247 ENERGY

Behind the Meter,

Ahead of the Curve

Battery Storage for Industrial and Commercial Decarbonisation

What every industrial energy director, CFO, and sustainability lead needs to understand.

James Troch

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FOREWORD

Why Energy Costs and Carbon Commitments Are Now the Same Problem

For a long time, conversations about energy cost and conversations about carbon reduction occupied separate rooms in most organisations. The finance team wanted lower electricity bills. The sustainability team wanted a credible net-zero roadmap. These were treated as competing priorities, each requiring its own budget, its own reporting line, and its own set of compromises. Behind-the-meter battery energy storage is one of the most significant technologies to have collapsed this distinction, because it genuinely serves both agendas at the same time, through the same asset, on the same balance sheet.

Industrial and commercial energy consumers are the group most exposed to the structural shifts currently reshaping electricity markets. Rising network charges, growing exposure to volatile wholesale prices, tightening carbon reporting obligations, and increasing pressure from customers, lenders, and regulators to demonstrate credible decarbonisation progress are all converging simultaneously. The organisations that respond to this convergence with integrated solutions will have a structural cost and reputational advantage over those that continue to treat energy cost and carbon as separate problems requiring separate remedies.

At 247 Energy, our development work in utility-scale battery storage has given us a detailed understanding of the value that battery systems can create when they are positioned correctly relative to a site's load profile, its renewable generation assets, and the grid tariff structure it operates under. This paper draws on that understanding to provide industrial and commercial decision-makers with a practical framework for evaluating behind-the-meter battery storage as both an economic investment and a decarbonisation instrument. The numbers, when examined honestly, make a compelling case.

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Rising Costs, Rising Commitments

A Structural Change in the Energy Environment

Industrial and commercial organisations face an energy environment that is structurally different from the one that prevailed a decade ago. Electricity prices have become more volatile as the share of weather-dependent renewable generation in the supply mix has grown, while network infrastructure charges have risen to fund the grid reinforcements needed to accommodate that renewable capacity. The result is that energy procurement, which many organisations once treated as a largely administrative function, has become a significant financial risk management challenge requiring active strategy and sophisticated market engagement.

At the same time, the external commitments attached to energy consumption have multiplied. Corporate net-zero targets, Scope 2 emissions reporting under established accounting frameworks, supply chain decarbonisation requirements from major customers, and increasingly prescriptive green finance conditions from lenders have transformed energy management from a cost centre into a strategic business function. An organisation that cannot demonstrate a credible pathway to reducing the carbon intensity of its electricity consumption faces growing constraints on its access to capital, its relationships with key customers, and its ability to attract and retain skilled employees.

The conventional response to rising energy costs has been demand reduction through efficiency measures: better insulation, more efficient motors, LED lighting, and process heat recovery. These interventions remain valuable and should be pursued where the economics support them. However, they address energy consumption rather than the way energy is procured and used in relation to the grid. Behind-the-meter battery storage operates in a different dimension: it reshapes the timing and structure of energy flows between the site and the grid, creating value from the arbitrage between periods of high and low electricity prices without requiring any reduction in the energy-intensive activities that the site performs.

> ***The industrial site that installs behind-the-meter battery storage does not consume less energy; it consumes the same energy more intelligently, buying when the grid is cheap and green and avoiding the moments when it is neither.***

The convergence of rising costs, rising commitments, and falling battery prices has created a market window that is attractive for behind-the-meter storage investment in a way that was not the case even three years ago. Battery system costs have fallen significantly over the past decade, while the spread between peak and off-peak electricity prices in most markets has widened as renewable generation creates predictable periods of surplus and scarcity. The economic case for behind-the-meter storage has improved substantially, and the organisations that move now will establish cost structures and carbon positions that their slower-moving competitors will find difficult to replicate.

Understanding the full value of behind-the-meter battery storage requires a site-specific analysis that accounts for the local tariff structure, the load profile of the facility, the characteristics of any on-site generation, and the available grid connection capacity. However, the general framework of value creation is consistent across a wide range of industrial and commercial contexts, and the sections that follow set out the key value drivers in a form that allows decision-makers to assess their relevance to their own situation before commissioning a detailed feasibility study.

