247 ENERGY

Charging the Fleet Without Waiting for the Grid

How on-site storage and power let depots charge electric fleets when the grid connection is too small, too slow, or not there at all.

James Troch

Chief Executive Officer

247 Energy NV

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FOREWORD

The Real Bottleneck of Fleet Electrification

Fleet electrification is usually discussed in terms of vehicles: their range, their price, their batteries. Those problems are being solved. Electric trucks, vans, and buses are arriving, improving, and falling in cost. The bottleneck has moved, and it now sits somewhere less visible and harder to fix: the depot, and specifically the power needed to charge a fleet once it gets there.

A fleet that cannot charge cannot run, and charging a fleet demands far more power, concentrated into far tighter windows, than the site it sits on was ever built to draw. The grid connection that comfortably served a depot of diesel vehicles is not remotely sized to recharge that same fleet overnight as electric. Operators discover this not when they buy the vehicles but when they try to power them, and by then the order is placed and the deadline is set.

I write this paper because the charging problem is solvable today, without waiting for a grid upgrade that may be years away. The answer is to put energy infrastructure at the depot: storage to buffer the charging demand so a modest connection can charge a large fleet, and on-site generation to supply power where the connection cannot. This turns charging from something the grid grants on its own timetable into something the operator controls on theirs.

The operators who treat charging power as a designed part of the depot will electrify on schedule and run their fleets without interruption. The ones who assume the grid will simply provide it will find their electrification plans waiting in a queue. This paper is about being in the first group.

James Troch, Chief Executive Officer, 247 Energy

THE CONTEXT

Why the Depot Is the Hard Part

The problem moved from the vehicle to the power

For a decade the barriers to fleet electrification were in the vehicles: too little range, too high a price, too few models. Those barriers are falling fast. As they fall, a different barrier has become the binding one, and it sits at the depot rather than on the road. The challenge now is not whether the fleet can be electric but whether the depot can deliver the power to charge it.

The numbers make the problem plain. A diesel vehicle refuels in minutes from a tank that holds days of energy. An electric vehicle must draw that energy from the grid through a charger, and a depot full of them must do so within the hours the fleet is parked. Charging a fleet therefore concentrates a very large amount of power into a narrow window, and the size of that power demand routinely dwarfs everything else the site uses.

That demand meets a connection sized for a different era. The grid connection serving a depot was specified for the building, the lighting, and the handling equipment, not for recharging an entire fleet. Adding fleet charging on top can multiply the site's peak demand several times over, far beyond what the existing connection can carry, and enlarging a connection in a congested grid can take years.

So the operator faces a gap between a near-term electrification commitment and a connection that cannot support it on the required timescale. Closing that gap by waiting for the grid means missing the commitment. Closing it at the depot, with energy infrastructure that lets the existing connection do far more, means meeting it. The rest of this paper is about how the second path works.

THE DEMAND

The Shape of Charging Demand

Concentrated, high-power, and scheduled

To power fleet charging well, you have to understand its shape, because it is unlike ordinary site demand. Fleet charging is concentrated: vehicles return together and charge together, in the gap between shifts or overnight, so the demand arrives as a large, simultaneous draw rather than a steady load. It is high-power: depot chargers, especially for trucks and buses, pull heavily, and many at once create a peak measured in large fractions of a megawatt or more. And it is scheduled: the fleet must be ready by a fixed departure time, so the charging cannot simply be spread out indefinitely to suit the grid.

This shape is expensive in two ways. First, the connection must be rated for the peak, so an unmanaged charging operation forces the site to buy or upgrade to a connection sized for its highest instantaneous draw, most of which sits unused the rest of the day. Second, where demand charges apply, that brief, towering peak can dominate the energy bill, because tariffs price the peak rather than the average.

> ***A fleet refuels on a deadline. The charging has to be done by departure, which is exactly why the demand arrives as one large, simultaneous peak.***

The shape is also unforgiving of interruption. If the depot cannot deliver the scheduled charge, vehicles leave with too little energy or do not leave at all, and the fleet's service suffers directly. Charging is not a background utility at an electric depot. It is on the critical path of the operation, and anything that disrupts it disrupts the business.

These three features, concentration, high power, and a hard schedule, are precisely the profile that on-site storage is suited to manage. A buffer that can absorb energy slowly and release it quickly turns a sharp, scheduled, high-power demand into a smooth draw on the grid, which is the core of charging a fleet without rebuilding the connection.

THE MISMATCH

The Connection That Was Not Built for This

Why the grid is the obstacle

The grid connection is where fleet electrification most often stalls, for reasons that have little to do with the fleet itself. The connection was sized, sometimes decades ago, for an operation that drew a fraction of what a charging depot needs. Asking it to carry fleet charging on top is asking it to deliver a multiple of its design capacity, which it cannot do.

The obvious remedy, a larger connection, runs into grid congestion. In many regions the local network has no spare capacity to give, and a reinforcement to provide it can take years of planning, permitting, and construction. A depot that needs charging power within months cannot wait for a connection upgrade measured in years, and increasingly the upgrade is not even on offer at any timescale.

