SCALE MICROGRIDS

Accelerating Fleet Electrification With Microgrids

Quality Custom Distribution Case Study

Contents

Executive Summary

Fleets nationwide are transitioning to electric vehicles (EVs), driven by corporate sustainability goals, policy incentives (and mandates) in states like California, and the promise of total cost of ownership (TCO) savings from lower fueling and maintenance costs. However, in many cases fleets' existing utility service isn't ready to match these ambitions, with wait times of 2 or more years for the major capacity upgrades needed to charge their EVs – on top of any potential cost, reliability, and sustainability shortcomings of grid electricity supply.

Microgrids are emerging as a uniquely versatile solution to these challenges, giving fleet managers the ability to take charge of their electricity supply and augment their utility service to provide enhanced performance. The microgrid built by Scale for QCD, a national food service logistics provider with a fleet of 30 Volvo VNR Electric delivery trucks in La Puente, California, will accelerate their EV transition and provide multiple additional benefits.

- **Rapid Deployment:** QCD's microgrid will be completed in roughly 18 months, compared to wait times of 4 years or more for utility upgrades for many EV fleets in California.
- **Cost savings:** Advanced controls automatically optimize the use of low-cost solar and battery storage, which along with avoided diesel backup generator costs and avoided regulatory costs will save QCD over $192,000 annually today – and more over time as utility rates increase.
- **Resilience:** With multiple on-site resources including solar, battery storage, and a backup generator, QCD has redundancy to ensure fleet uptime even during prolonged utility outages.
- **Sustainability:** The ability to draw on zero-emission on-site solar power will reduce greenhouse gas emissions from QCD's electricity supply by 32%, and the accelerated fleet electrification will enable QCD to deliver local air quality benefits sooner.
- **Flexibility:** Robust on-site power supply and advanced controls gives QCD enough capacity to electrify the remaining 15 vehicles in this fleet whenever they choose, without waiting for utility upgrades.

By deploying a microgrid to navigate the challenges of electrification, QCD is demonstrating leadership in the industry, meeting regulatory requirements ahead of schedule, and delivering sustainability results that are highly valued by its corporate customers. And by offering turnkey solutions to meet these needs with no upfront cost, Scale is working to enable other fleets in California and nationwide to charge EVs sooner, more sustainably, and more cost-effectively.

What is a Microgrid?

A microgrid is a layer of integrated on-site electricity infrastructure that works alongside existing utility service to deliver enhanced performance.

By leveraging cutting-edge technologies including solar panels, battery storage, dispatchable generation, and advanced controls, microgrids provide everyday cost savings and emissions benefits and ensure resilience for critical operations during grid outages.

Microgrids also enable the electrical service capacity of a given site to be increased without waiting for utility upgrades that can take years to complete and cost millions of dollars. This is particularly important for EV fleets, which may require major increases in on-site power capacity to supply charging equipment.