PEAK SHAVING AND DEMAND CHARGES

The First Revenue Layer

How Storage Reshapes the Industrial Electricity Bill

The most immediately quantifiable value of behind-the-meter battery storage for industrial and commercial sites is its ability to reduce peak demand charges. In most industrial electricity tariff structures, a significant portion of the total electricity bill is not determined by the volume of energy consumed but by the peak level of power demand recorded over a defined measurement period, typically fifteen or thirty minutes. This peak demand charge reflects the cost of the network capacity that must be reserved to serve the site at its maximum possible draw, regardless of how briefly that maximum is actually reached.

A battery storage system positioned between the grid connection and the site's internal distribution system can intervene at the moments when demand is approaching a new peak and inject stored energy to flatten the demand profile. The grid sees a smoother, lower maximum demand, and the demand charge on the electricity bill is reduced accordingly. The battery charges during periods of low demand, often overnight or during midday periods when on-site solar generation is producing surplus energy, and discharges during the demand peaks that would otherwise trigger the highest charge tiers. This cycle can be repeated daily without significant degradation to the battery system when properly managed.

The scale of demand charge savings available depends on the site's tariff structure and the variability of its load profile. Sites with intermittent high-power processes, such as electric arc furnaces, large press operations, or high-speed packaging lines with frequent start-up cycles, typically present the strongest case for peak shaving because their demand peaks are large relative to their average consumption. The ratio of peak demand to average demand, known as the load factor, is a first-pass indicator of the potential saving available, and sites with low load factors are the most attractive candidates for behind-the-meter storage.

Beyond the direct reduction in demand charges, battery storage can also provide value through network tariff optimisation. In markets where time-of-use tariffs apply to network charges as well as to energy charges, the ability to shift consumption away from peak network tariff periods amplifies the financial benefit of storage beyond what demand charge reduction alone delivers. The combination of demand charge reduction and time-of-use optimisation can produce bill savings that justify significant investment in storage capacity, particularly for sites with high electricity costs and constrained grid connection capacity.

The demand charge reduction benefit is particularly resilient to changes in energy market conditions because it is driven by the structure of the network tariff rather than by wholesale market prices. Even in a scenario where wholesale electricity prices remain flat or decline, the demand charge component of the industrial electricity bill continues to provide a stable and predictable value layer for behind-the-meter storage. This characteristic makes peak shaving one of the most bankable elements of the behind-the-meter storage business case, suitable as the foundation for project financing rather than merely as an upside scenario.

RENEWABLE SELF-CONSUMPTION

Closing the Gap Between Generation and Load

Why Solar Without Storage Leaves Value Behind

Many industrial and commercial sites have installed or are considering on-site solar photovoltaic generation as a means of reducing electricity costs and demonstrating a commitment to clean energy. The economic performance of an on-site solar installation depends critically on the proportion of the generation that can be used directly by the site, known as the self-consumption rate, because energy that is exported to the grid typically attracts a significantly lower value than energy that displaces grid purchases. Battery storage is the most effective tool available for maximising self-consumption by bridging the temporal gap between when solar energy is generated and when the site needs it.

Solar generation follows a predictable daily pattern that is often poorly aligned with industrial load profiles. Generation peaks in the middle of the day, when some industrial processes are at reduced capacity, during shift changes, or when on-site demand is temporarily lower than its morning and evening peaks. Without storage, this midday surplus must be exported to the grid, often at low or even negative prices in markets where solar saturation regularly occurs. A battery storage system co-located with the solar installation can absorb this surplus and release it during the morning and evening demand peaks, converting what would have been a grid export into a reduction in grid purchases at the higher time-of-use tariff rates.