This converts a vehicle decision into a grid decision, and the grid decision is the slow one. An operator can have the vehicles, the chargers, the drivers, and the routes ready, and still be unable to run because the single missing input is power at the depot. Electrification deadlines set by regulation or by customers do not pause for connection queues, so the gap between commitment and capacity becomes a real operational risk.

The way out is to stop treating the connection as the only source of charging power. The connection is one input. Storage that lets that input do far more, and on-site generation that supplies power the input cannot, together free the depot from depending on a grid upgrade it cannot control. The charging problem becomes an engineering problem at the depot rather than a waiting problem at the grid.

THE BUFFER

The Buffer Between Grid and Vehicle

How storage lets a small connection charge a large fleet

The central tool for charging a fleet on a constrained connection is a storage buffer between the grid and the chargers. The idea is straightforward. The grid connection charges the buffer slowly and steadily across the whole day, while the buffer charges the vehicles quickly during the charging window. The grid sees a flat, modest draw. The fleet receives the sharp, high-power delivery it needs.

This decoupling is powerful because it breaks the link between the connection size and the charging peak. Without a buffer, the connection must be rated for the instantaneous power of every charger running at once. With a buffer, the connection only needs to supply the fleet's average daily energy, spread over the full day, while the buffer provides the burst. A depot can therefore charge a far larger fleet than its connection could ever support directly, on the connection it already has.

> ***Without a buffer the connection must carry every charger at once. With one, it only carries the daily average, and the depot charges a far larger fleet.***

The buffer also removes the demand-charge penalty. Because the grid never sees the charging peak, the site avoids the charges an unbuffered peak would trigger, and it can draw its energy when power is cheapest rather than when the fleet happens to need it. The storage shifts the charging load in time as well as smoothing it in power, which lowers the cost of the energy on top of relieving the connection.

The technology of the buffer matters for this duty. Charging is a high-power, high-frequency, daily task, exactly the work that wears a conventional battery and exactly the work a supercapacitor is built for. A supercapacitor buffer charges and discharges fast, switches instantly between the two, tolerates heavy daily cycling without rapid degradation, and cannot catch fire next to the vehicles and people it serves. For a buffer that must deliver hard power every day for years at a depot, those properties are the requirement, not a bonus.

BEYOND THE CONNECTION

Charging Where the Grid Cannot Reach

On-site generation for depots with weak or no power

A buffer multiplies what a connection can do, but it cannot create energy the connection does not supply. Some depots face the harder version of the problem: a connection too weak to provide even the fleet's average daily energy, a temporary or remote site with no usable connection at all, or a charging requirement so large that no plausible upgrade will meet it in time. For these, charging needs power generated on site.

Containerised generation provides it. A unit delivered to the depot can be operational in under four hours, supplying charging power independently of the grid, with no permanent infrastructure and no construction programme. For an operator that would otherwise be unable to charge at a site, or unable to charge enough of the fleet, on-site generation is what makes electrification possible there at all.

The fuel choice keeps the charging clean and affordable. Generation on liquefied natural gas produces roughly a quarter less carbon dioxide than diesel and cuts nitrogen oxide emissions by close to ninety-nine percent, while costing substantially less to run over its life. Charging an electric fleet from clean on-site generation preserves the environmental case for electrifying in the first place, which charging from a dirty diesel generator would undermine.

As with the grid-congestion case, on-site generation is best understood as a bridge and a complement rather than a permanent substitute. It lets a depot electrify and operate now, on the timescale the fleet demands, and it can be scaled back as grid capacity arrives or paired with storage and any available connection to form a hybrid that draws on each source where it is strongest. The point is that no depot need wait for the grid to begin charging its fleet.

THE DESIGN

Designing the Charging Depot

Storage, generation, and smart charging as one system

A charging depot performs best when storage, any on-site generation, the chargers, and the charging schedule are designed as one system rather than bought as separate parts. The connection, the fleet size, the charging windows, the route energy needs, and the available roof or land all shape how much storage and generation a site needs and how they should be operated. A buffer sized without reference to the fleet's daily energy, or a charging schedule set without reference to the connection limit, leaves value on the table or fails outright.

Managed charging is part of the design. Not every vehicle needs full power the instant it plugs in, and a control system that sequences charging across the parked fleet flattens the demand further, making the most of the connection and the buffer together. Combined with storage, intelligent scheduling lets a depot charge more vehicles on less power than a naive approach would ever allow.

> ***Charging a fleet is not about a bigger connection. It is about designing the depot so a modest connection, a buffer, and smart scheduling do the work together.***

The design also has to plan for growth. A fleet rarely electrifies all at once. It converts in stages over years. An energy system that can start with a buffer on the existing connection, add generation as more vehicles convert, and expand storage as the charging load grows lets the depot track the electrification rather than betting on its final size from the start. This staging matches the investment to the fleet's actual transition.