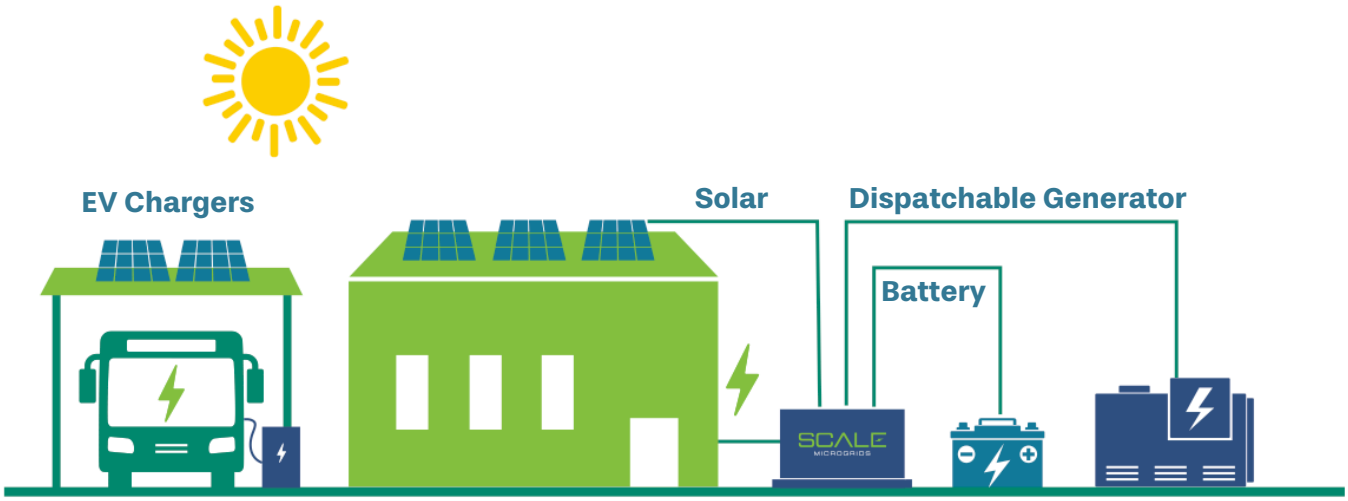


Figure 2. Scale Microgrids' microgrid system

How Microgrids Work

During a normal day the microgrid operates alongside the utility grid, with advanced controls optimizing the use of energy from each resource to minimize your energy costs. In the event of a grid outage, these controls enable your facility to automatically isolate (or "island") from the grid and rely on the microgrid to keep critical operations running.

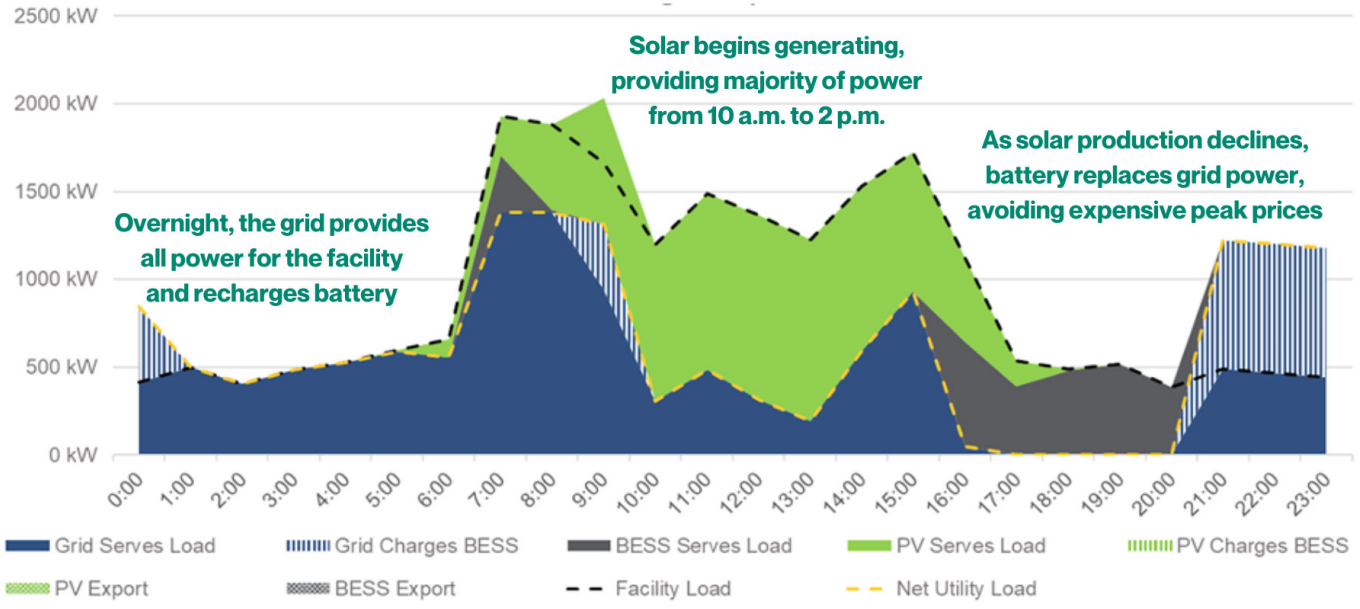


Figure 1. How a microgrid meets facility electricity demand during a typical day

Grid-Connected vs Off-Grid Microgrids

Microgrids may either be integrated with utility service in a grid-connected configuration or operate entirely independently as an off-grid microgrid. Both grid-connected and off-grid microgrids can offer cost, resilience, and sustainability advantages, but in most cases a business will choose between these two options based on their facility's location and the cost and time required to connect to the grid.