The improvement in self-consumption rate that battery storage can deliver depends on the relative sizing of the solar array, the battery capacity, and the site load profile. Well-sized behind-the-meter storage systems can increase self-consumption rates from the fifty to sixty percent range, which is typical for solar installations without storage, to eighty to ninety percent, capturing a substantially larger share of the economic value of the on-site generation. This improvement in self-consumption has a direct impact on the payback period of the solar investment and, in many cases, transforms projects that were marginal on a solar-only basis into clearly bankable investments.

> ***Battery storage does not make solar more productive; it makes its production more valuable, by ensuring that every kilowatt-hour generated is consumed at full tariff value rather than exported at a fraction of it.***

The combination of on-site solar and behind-the-meter storage also provides a degree of insulation against future electricity price increases. An industrial organisation that has invested in this combination is exposed to grid electricity prices only for the residual consumption that its storage-optimised solar system cannot cover. As grid electricity prices rise, the value of the solar-plus-storage system increases in proportion, because the avoided grid purchases become more valuable. This dynamic creates a natural hedge against energy price inflation that becomes more effective as the size and sophistication of the storage system increases.

Looking beyond solar, the principles of renewable self-consumption maximisation apply equally to on-site wind generation, combined heat and power systems with variable electrical output, and any situation where on-site generation is not continuously matched to on-site demand. Battery storage can smooth the output of any generation asset that exhibits temporal variability, converting that variability from a constraint into an opportunity by capturing surplus generation for deployment at the highest-value moment. As more industrial sites add multiple generation technologies, the role of storage as the integration layer that maximises the collective value of those technologies becomes increasingly central to site energy strategy.

How Storage Reshapes a Corporate Carbon Balance Sheet

Temporal Carbon Optimisation and Its Financial Consequences

Scope 2 greenhouse gas emissions, defined as the indirect emissions associated with purchased electricity, heat, and cooling, have become a central element of corporate climate reporting and are subject to increasing scrutiny from investors, customers, and regulators. Reducing Scope 2 emissions requires either shifting to electricity supply with a lower carbon intensity or reducing the overall volume of electricity purchased from the grid. Behind-the-meter battery storage contributes to both of these objectives in ways that go beyond what is commonly understood in corporate sustainability discussions.

The carbon intensity of grid electricity varies continuously with the generation mix that is supplying the network at any given moment. In markets with significant renewable capacity, periods of high wind or solar generation produce electricity with very low carbon intensity, while periods of low renewable output typically require higher-carbon dispatchable generation to meet demand. A battery storage system that charges preferentially during low-carbon periods and discharges during higher-carbon periods enables the site to consume a lower-carbon mix of electricity than the average grid intensity would suggest, without requiring any additional renewable generation or any change in the site's total consumption.

This temporal carbon optimisation can be combined with geographic matching of renewable energy through power purchase agreements and renewable energy certificates to create a comprehensive Scope 2 decarbonisation strategy. Storage-enabled temporal matching captures the value of carbon variability within the day, while long-term renewable energy agreements address the annual average carbon intensity of the site's grid purchases. Together, these approaches can support a credible claim to near-zero Scope 2 emissions for industrial sites that are not in a position to fully meet their demand through on-site generation.

The financial value of Scope 2 reduction is no longer limited to reputational considerations. Carbon pricing mechanisms in various markets create a direct financial cost or opportunity cost associated with the carbon intensity of electricity consumption. Supply chain carbon requirements from major industrial customers are increasingly quantified and contractually specified, with suppliers facing commercial consequences for failure to demonstrate progress against agreed emissions targets. Green finance frameworks, including sustainability-linked loans and green bonds, incorporate Scope 2 performance metrics as conditions that affect borrowing costs. In aggregate, the financial consequences of Scope 2 performance are becoming material for a growing number of industrial organisations.

Battery storage also supports the procurement of renewable energy under power purchase agreements by improving the predictability and firmness of the site's consumption profile. Renewable energy generators prefer offtake partners who can commit to taking delivery of specified volumes at specified times, because this predictability reduces the risk of curtailment and improves the revenue stability of the generating asset. A storage-enabled industrial site can offer a smoother, more predictable load profile to renewable energy counterparties, potentially accessing better terms in long-term power purchase agreements and strengthening the commercial relationships that underpin a robust renewable energy supply chain.

