

The AI-Powered Convergence of Mobility and Energy



Introduction

For decades, the mobility and energy industries evolved largely independently. Energy companies generated and distributed electricity, while mobility companies manufactured and operated vehicles and consumed mainly fuel. Today, mobility and energy are evolving into a tightly connected ecosystem, where progress in one industry increasingly impacts the other.

The shift toward electric mobility, the rise of software defined and autonomous vehicles, and the explosive growth of artificial intelligence in mobility and automotive applications are creating an unprecedented level of interdependence between the two industries. Mobility is becoming increasingly dependent on electricity, while the energy sector must adapt to support both transportation electrification and AI driven infrastructure.

At the same time, electrification is transforming mobility companies from large energy consumers into owners of valuable energy assets, including batteries, charging infrastructure and sophisticated energy management systems. AI is accelerating this transformation by enabling these assets to operate more efficiently and to create value beyond transportation itself.

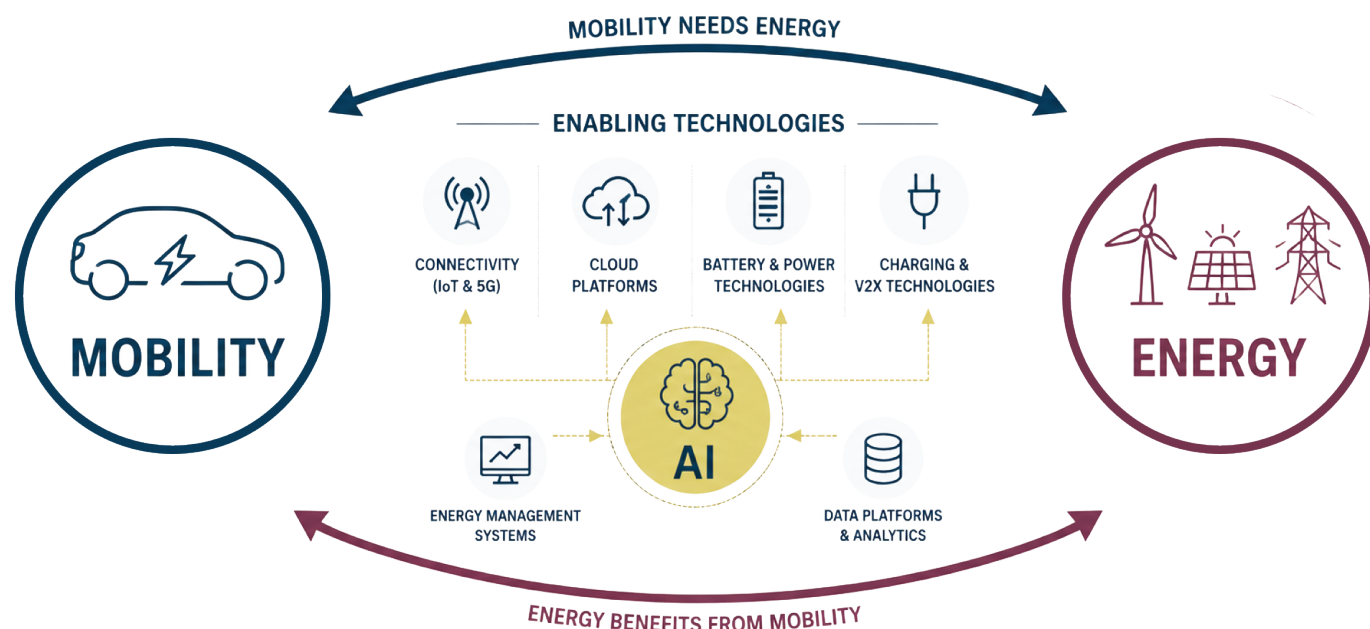
As a result, the relationship between mobility and energy is evolving from a traditional supplier–customer model into a shared ecosystem, creating both opportunities and challenges for mobility companies. Success will increasingly depend on each organization's ability to define its strategic position within this ecosystem and build the capabilities required to support that role.

This report explores the forces driving the convergence between mobility and energy, including the technological innovations, business models and ecosystem developments that are reshaping both industries. It presents the strategic positions that mobility players, including mobility service providers, vehicle manufacturers, fleet operators and aftermarket companies, can pursue along the mobility–energy continuum, and highlights real world examples of organizations that are already putting these strategies into practice.