Benefits of Microgrid for EV Fleets

Electric vehicle (EV) adoption has emerged as a major priority – and a major challenge – for a growing number of fleet managers in recent years. Whether this transition is driven by corporate sustainability goals, policy incentives (and mandates) in states like California, the promise of total cost of ownership (TCO) savings from lower fueling and maintenance costs, or all of the above, all signs are pointing to an electrified transportation future.

However, in contrast to the incredibly ambitious EV goals being set in C-suites and state capitol buildings, the reality on the ground is that the road to electrification is slow, bumpy, and largely untraveled. For fleet managers tasked with navigating this journey, the transition from familiar liquid fuels to electrons requires adapting to vehicles with shorter driving ranges and longer refueling (or, in this case, recharging) times while ensuring their drivers can meet duty cycle requirements and complete their routes on time, every time.

Choosing the right EVs for a given fleet's operational requirements is challenging enough, but in many cases fleet managers face an additional and even less-familiar challenge: ensuring their electricity supply is up to the task of charging their new EVs. Sometimes, relying solely on existing utility service can result in long waits for grid connections or service upgrades, unanticipated increases in electricity bills, unplanned as well as planned power outages, and a too-slow pace of decarbonization to meet sustainability goals.

Microgrids are increasingly seen as an essential solution for navigating this journey successfully, giving fleet managers the ability to take charge of their electricity supply and supplement their utility service to overcome any of these potential shortcomings. The availability of turnkey, fully-financed, microgrid-as-a-service offerings from companies like Scale only increases their appeal, offering the familiar convenience of a fueling service provider for the next generation of vehicles.

Rapid Deployment

Many utilities are struggling to keep up with the sudden acceleration of demand from new factories and data centers as well as vehicle electrification, leading to long queues for grid connections at new facilities or for service capacity expansions at existing facilities. Wait times of 24 months or longer are increasingly common in many cases, including wait times of 4 years or more for areas in California, which can result in costly delays for new or growing businesses.

This challenge can be particularly maddening for EV fleets, which may require site capacity increases of 2x or more for fast chargers to serve just a portion of their trucks. Fleet managers can spend months determining the optimal initial mix of EVs and chargers to begin electrifying their vehicles, only to find that they will need to wait years and spend millions of dollars for their utility to upgrade their electrical service.

Microgrids empower fleet managers to take matters into their own hands. The combination of on-site power supply from solar, batteries, generators, and advanced controls to optimize their performance allows fleets to increase their overall site capacity to meet their charging needs, reducing or eliminating the need to wait for additional power from the utility grid.

And, in contrast to interminable waits for utility service, microgrids can often be designed, developed, and begin delivering power to facilities in 18 months or less. By installing a microgrid, fleets can skip the service upgrade queue and start charging sooner.

Cost Savings

It's no secret that the cost of kilowatt-hours have been going up even faster than the pace of inflation, with a national average electricity rate increase of 20% since 2020 for commercial and industrial customers – and eye-watering cumulative rate increases reaching 50% since 2020 in much of California. While charging with electrons is typically significantly cheaper than fueling with diesel, ongoing rate increases will eat away at these savings.

Beyond per-kilowatt-hour rate increases, fleet managers with EVs may be in for an additional electricity bill shock from demand charges, depending on how their rates are structured. Demand charges are based on the highest level of energy consumed within a given time interval (e.g. 15 minutes) over a monthly billing cycle, which means that having EVs charging from multiple fast chargers at any point in a month can translate into a significant increase to this portion of a fleet depot's electricity costs.