BEYOND THE ECONOMICS

Grid Resilience, Power Quality, and Operational Security

The Benefits That Do Not Always Appear in Financial Models

The economic value drivers of behind-the-meter battery storage, compelling as they are, do not capture the full range of benefits that an industrial or commercial site derives from a well-designed system. Grid resilience, power quality, and operational security are dimensions of value that do not always appear in financial models but that can determine whether a site can maintain its operations, protect its equipment, and honour its commitments to customers during grid disturbances. For industrial processes where unplanned interruptions carry significant cost consequences, these non-economic benefits can dominate the investment case.

Grid disturbances range from brief voltage dips lasting a few cycles to complete supply interruptions lasting minutes or hours. Battery storage systems configured for uninterruptible power supply capability can respond to voltage dips within milliseconds, bridging the gap between a grid disturbance and either the restoration of grid supply or the start-up of on-site backup generation. For sensitive manufacturing processes, where a half-cycle voltage dip can cause programmable logic controllers to reset, automated equipment to fault, and production lines to require lengthy restart procedures, the ability to bridge voltage disturbances represents a significant productivity and quality protection benefit.

Power quality issues beyond voltage dips, including voltage fluctuations, harmonic distortion, and reactive power imbalances, also impose costs on industrial sites that are not always fully quantified. Battery storage systems with appropriate inverter control can actively regulate voltage at the point of connection, absorb harmonic currents produced by large variable-speed drives and other non-linear loads, and provide reactive power compensation that improves the power factor of the site's demand profile. Improved power factor can reduce the reactive power component of the electricity tariff, which in some tariff structures represents a significant additional saving beyond the active power demand charge reduction already discussed.

The resilience value of behind-the-meter storage has become more prominent in the context of increasing climate-related weather events and the associated risk of extended grid outages. Industrial organisations with critical processes, including food production, pharmaceutical manufacturing, and water treatment, face not only the direct cost of interrupted production but also potential regulatory consequences for failure to maintain continuous operation. Battery storage, particularly when combined with on-site generation and a capable energy management system, can support island mode operation that allows critical loads to continue during grid outages of meaningful duration.

The operational security dimension of behind-the-meter storage extends to the management of grid connection constraints. Many industrial sites are encountering limitations on their ability to increase grid connection capacity as they electrify thermal processes, install electric vehicle charging infrastructure, or expand production capacity. A storage system can defer or avoid the cost of grid connection upgrades by managing the peak demand that the site presents to the network, effectively increasing the effective capacity of the existing connection without the lengthy permitting and capital expenditure associated with a formal connection upgrade.

POLICY AND MARKET LANDSCAPE

Incentives, Carbon Markets, and Grid Tariffs

The Regulatory Tailwind Behind Behind-the-Meter Storage

The policy and market environment for behind-the-meter battery storage is evolving rapidly across most developed economies, and the direction of travel is broadly favourable for industrial and commercial storage investment. Understanding the key policy mechanisms, market structures, and regulatory frameworks that affect the economics of behind-the-meter storage is essential for organisations that want to time their investment decisions effectively and structure their projects to capture the available incentives.

Grid tariff structures are the most immediate policy variable affecting the economics of behind-the-meter storage. Tariff structures that include significant demand charge components, time-of-use energy charges, and reactive power penalties create the strongest economic case for storage investment. Tariff reform processes are ongoing in many markets, and the direction of reform is generally towards greater cost-reflectivity, including stronger peak demand signals and more granular time-of-use differentiation.

Industrial organisations that invest in storage now are likely to find the economics improving rather than deteriorating as tariff reform progresses.

Carbon pricing and carbon market mechanisms create an additional financial dimension to the behind-the-meter storage investment case. Where electricity is subject to a carbon price mechanism, the ability to shift consumption away from high-carbon periods reduces the effective carbon cost of the site's electricity purchases. Where corporate carbon reporting frameworks require disclosure of Scope 2 emissions, the measurable reduction in carbon intensity that storage-enabled temporal optimisation delivers supports a stronger disclosure narrative and may reduce the cost of sustainability-linked financing.

