

A PANASONIC CITYNOW WHITE PAPER



At Peña Station NEXT—a 382-acre transit-oriented development in Denver, Colorado—stakeholders Panasonic, Xcel Energy, Denver International Airport, Younicos, and LC Fulenwider, Inc. have partnered on a unique solar+storage microgrid that deploys the battery energy storage system for five complementary use cases.

Executive Summary

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A Portfolio Microgrid in Denver, Colorado

How a multi-use battery energy storage system provides grid and customer services through a public-private partnership

Introduction

Energy storage technologies have shown great promise as the “Swiss army knife” of the power grid, capable of doing many things for many stakeholders. Battery systems in particular are quickly gaining a larger foothold as flexible, nimble resources that can benefit utilities, customers, and the entire power grid.

As Battery Costs Fall, Deployments and Installation Forecasts Begin Scaling

Regulatory mandates and incentives at the state and federal level, growing opportunities for market participation, and the pure economics of falling storage costs are making battery systems more attractive to customers and to utilities such as Xcel Energy. As storage deployments scale under these favorable conditions, utilities and solutions developers are better learning how to leverage these nimble assets to provide value for the electric utility industry and customers.

Revenue Stacking with Multi-Use Storage Systems Unlock Greater Market Potential

In recent history, battery systems were primarily deployed on the basis of singular use cases serving either a customer or utility and are already providing a financial return in some markets using this model. Trailblazing utilities and project developers are now discovering how revenue stacking with multiple value streams can greatly enhance storage system value.

The battery energy storage project undertaken in partnership by Xcel Energy, Panasonic, Younicos, and Denver International Airport (DEN) at a new transit-oriented development called Peña Station NEXT, in Denver, Colorado, is one of the latest projects to explore the potential of a multi-use battery energy storage system.

Peña Station NEXT Becomes a Proving Ground for Battery and Other Technologies

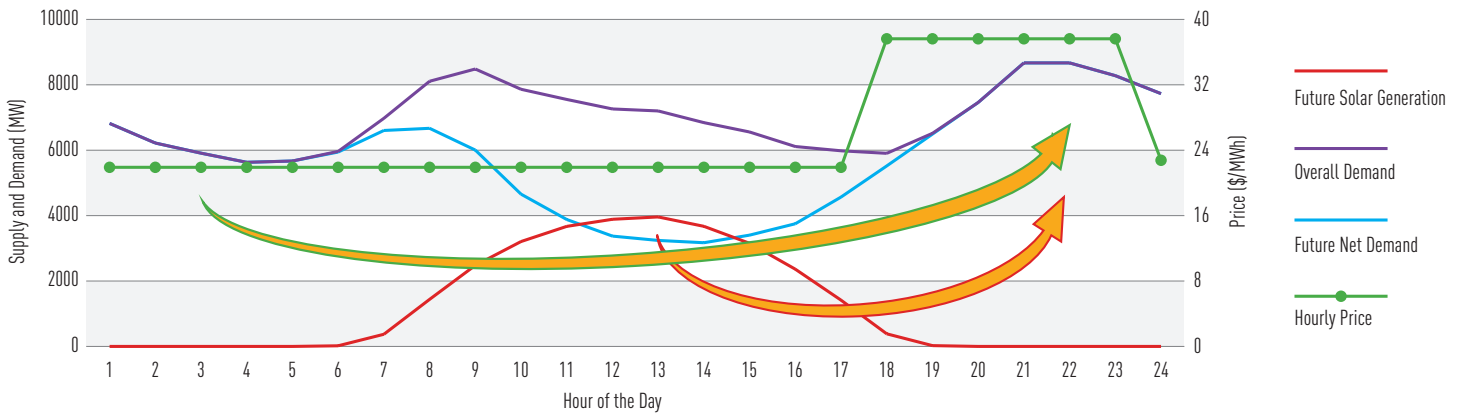
Peña Station NEXT is a 382-acre transit-oriented development adjacent to the Regional Transportation District’s 61st & Peña Station rail stop, located along the University of Colorado A Line train linking downtown Denver with DEN.