The objective of this report is to encourage strategic thinking around the evolving role of energy within the mobility industry and to identify the key areas in which organizations should invest and innovate. By understanding the available strategic options and the capabilities required to support them, mobility companies can begin building the technologies, partnerships and organizational capabilities needed to successfully execute their chosen strategy.

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The Rise of The Mobility–Energy Ecosystem



➤ Mobility Has Become Increasingly Dependent on Electricity

For more than a century, the mobility industry relied on energy in the form of liquid fuels to power transportation, while electricity played only a limited supporting role. Vehicle manufacturers and fleet operators purchased fuel as an operational input, with relatively little interaction with the broader electricity system. These days, the transition toward electric mobility is fundamentally changing this relationship. Electricity is not simply replacing gasoline or diesel, it has become a strategic resource that directly influences vehicle performance, operating costs, charging availability and long term competitiveness.

The electrification process of passenger vehicles, commercial fleets and public transportation has significantly increased the industry's dependence on electricity. Unlike conventional vehicles, electric fleets require reliable charging infrastructure, sufficient grid capacity and smart energy management methods and systems. Fleet operators must optimize when and where vehicles are charged, balancing electricity prices, grid constraints, renewable energy availability and operational requirements. As a result, managing electricity has become a core operational capability rather than a supporting utility function.

This transformation is already visible at the global energy system level. According to the International Energy Agency (IEA), electricity consumption from EVs has increased from approximately 70 TWh in 2020 to around 250 TWh in 2025, more than tripling in just five years. Although EVs still account for only about 1% of global electricity consumption, they already contribute more than 10% of annual growth in global electricity demand, making transport one of the fastest growing drivers of electricity consumption worldwide.

At the same time, vehicles are evolving into connected, software defined and increasingly autonomous computing platforms. Advanced driver assistance systems, onboard AI processors, continuous connectivity, cloud services, over-the-air software updates and autonomous driving technologies all require substantial electrical power. Moreover, much of the intelligence behind modern mobility resides outside the vehicle itself, relying on cloud infrastructure and AI data centers that continuously process and exchange data with connected fleets.

Together, electrification and vehicle intelligence are transforming the role of electricity within the mobility industry. Electricity is not required solely to propel vehicles, it also powers the digital infrastructure, computing platforms, and AI capabilities that define modern transportation. As mobility becomes increasingly electrified, connected, and autonomous, electricity is evolving from a fuel substitute into a strategic capability that directly shapes business performance, operational resilience and competitive advantage.



Electric Mobility Could Support the Future Energy System

The growing dependence of mobility on electricity comes at a time when the energy industry is facing one of its greatest challenges in decades. Global electricity demand is rising rapidly as transportation, industrial processes and buildings become increasingly electrified. At the same time, the rapid expansion of AI is driving unprecedented demand for electricity to power data centers, high-performance computing infrastructure and the supporting transmission and distribution networks. Together, these trends are placing increasing pressure on electricity generation, grid capacity and network resilience. Reflecting these trends, global electricity consumption has increased by approximately 13% over the past five years and is projected to grow by a further 3.5% per year by 2030, highlighting the accelerating pressure on energy systems worldwide.

While electric vehicles contribute to this growing demand, the transition to electric mobility is also creating a new class of distributed energy assets. Every electric vehicle battery, charging station, fleet depot, stationary battery and energy management platform represents infrastructure that in principle could support the electricity system in addition to its primary transportation function. Although these capabilities remain at an early stage of adoption, they offer the foundation for a fundamentally different relationship between mobility and energy.

Smart charging can shift electricity consumption to periods of lower demand or greater renewable energy availability. Bidirectional charging technologies can enable vehicle batteries to temporarily return electricity to buildings, other vehicles, electric devices or even the grid. Fleet depots equipped with stationary storage, renewable generation and smart energy management systems can optimize local energy flows and improve operational resilience. Collectively, these assets have the potential to provide flexibility, increase energy storage capacity and help balance electricity supply and demand.