Demand response programmes and flexibility markets provide an additional revenue stream for industrial organisations with behind-the-meter storage. Grid operators and energy suppliers in many markets offer financial incentives to consumers who can temporarily reduce their grid demand at times of network stress or high wholesale prices. A battery storage system provides the most flexible and lowest-cost mechanism for delivering these demand response services, because it can absorb the reduction in grid demand without interrupting any of the site's production processes. The revenue from demand response participation adds to the financial return from storage investment and, in some markets, can be substantial.

The regulatory treatment of storage assets, including metering requirements, connection standards, and the eligibility of storage to participate in various market mechanisms, continues to evolve. Organisations that engage with their grid operators and energy market authorities early in the development process are better positioned to structure their storage assets in ways that maximise market access. The development of regulatory frameworks that explicitly recognise and reward the flexibility value of behind-the-meter storage is a policy priority in most major electricity markets, and the trajectory of these frameworks is towards greater recognition of the value that storage provides to the overall system.

Calculating the Returns from Behind-the-Meter Storage

A Framework for Multi-Value Analysis

The financial return from a behind-the-meter battery storage investment is the sum of multiple value streams, each with its own magnitude, its own time profile, and its own degree of certainty. Building a robust investment case requires a systematic approach to identifying and quantifying each value stream, assessing the evidence base for its magnitude, and constructing a combined return profile that reflects the realistic range of outcomes. The following framework provides a structure for this analysis that can be adapted to the specific circumstances of any industrial or commercial site.

The primary value streams for most industrial and commercial sites are: demand charge reduction, time-of-use energy arbitrage, renewable self-consumption improvement, and grid service revenue. Of these, demand charge reduction is typically the most immediately quantifiable, because it is derived directly from the tariff structure and the site's historical demand profile. Time-of-use energy arbitrage requires forecasting of price spreads and may be more variable. Self-consumption improvement depends on the solar array size, orientation, and shading, as well as the site load profile. Grid service revenue depends on market participation eligibility and competitive tendering outcomes.

The capital cost of a behind-the-meter battery storage system has fallen significantly over the past decade and continues to decline as manufacturing scale increases. The total installed cost, including the battery modules, inverters, balance-of-plant, grid connection works, and commissioning, varies with system size and site-specific factors, but the cost per kilowatt-hour of storage capacity has reached levels at which the payback period, when all value streams are captured, is attractive relative to other industrial capital expenditure categories. Systems that are sized to capture the full range of available value streams typically achieve better economics than those sized only for a single use case.

> ***The industrial finance director who evaluates behind-the-meter storage against a single use case will miss most of the return; the value is in the combination, and the combination is why the economics have changed so profoundly in the last three years.***

Financing structures for behind-the-meter storage are becoming more sophisticated and accessible. Operating lease structures, energy-as-a-service models, and sale-and-leaseback arrangements allow industrial organisations to capture the operational and carbon benefits of storage without a large upfront capital commitment, spreading the cost over the operating life of the asset and aligning the payment structure with the cash flows that the storage system generates. The availability of these financing structures has broadened the range of organisations for which behind-the-meter storage is a financially accessible investment.

The risk profile of a behind-the-meter storage investment is generally more favourable than that of many industrial capital expenditure categories because the primary value stream, demand charge reduction, is highly predictable and is based on a tariff structure that changes slowly relative to the investment horizon. Technology risk is manageable given the maturity of lithium iron phosphate battery technology and the availability of long-term performance warranties from established manufacturers. Market risk, which relates to the variability of energy arbitrage and grid service revenues, can be mitigated through conservative case sensitivity analysis and by ensuring that the investment is financially justified on the basis of the more certain value streams alone.