Microgrids give fleet managers the power to reduce both of these costs. Most microgrids include on-site solar panels that provide significant cost savings compared to utility rates, which include both generation from a mix that usually includes expensive fossil fuels as well as costs to cover the use of transmission and distribution infrastructure. And, because solar has no cost for fuel, it also provides price certainty compared to fast-rising utility rates. For fleets, solar can often be sited on carports or other depot structures in addition to facility rooftops.

Battery storage is also included in most microgrid configurations, creating additional opportunities for cost savings. Advanced microgrid controls can optimize when EV chargers draw power from the battery and when they draw from the utility, minimizing the peak level of grid use and avoiding excess demand charges. In states with time-of-use (TOU) rates like California, batteries can also automatically charge from the grid when prices are cheapest so that fleets can draw from that power when grid prices are expensive. Depending on utility territory, batteries can also generate revenues through participation in utility demand response programs and virtual power plants.

The emergence of fully-financed, $0 down "microgrid-as-a-service" options can make these cost savings even more appealing by eliminating up-front costs. Replacing a potentially huge capital expenditure with an annual service fee can be a game-changer for many fleet managers, simplifying their budgetary math and making it easier to pursue their EV transition at whatever pace makes sense for their operations. For example, by freeing up the capital that would have been used to purchase a microgrid, fleets can use that budget to purchase additional EVs and accelerate their transition.

Finally, microgrid-as-a-service offerings also allow fleets to lock in costs over contract terms typically extending for 20 years or more. This is a major concern for fleets in California in particular, where the undergrounding of power lines to prevent wildfires is likely to continue driving up rates. Being able to count on a fixed price for fleet charging frees fleet managers from having to worry about rate increases, providing peace of mind as well as budget certainty – especially compared to having to worry about volatile diesel fuel prices.

Resilience

Between fast-rising demand, growing generation supply constraints, and the steadily-increasing frequency of extreme weather events like wildfires, severe storms, and heat waves, the US electricity grid is facing unprecedented reliability challenges. As a result, over the past decade the average annual duration of power outages experienced by US homes and businesses has increased by over 50%.

These increasingly-frequent disruptions to power supply as well as power quality can pose a major challenge for businesses that require 100% uptime for their operations, including fleets. Even a grid outage lasting just a few hours at the wrong time can disrupt vehicle charging schedules and lead to cascading delays in completing routes. And, needless to say, the kinds of multi-day outages caused by wildfires – as well as the planned outages used by PG&E in California in recent years to reduce wildfire risks – can be disastrous for an EV fleet.

Microgrids dramatically enhance resilience through their ability to automatically disconnect or "island" from the grid and continue operations during a disturbance. The combination of multiple layers of integrated energy assets, typically including on-site solar and battery storage, dispatchable generation for backup, and advanced controls, can ensure uptime for critical operations like EV charging even when the grid goes down. Additional measures such as provisions for emergency roll-up generators can also be included as a failsafe.

Sustainability

The environmental impacts of fleet operations are increasingly being scrutinized, as a growing number of businesses – and their customers – set increasingly-ambitious sustainability goals. Minimizing charging emissions can be especially important for fleets that are electrifying to meet broader corporate sustainability goals. After all, why bother transitioning to EVs if they're going to charge with dirty electricity?

Microgrids can often deliver reductions in greenhouse gas emissions of 30% or more compared to electricity from the utility grid. By utilizing zero-emission solar energy to meet a significant portion of energy demand, microgrids directly reduce a facility's carbon footprint. Microgrids can also deliver additional emissions benefits by drawing from solar power stored in the on-site battery system during hours of high demand on the utility grid, reducing or eliminating the need to fire up highly-polluting fossil fuel peaker plants. These benefits can be magnified with EV fleets, which offer additional battery capacity to coordinate with the grid to minimize greenhouse emissions system-wide.

Of course, EVs provide more than just climate benefits. Regardless of the level of emissions from charging, the replacement of diesel-fueled trucks with electric models completely eliminates harmful tailpipe emissions, including smog-forming NOx pollution and dangerous particulate matter. The health risks caused by diesel pollution are particularly acute in urban areas, making the electrification of fleets an urgent near-term priority. By getting EVs on the road sooner, microgrids accelerate delivery of their local air quality benefits.