Whether this vision becomes reality will depend on continued advances in technology, regulation, market design and business models. Nevertheless, the infrastructure being deployed to enable electric mobility is creating an opportunity that extends well beyond transportation. Rather than serving solely as electricity consumers, mobility companies have the potential to become valuable contributors to a more flexible, resilient and renewable energy system. This emerging opportunity forms the foundation for the strategic framework presented in the following chapters.



Innovation Is Making the Convergence Possible

The convergence between mobility and energy is not driven by electrification alone. Until recently, vehicles, charging infrastructure, electricity networks and energy management systems operated largely as independent systems with limited interaction. Over the past decade, advances across multiple technology domains have created the technical foundation required for these systems to operate as a coordinated ecosystem.

Improvements in batteries, charging technologies, power electronics, renewable energy, stationary energy storage and distributed energy resources have significantly expanded the physical capabilities of electric mobility. At the same time, software platforms, cloud connectivity, IoT devices and advanced energy management systems have made it possible to monitor, coordinate and optimize millions of distributed assets in real time.

These innovations enable electric vehicles, charging infrastructure, buildings and electricity networks to communicate, exchange data and respond dynamically to changing operating conditions. As a result, mobility assets are no longer isolated consumers of electricity, they can become active participants in a digitally connected energy ecosystem.



Why Now?

The convergence between mobility and energy has been technically possible for several years, but a unique combination of market conditions is turning it into a strategic priority. Electric vehicle adoption continues to expand, charging infrastructure is becoming more widespread, electricity markets are becoming increasingly decentralized, and organizations across both industries are under growing pressure to improve efficiency, resilience and sustainability. At the same time, the rapid commercialization of AI is accelerating digital transformation across both mobility and energy, making it possible to manage increasingly complex systems at scale.

Among these forces, AI is emerging as the critical catalyst. As fleets, vehicles, charging infrastructure, batteries, and electricity networks become increasingly connected, the volume and complexity of data exceed the capabilities of traditional rule-based management systems. AI enables organizations to forecast demand, optimize energy consumption, coordinate distributed assets and continuously adapt operations to changing market conditions, electricity prices, renewable energy availability and operational priorities.

The same AI capabilities are also lowering the barriers to new business models. Tasks that once required manual planning or isolated control systems can now be orchestrated across thousands of connected assets in real time. This enables mobility companies not only to operate more efficiently, but also to unlock new opportunities in energy services, asset optimization and ecosystem collaboration.

As AI capabilities continue to mature, the competitive advantage will increasingly shift from simply owning electric vehicles or charging infrastructure to intelligently orchestrating these assets. Organizations that begin building these capabilities today will be better positioned to capture value from the growing convergence between mobility and energy.

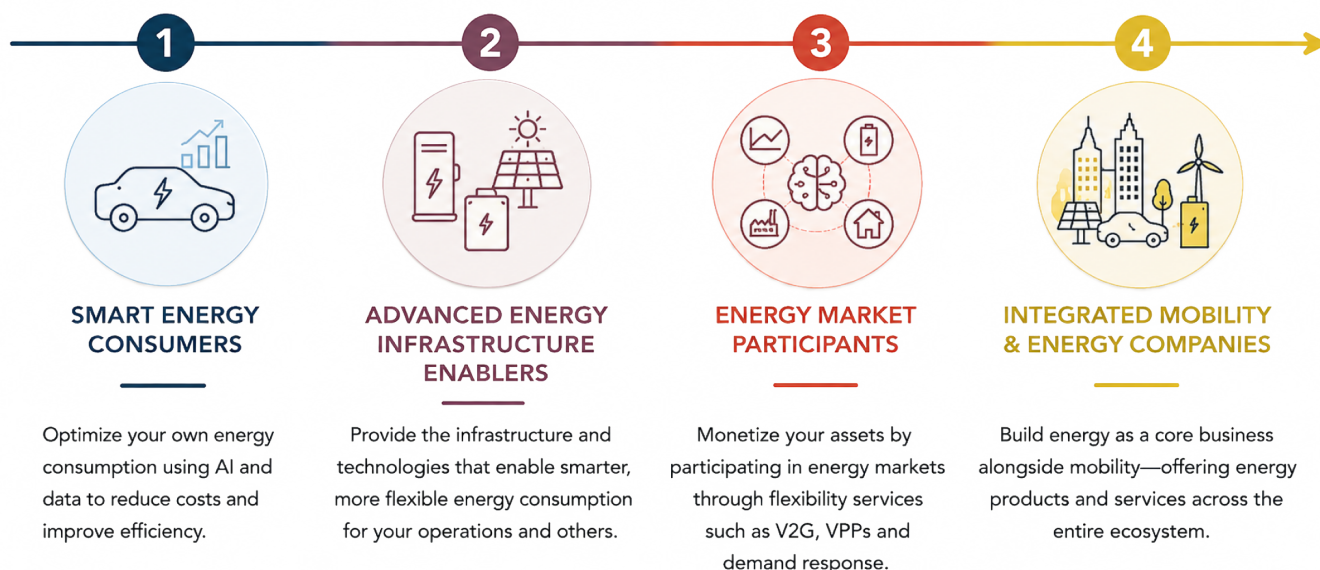
The Strategic Positioning in the Mobility–Energy Ecosystem