THE DECISION WINDOW

Why Industrial Decarbonisation Cannot Wait

The Costs of Delay Are Compounding

The combination of falling storage costs, rising electricity prices, tightening carbon obligations, and improving policy support creates a window for behind-the-meter storage investment that is currently more attractive than at any previous point in the technology's development. However, the conditions that define this window will not remain static. Understanding the forces that are likely to change over the coming years is important for organisations that are weighing the timing of their storage investment decisions.

Battery system costs have fallen substantially and are expected to continue declining, but the rate of decline is slowing as manufacturing capacity catches up with demand and as the marginal gains from incremental process improvements become smaller. The more important timing consideration is not the equipment cost but the accumulation of financial and carbon benefits that begin only when the system is operational. Every year of delayed investment is a year of foregone savings.

The regulatory and market environment is also evolving in ways that reward early action. Grid tariff structures are moving towards greater cost-reflectivity, which will increase the value of demand charge reduction but may also introduce new complexity in tariff navigation. Carbon pricing mechanisms are expanding in scope and increasing in stringency, which will increase the financial consequences of high Scope 2 emissions. Supply chain carbon requirements are becoming more prescriptive, with some major industrial customers moving towards contractual requirements for demonstrable Scope 2 progress from their suppliers.

Grid connection constraints represent a specific timing risk for industrial sites in locations where network capacity is under pressure. The lead time for grid connection upgrades in many markets has extended significantly as the network reinforcement required to accommodate rising renewable generation and electrification demands outpaces the capacity of network operators and contractors to deliver it. An industrial site that defers a storage investment and later finds that it needs a grid connection upgrade to accommodate electrification of its thermal processes may face a lengthy and costly delay. Storage investment now can reduce or defer this constraint.

The competitive dimension of industrial decarbonisation should not be underestimated. In industries where customers, investors, and regulators are paying close attention to carbon performance, the organisations that establish a demonstrably superior position early are likely to retain that advantage as the policy and market environment tightens. A storage-enabled site that has documented four or five years of reduced demand charges, lower Scope 2 emissions, and successful demand response participation will have a richer evidence base for its sustainability claims than a competitor that begins the same investment three years later. The carbon accounting and financial reporting benefits of early action compound over time in ways that create a durable competitive advantage.

247 ENERGY

Behind-the-Meter Decarbonisation

247 Energy NV brings the engineering depth and operational experience of a utility-scale battery storage developer to behind-the-meter projects for industrial and commercial clients. The same capabilities that enable 247 Energy to develop, finance, and operate large grid-connected battery storage parks, including in-house battery management software, a dedicated hardware security architecture, and rigorous performance monitoring, are applied directly to co-located and behind-the-meter storage solutions that serve industrial clients' specific cost and carbon reduction objectives.

247 Energy's in-house software development capability is particularly relevant for behind-the-meter applications, where the dispatch optimisation logic must balance demand charge reduction, time-of-use arbitrage, self-consumption maximisation, carbon intensity optimisation, and grid service participation simultaneously and in real time. Rather than deploying a black-box energy management system from a third-party vendor, 247 Energy develops and maintains its own operational software, giving industrial

clients full transparency into the logic governing their storage system and the ability to adapt the optimisation parameters as their energy strategy evolves.

The co-investment model that 247 Energy employs for its utility-scale portfolio can be adapted to provide industrial clients with access to behind-the-meter storage on terms that reduce or eliminate the upfront capital requirement. Under this model, 247 Energy retains a stake in the storage asset and participates in the revenue it generates, aligning the company's interests directly with the client's operational and financial objectives. This structure is designed for industrial organisations that want to capture the benefits of storage without diverting capital from their core manufacturing or processing investments.

With 505 megawatts of battery storage capacity under development across Belgium and surrounding markets, 247 Energy has the project pipeline, the technical capability, and the financial structure to engage with industrial clients at every scale, from single-site behind-the-meter installations to multi-site storage programmes that serve an organisation's full portfolio of production facilities. The company invites industrial and commercial organisations facing rising energy costs, tightening carbon obligations, or constrained grid connections to begin a conversation about how behind-the-meter battery storage can be structured to meet their specific requirements.

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