Future-Proof Flexibility

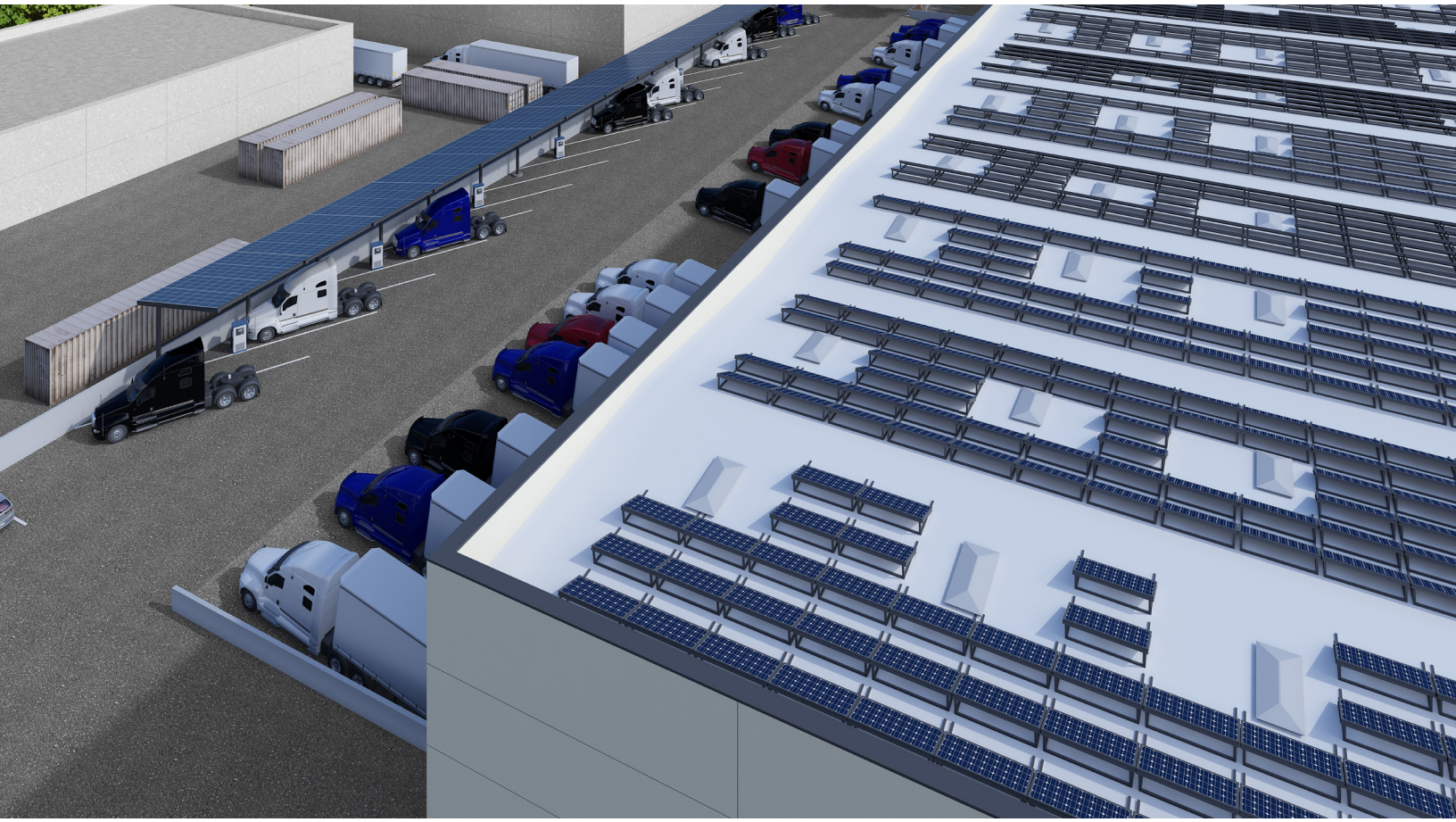
Finally, microgrids provide a flexible platform for additional energy upgrades down the road, allowing businesses to future-proof their fleet expansion plans in case utility delays or other electricity supply issues persist.