> The Mobility Energy Maturity Framework

The convergence of mobility, energy, and AI is creating a new strategic landscape for the mobility industry. As electricity becomes increasingly central to transportation and mobility assets gain the potential to interact with the energy system, mobility organizations must decide what role they want to play in this evolving ecosystem. For some, energy will remain an operational capability focused on efficiency and resilience. For others, it may become a source of competitive advantage, new revenue opportunities or long term business growth.

To help organizations navigate these strategic choices, we propose a four-level maturity framework that outlines the different ways mobility companies can position themselves within the emerging energy ecosystem. Rather than prescribing a single path, the framework highlights a range of strategic options that organizations can pursue based on their ambitions, capabilities, existing assets and long term business objectives.

The Mobility Energy Maturity Framework



> Level 1: Smart Energy Consumers

The first and most accessible level of participation in the energy ecosystem is becoming a smart energy consumer. At this stage, electricity remains an operational resource rather than a business opportunity. Mobility companies continue to consume electricity to power electric fleets, manufacturing facilities or logistics operations, but instead of treating energy as a fixed operating expense, they actively optimize how and when it is consumed to reduce costs, improve efficiency and strengthen operational resilience.

This approach focuses on making better use of existing assets rather than deploying new energy infrastructure. By combining real-time operational and energy data with AI-driven forecasting, energy management

systems, connected charging infrastructure, smart meters and advanced power electronics, organizations can continuously optimize electricity consumption according to operational requirements, electricity prices, renewable energy availability and grid conditions. Instead of charging vehicles as soon as they become available, charging schedules are intelligently coordinated to minimize costs while ensuring fleet readiness and business continuity.

This shift is already underway across the mobility industry. An increasing number of fleet operators are adopting dedicated energy management software to optimize electricity consumption, intelligently schedule vehicle charging, maximize battery utilization and improve overall fleet efficiency. At the same time, the fleet energy management software market is expanding rapidly, with companies such as **Make My Day, Synop**, and **Ampcontrol** partnering with fleet operators and raising significant funding to accelerate adoption.

The business case for intelligent energy management is already well established. Depending on fleet characteristics, electricity tariffs and charging flexibility, smart charging solutions can typically reduce electricity costs by 5–20%, while peak demand charges may decline by 20–50%. Although these solutions can benefit fleets of almost any size, they become particularly attractive for operators managing approximately 20–30 vehicles or more, where coordinated charging begins to generate meaningful operational and financial value. The greatest impact is typically seen in fleets with predictable charging patterns and centralized depots, such as public transportation, logistics and commercial delivery fleets.

Beyond direct cost savings, intelligent energy consumption improves asset utilization, extends battery lifetime, reduces exposure to electricity price volatility and enhances operational resilience during periods of grid congestion. Because implementation primarily relies on software and operational optimization rather than major infrastructure investments, this level typically requires relatively modest investment and can be deployed incrementally across existing operations.

As a result, becoming a smart energy consumer represents the natural starting point for virtually every mobility organization, including automotive OEMs, fleet operators, leasing companies, logistics providers, public transportation operators and other mobility businesses with significant electricity consumption. It establishes the digital capabilities, operational processes and organizational mindset required before investing in dedicated energy infrastructure and pursuing more advanced participation in the energy ecosystem.