The development is also one of the first major steps toward realizing Colorado’s vision of creating a “live, work, play” aerotropolis—or “airport city”—around DEN. It will feature a variety of smart and sustainable solutions including smart street lighting, ultra-fast community Wi-Fi, smart parking, electric vehicle charging stations, a smart bus shelter, environmental sensing, interactive digital signage, and a solar-plus-storage microgrid.

A Public-Private Partnership Yields a Portfolio Microgrid

A recent shift toward multi-stakeholder microgrid models is improving both project economics and growth expectations. At Peña Station NEXT in particular, the public-private partnership approach has resulted in a unique “portfolio microgrid” model.

Solar Time Shifting and Energy Arbitrage Use Cases Move Inexpensive, Off-peak kWh and Solar Generation Into Higher-Price, On-peak Hours



Portfolio of Stakeholders

- **Xcel Energy:** Colorado's major investor-owned utility with an ambitious vision for the state's energy system that includes a modern power grid and renewable energy
- **Yunicos:** An expert in MW-scale battery energy storage and storage software applications, including embedded intelligent energy management
- **City and County of Denver (Denver) and Denver International Airport (DEN):** Entities with aggressive sustainability goals and an interest in improving the resilience and sustainability of critical DEN assets to support future growth
- **L.C. Fulenwider, Inc.:** Sustainability-minded master real estate developer in Colorado and for Peña Station NEXT
- **Panasonic:** Peña Station NEXT's anchor corporate tenant, smart and sustainable technologies lead, and invested equity partner

Portfolio of Assets

The battery system project at Peña Station NEXT is a pilot under Xcel Energy's \$10.3 million battery demonstration through its Colorado Innovative Clean Technology (ICT) program, comprising five core elements:

- **1.6 MWdc carport solar PV installation:** located over the DEN parking lot
- **259 kWdc rooftop solar PV array:** installed atop Panasonic's corporate office building using Panasonic HIT solar PV modules
- **1 MW / 2 MWh lithium ion battery system:** installed by Yunicos at Panasonic's corporate office
- **Panasonic's Denver operations hub building:** will serve as the initial anchor load for the microgrid; a high-tech, energy-efficient office targeting LEED Gold and net-positive energy, with an intelligent building energy management system
- **Switching and control systems:** to operate the battery energy storage system and microgrid functionality

Portfolio of Benefits/Services

The battery system at Peña Station NEXT will be leveraged for five complementary use cases whose services and benefits accrue to different combinations of the core stakeholders:

- **Solar Grid Integration:** Better grid integration of high-penetration solar PV actually comprises two related but distinct use cases:
 - + **Ramp Control for Solar Smoothing:** Charge and discharge the battery system to manage rapid fluctuations in solar PV output
 - + **Solar Time Shifting:** Store excess energy when solar generation output is high and dispatch that energy later in the day, helping to manage loads on the feeder
- **Grid Peak Demand Reduction:** Reduces peak demand by discharging the battery to offset grid demand based on historical and predictive data sets
- **Energy Arbitrage:** Charge the battery when prices are low and discharge when prices are high, based on energy price signals and low- and high-price thresholds
- **Frequency Regulation:** A fast-responding resource as part of the battery's ancillary services; this use case has broader relevance, not just for grid operations, but also for customers with strict power quality needs, such as data centers and high-tech manufacturers
- **Resilience Through Backup Power:** A portion of the battery's capacity will be reserved to provide an estimated four hours of backup power to Panasonic's facility, including its state-of-the-art network operations center

Conclusion and Looking Forward

Once the microgrid is live in early 2017, Xcel Energy, Panasonic, Yunicos, and the other project partners will gather data to review real-world performance and make refinements over time. After completion of the two-year pilot, the project partners will analyze the battery system performance data to determine the optimal settings for the remainder of the battery's estimated 10-year life span.