Designed this way, the depot becomes able to charge its fleet reliably, affordably, and cleanly on the power it can actually get, rather than the power it wishes the grid would provide. The charging stops being the fragile, uncertain part of the electrification plan and becomes a controlled, engineered capability the operator owns.

THE ECONOMICS

Charging on Your Own Terms

The cost of acting versus the cost of waiting

The economic case for solving charging at the depot rests on a comparison the obvious framing misses. The visible cost is the storage and any generation the depot installs. The hidden cost, on the other side, is everything that follows from not being able to charge: delayed electrification, missed deadlines, a connection upgrade paid for in years of waiting, and the demand charges an unbuffered charging peak would incur. Set against that, the on-site infrastructure is frequently the cheaper path, not the more expensive one.

The direct savings are real as well. A buffer avoids the cost of a larger connection and the demand charges of a raw charging peak, and it lets the depot buy energy when it is cheapest. Clean on-site generation, where needed, costs substantially less to run than diesel and avoids the connection upgrade altogether. Over the life of the depot, the energy system frequently pays for itself out of the charges and upgrades it removes, before the value of electrifying on time is even counted.

The strategic value is larger still. An operator that can charge a fleet at depots where the grid cannot is an operator that can electrify, bid, and grow where competitors are stuck waiting for connections. Charging capability becomes a competitive asset, not just a cost line, particularly for operators running many depots who can standardise the design and deploy it across the network.

The honest framing for any fleet operator is therefore not what the charging infrastructure costs, but what being unable to charge costs. Measured that way, designing the depot to charge on the operator's own terms, rather than the grid's, is usually the sound financial decision as well as the one that meets the deadline.

THE TIMING

The Window for Fleet Operators

The timing pressure on fleet charging is acute because several clocks are running at once. Electrification deadlines, set by regulation, by customers, and by the economics of operating vehicles, are fixed and approaching. The fleets converting to electric all need depot charging power in the same period, and the grid capacity, equipment, and installers to provide it are scarcest exactly when demand for them peaks.

Grid congestion compounds the pressure. The connection upgrades some operators are counting on are slow where they are available and unavailable where they are not, and the queues lengthen as more sites reach for capacity together. An operator that secures its charging power now, with storage and on-site generation rather than a connection upgrade, steps out of that queue entirely.

There is a first-mover advantage in depot capacity itself. The operator that builds charging capability early locks in the ability to electrify and grow, while later movers find the grid more congested, the equipment more scarce, and the deadlines closer. The capability compounds: each depot solved makes the next easier, and the operational know-how built early pays across the whole network.

The conclusion mirrors the rest of this series. The bottleneck in fleet electrification has moved to the power at the depot, that bottleneck can be cleared today with storage and on-site generation rather than a grid upgrade, and the advantage goes to the operators who clear it ahead of the deadlines and the congestion. A fleet that can charge is a fleet that can run, and charging is now a problem to be engineered at the depot rather than awaited from the grid.

Charging Power, Designed for the Depot

247 Energy develops, builds, and operates distributed energy solutions that let fleet operators charge electric vehicles without waiting for a grid upgrade. Our work combines on-site energy storage as a charging buffer, containerised power generation where the connection cannot supply enough, and the integration of on-site solar, designed around a depot's fleet, charging windows, and connection limit.

Our storage is built on supercapacitor technology, which suits depot charging for specific reasons. It delivers and absorbs high power and switches between charge and discharge instantly, which is what buffering a charging peak demands. It tolerates the heavy daily cycling of a charging duty without rapid degradation. It cannot enter thermal runaway, so it can sit safely among vehicles and people and in ATEX-classified areas, and it operates from minus twenty to plus fifty-five degrees Celsius for outdoor depots. It runs quietly at around fifty-five decibels and is warranted for ten thousand cycles or ten years, with a projected lifetime of up to fifty thousand cycles.

Our containerised generation runs on liquefied natural gas and is operational in under four hours from delivery. Against an equivalent diesel installation it produces roughly a quarter less carbon dioxide, cuts nitrogen oxide emissions by close to ninety-nine percent, and can roughly halve the total cost of ownership, which lets a depot charge cleanly where the grid connection is weak, delayed, or absent.

At utility scale, 247 Energy develops, builds, and co-invests in battery energy storage parks rated at 100 MW and above, with a current European pipeline spanning two regions and five countries and a combined capacity of 505 MW / 2,025 MWh. We retain skin in the game in the assets we develop, and we work with co-investors and partners who share a long-term view of energy infrastructure.

For fleet operators planning electrification, and for partners interested in co-investment, we welcome direct engagement. We can discuss specific depots in detail, from sizing a charging buffer against a constrained connection to supplying clean on-site power where no connection is available, under appropriate confidentiality arrangements.

247 Energy NV

Schaarbeekstraat 20E/11 | 9120 Beveren, Belgium

+32 3331 0000 | storage@247.energy | 247.energy