In the case of an EV fleet depot, the ability to avoid waiting for a utility service capacity upgrade and instead add more microgrid capacity – for instance, with additional battery storage – can be as valuable at the midpoint of a fleet's electrification journey as it is at the beginning.

Indeed, for many EV fleet managers, this built-in flexibility is one of the biggest advantages offered by microgrids.

As discussed, the different range and recharging characteristics of EVs can present a steep learning curve for fleet managers, and choosing the right combination of vehicles and chargers to satisfy their drive cycle and duty cycle requirements is a real challenge. With a microgrid, fleet managers have the freedom to add vehicles and chargers incrementally, see what works and what doesn't, and expand their site electrical service at whatever pace makes sense for their operations – and not at the pace dictated by their utility.

Microgrids thus represent a true "no regrets" strategy for EV fleet managers looking to address grid challenges today while preserving the flexibility to respond quickly to the challenges (and opportunities) of tomorrow.



Case Study

QCD
QUALITY CUSTOM DISTRIBUTION

Southern California's Need for Electrified Goods Transport

Southern California is one of the most populous parts of the country as well as one of its most polluted, with Greater Los Angeles ranking as the smoggiest metro region in the country and getting an "F" from the American Lung Association for both smog-forming NOx pollutants and particulate matter. Diesel-fueled goods movement vehicles are a major culprit, contributing more than half of the region's NOx emissions and over 10% of its particulate matter emissions, leading policymakers and regulators to target these fleets as they seek to address this persistent public health challenge.

Between the state-level California Air Resources Board (CARB) and the regional South Coast Air Quality Management District (SCAQMD), there are several interlocking requirements as well as incentives in place to steadily reduce the number of diesel-fueled vehicles on the road in Southern California — including policies specifically targeting fleets and the goods movement sector.

Overall, the statewide pace of fleet electrification is set by CARB's Advanced Clean Fleets (ACF) rule. This regulation requires government fleets and all companies operating 50 or more medium- or heavy-duty vehicles in California to either purchase only zero-emission vehicles (ZEVs) for new vehicles starting in 2024, or else meet steadily-escalating "milestones" of ZEV adoption as a percentage of their entire fleet until reaching 100% between 2035 and 2042 depending on vehicle type. The ACF rule will also require 100% of the medium- and heavy-duty vehicles sold in the state to be ZEVs starting in 2036.

Many distribution fleets in SCAQMD territory will face additional pressure to electrify from the Warehouse Actions and Investments to Reduce Emissions (WAIRE) program, which targets goods movement specifically. Under WAIRE, owners and operators of warehouses of at least 100,000 square feet must take actions to earn "WAIRE Points" or else pay mitigation fees, with the number of points required based on the number of trips made to and from the warehouse annually. Compliance actions may be selected from a menu that includes the acquisition and use of EVs as well as non-fleet steps such as the installation of on-site solar panels or air filters.

Collectively, these rules will force fleets operating in California — and in other states that typically follow California's lead on vehicle regulations — to electrify faster than the rest of the market. Fortunately for fleet owners, there are a variety of financial incentives available to reduce the costs of medium- and heavy-duty EVs for early adopters, including state-level grants from the California Energy Commission (CEC), South Coast-specific regional grants from the Mobile Source Reduction Committee (MSRC) of SCAQMD, and federal tax credits.

This combination of regulatory "sticks" and incentive "carrots" has effectively put fleet operators in California on notice: the future is electric, and fleets that begin that transition today will be rewarded.

Delivering for Southern California's Restaurants

Quality Custom Distribution (QCD), a Golden State Foods company, is a food service logistics provider that serves over 7,500 quick-service restaurants across the country with a fleet that clocks 38 million miles on the road every year. Their nationwide network of 25 distribution centers includes two in California – a warehouse in La Puente in Los Angeles County, which exclusively supplies all of the Starbucks locations in the metro area, and a smaller one in Fontana in San Bernardino county.

