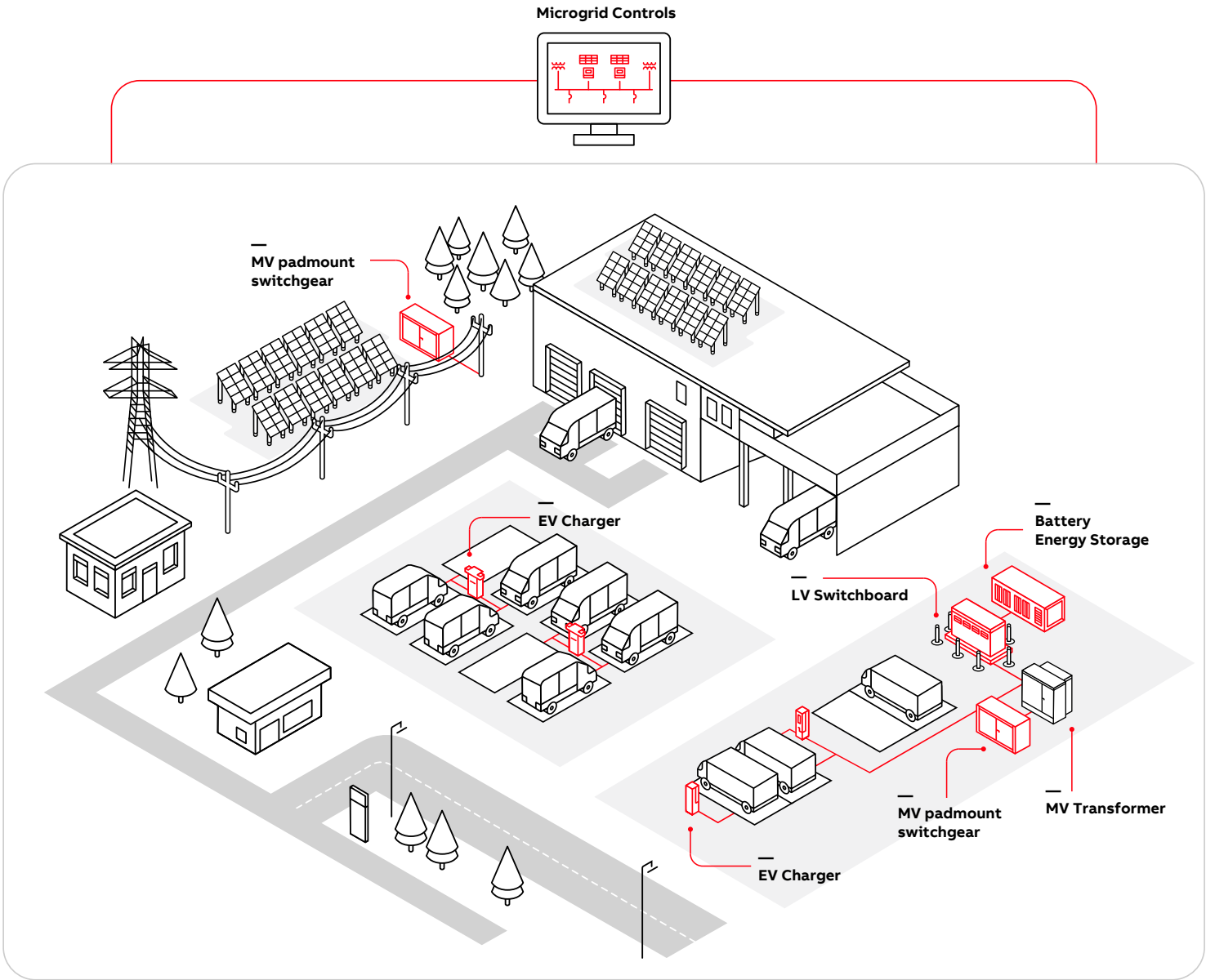
Islanded
Critical operations supported during outages

FROM DESIGN TO DELIVERY

The implementation journey

Once the transit authority decided to proceed with the project, ABB developed detailed engineered design documents for review and alignment with the customer's technical and scheduling requirements. To keep the project on track, ABB also led an in-person workshop and several virtual working sessions that enabled an expedited review and approval of the product design documents so the equipment could be released without delay. Following design approval, ABB provided regular status updates on equipment readiness, which gave the team and the customer confidence that the project remained aligned with the target installation schedule.

During field execution, engineering support, equipment installation, and system commissioning advanced through final completion. The process involved the full range of expected activities, including resolving communication and coordination nuances with third-party inverters and other vendor equipment, but ultimately proceeded smoothly, bringing the microgrid online in time to support the transit authority's next phase of autonomous shuttle operations.



Microgrid powers autonomous EVs for city transportation.

POWERING THE NEXT ERA OF URBAN MOBILITY

The transit authority's new microgrid provides a flexible energy platform that can evolve with the city's needs and directly advance its sustainability and electrification goals. With this infrastructure in place, the city has a clear path from a fixed-route monorail to a network of autonomous electric shuttles, with charging and critical operations able to keep pace with service expansion.

Working with a single integrated provider for controls, switchgear, and engineering simplified procurement and coordination while giving the authority one point of accountability from design through operation. Just as importantly, the standardized, microgrid-ready switchgear and proven control templates developed for this project can be reused, reducing engineering effort and delivery time on future deployments. These elements create a replicable model that enables other cities to adopt microgrid technologies to modernize public transportation.

Explore ABB microgrid controls

Learn how ABB microgrid control solutions help coordinate distributed energy resources, storage and loads for resilient, flexible power.

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