With CARB's Advanced Clean Fleets rule setting a phaseout date for their use of diesel-fueled vehicles in California, QCD was eager to take advantage of opportunities to get ahead of the curve and facilitate a smooth transition to EVs. Moreover, many major restaurant chains including Starbucks have set ambitious long-term sustainability goals and will be subject to climate disclosure rules for their Scope 1, Scope 2, and (in California) Scope 3 emissions, making the transition to EVs a priority for QCD's customers as well.

QCD's electrification journey began with its participation in the Volvo LIGHTS (Low Impact Green Heavy Transport Solutions) project, a public-private partnership between Volvo Trucks and major fleets in Southern California that began in 2020 with funding from CARB and SCAQMD. As one of 12 Southern California fleets participating in the program, QCD had the opportunity to test out a Volvo VNR Electric truck, which operated various nightly last-mile distribution routes of nearly 100 miles roundtrip from its Fontana distribution center.

The performance of the VNR Electrics was sufficiently impressive for QCD to commit to ordering 30 of the trucks to electrify two-thirds of the 45-truck fleet operating out of its La Puente distribution center. This decision was also aided by the availability of generous incentives from the MSRC's Last Mile Freight Program (LMFP) and HVIP funding from the CEC, which covered a combined 80% of the costs of the electric trucks.

The Electricity Supply Challenge

The addition of five 480 kW fast chargers for QCD's new electric truck fleet could more than double the previous maximum load of their La Puente facility, a major increase in demand that would likely trigger the need for an expensive and potentially time-consuming site electrical capacity upgrade. The limits posed by site electricity capacity has bedeviled fleet EV projects in California in particular, with quotes for utility upgrades recently escalating from 2 years to 4 years or more and sending fleet managers scrambling to revise their electrification timelines.

QCD was all too aware of the potential electricity supply challenges the project might face after their utility gave them an estimated wait time of over 2 years to upgrade the site capacity at their Fontana warehouse. Thus, when QCD's charging provider InCharge brought in Scale to evaluate the potential for an on-site microgrid to avoid the need for an electric service capacity upgrade, QCD was ready to listen.

Beyond the potential to expedite operations for their EV chargers, QCD placed a high value on the added resilience benefits of having multiple on-site DERs supplying backup power. As a supplier of perishable food and beverage items, QCD already had provisions to use a mobile diesel generator to provide emergency backup power for their refrigerated warehouse, and the addition of critical EV charging operations to their site load drove their interest in a more robust solution to ensure 100% reliable electricity supply for their fleet as well.

Scale's Microgid Solution

Scale has designed a microgrid that will incorporate multiple on-site DERs to power the La Puente distribution center and its fleet depot. Advanced controls will allow Scale to manage charging and dispatch of each resource at optimal times to maximize cost, sustainability, and resilience benefits while simultaneously minimizing grid demand to avoid the need for a utility service capacity upgrade.

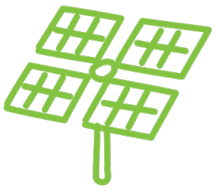
- **Solar**: To reduce electricity supply costs and boost the emissions benefits of the facility, Scale will build 1,240 kW of on-site solar capacity, including a 1,000 kW rooftop installation and an additional 240 kW incorporated into the carport.

- **Battery Storage**: The addition of a 770 kW on-site battery system with 3,000 kWh of capacity will allow this solar energy to be stored and used throughout the day at times of maximum value, while also optimizing charging and discharging to minimize demand charges.

- **Backup Generator**: A 1,500 kW low-emission backup generator will enable QCD to avoid the need to roll in mobile diesel-fueled generators and rely instead on a cleaner and less expensive solution capable of meeting a larger portion of the site's load.

Unlike the vehicles, this $8.3 million microgrid is not supported by grant funding or other incentives. Instead, it is being financed through a 20-year microgrid services agreement (MSA) with Scale, enabling QCD to avoid any capital expense and instead pay an annual all-in service fee that covers the microgrid costs as well as its operations and maintenance.

Including avoided costs for WAIRE compliance and diesel backup generation, the microgrid will allow QCD to reduce the overall cost of meeting its fleet electrification goals while ensuring 100% uptime for its fleet as well as its refrigerated warehouse operations.



1,240 kW
Solar PV

770 kW
Battery Storage

1,500 kW
Backup Generator

Multiple Benefits of QCD's Microgrid

QCD's microgrid will be up and running in less than two years, enabling it to begin charging its EV fleet sooner than if it had waited for their utility to upgrade their service capacity. Moreover, the combination of robust on-site generation and Scale's optimized controls will ensure that the microgrid will also be able to support the electrification of the remaining 15 vehicles in QCD's fleet. Thus, the project gives QCD's fleet managers the ability to start operations sooner as well as expediting future electrification steps as necessary.

On top of over $41,000 in annual savings from the use of electrons instead of diesel for their truck fleet, the microgrid will save QCD over $192,000 in their first year. These cost savings are due to the microgrid's lower cost of electricity compared to utility service – achieved through optimized use of the solar and battery storage system to minimize both energy costs and demand charges – as well as the avoided costs of diesel backup generation and WAIRE compliance. These cost savings will very likely increase over time if and when utility rates increase, giving QCD valuable certainty and control over their long-term charging costs.

The electricity provided by its microgrid will also lower QCD's carbon footprint. By drawing on the on-site solar panels and battery storage to charge its trucks as well as power its refrigerated warehouse, QCD will reduce greenhouse gas emissions by 31% compared to the utility grid. And, by getting its VNR Electrics on the road sooner, the microgrid will also help QCD do its part to reduce smog and particulate pollution from diesel vehicles in the region.

$192,000
Annual Cost Savings

32%
GHG Emission Reductions

100%
Resilience

Conclusion - Driving Towards the Future

Already a leading early adopter of EVs through its participation in the Volvo LIGHTS program, QCD is demonstrating continued leadership in its approach to electrifying its La Puente fleet depot. By working with Scale to install a microgrid to power their EV chargers, QCD is accelerating the electrification of its fleet. The microgrid also gives QCD the freedom to pursue its plan to electrify the remainder of its California fleet within the next 5 years, a milestone which will put it well ahead of the 2035 deadline set by the ACF regulation.

The microgrid's integration of solar, battery storage, and backup generation with Scale's optimized controls will also provide superior electricity service compared to relying exclusively on the grid. The combination of cheaper, cleaner electricity from solar and the sophisticated energy management made possible by battery storage and Scale's optimized controls will deliver substantial cost savings and emission reductions. Moreover, QCD will have additional peace of mind from a 100% resilient system that will enable its refrigeration and EV charging operations to power through grid outages.

"QCD's long-term commitment to sustainability and our customers' success depends upon reliable clean energy infrastructure like the on-site microgrid we're building at our Los Angeles distribution center," said Shane Blanchette, QCD's Vice President Operations. "As we pursue emissions reduction initiatives, our partnership with Scale Microgrids and In-Charge Energy will enable QCD to leverage emerging technologies in clean energy to resiliently power our growing battery-electric truck fleet."

The use of EVs in QCD's California fleets is only the beginning of the company's electrification journey. With distribution centers spread across the country, QCD understands that future federal regulations as well as customer demands for sustainability could lead it to electrify fleets in other states as well. While its pace of EV adoption will inevitably vary from location to location, the microgrid-enabled success of its La Puente facility will give it a blueprint for future depot electrification initiatives.

California's combination of strict regulations and generous incentive programs are pushing the pace of vehicle emission reductions in the state, but when the rubber hits the road it's companies like QCD that ultimately drive change. By being at the forefront of adopting innovative technologies – and innovative approaches to deploying them, like microgrids – QCD is providing a roadmap for other fleets to make their own electrification journeys easier to navigate.

SCALE
MICROGRIDS