Level 2: Advanced Energy Infrastructure Enablers

The second level represents a strategic shift from optimizing electricity consumption to deliberately building energy capabilities. Rather than relying solely on software to manage energy demand, mobility companies begin investing in advanced energy technologies and infrastructure that improve their own operations while creating the capabilities required for deeper participation in the energy ecosystem. At this stage, energy infrastructure is no longer viewed simply as a means of supplying electricity, but as a strategic asset that increases operational flexibility today and enables new business opportunities in the future.

This typically includes deploying advanced charging infrastructure, bidirectional charging capabilities, stationary battery storage, on-site renewable energy generation and integrated energy management platforms. While these technologies are initially deployed to support the organization's own operations such as reducing electricity costs, improving resilience, optimizing charging and increasing energy independence, they also create the physical

and digital foundation required for future participation in electricity markets. In other words, organizations begin investing not only in consuming energy more intelligently, but also in building the energy assets that will enable them to become active players in the evolving energy ecosystem.

This transition is already underway across the mobility industry. Several automotive OEMs, including **Ford**, **Hyundai**, **Renault**, and others, have introduced electric vehicles equipped with bidirectional charging capabilities. While current applications primarily focus on Vehicle-to-Home (V2H) and Vehicle-to-Load (V2L), these technologies establish the hardware foundation for future Vehicle-to-Grid (V2G) services.

At the same time, fleet operators are increasingly partnering with renewable and distributed energy providers to deploy on-site energy generation, battery storage and other local energy solutions that improve energy resilience and reduce dependence on the grid.

These physical investments are increasingly complemented by intelligent software. For example, **Volvo Cars** has invested in **Eliq**, which provides home energy management software, and **dcbel**, which develops bidirectional chargers and integrated energy management systems connecting EVs, batteries, solar generation, and the grid. Together, these examples demonstrate that building advanced energy capabilities requires the integration of intelligent hardware, software and distributed energy resources.

Delivering this level of capability requires significantly greater investment than becoming a smart energy consumer. Deploying advanced charging infrastructure, stationary battery storage, bidirectional charging technologies, and local energy systems often requires investments ranging from hundreds of thousands to several million dollars per site, depending on the scale and complexity of the deployment. However, these investments can generate substantial economic value by reducing long-term electricity costs, improving charging asset utilization, deferring expensive grid upgrades and increasing resilience against electricity price volatility and power disruptions.

The business case is strongest where electricity demand is both large and predictable. Public transportation operators, logistics providers, large fleet depots, manufacturing facilities and other energy-intensive mobility operations typically realize the greatest value, as the scale of their electricity consumption justifies investment in dedicated energy infrastructure. Implementation is usually gradual, often aligned with new EV launches, fleet electrification programs, charging infrastructure deployment or major facility modernization initiatives.

Beyond the immediate operational benefits, investing in advanced energy infrastructure establishes the foundation for deeper participation in the energy ecosystem. By deploying advanced energy related technologies, mobility companies begin building the physical and digital capabilities required to participate in future energy services and electricity markets. For automotive OEMs, fleet operators and other mobility players, this stage represents not only an infrastructure upgrade, but also a strategic gateway toward becoming active participants in the future energy economy.



Level 3: Energy Market Participant

At the third level of participation, mobility companies move beyond building energy capabilities and begin monetizing them through active participation in energy markets. Rather than investing in energy infrastructure solely to improve operational performance, they begin generating direct economic value by providing energy services and participating in electricity markets.

At this stage, electric vehicle fleets, charging infrastructure, stationary battery systems and other distributed energy resources are actively coordinated to deliver services such as demand response, peak shaving, and Virtual Power Plant (VPP, see explanation below) participation, where distributed energy assets are aggregated and managed as a single flexible resource. AI-powered energy management platforms continuously optimize when assets consume, store, or export electricity based on real-time electricity prices, market signals, renewable energy availability, and grid conditions. Energy assets therefore evolve from operational infrastructure into revenue-generating business assets.

This model is already beginning to emerge across the mobility industry. In 2024, **Ford, BMW, Nissan** and **Honda** launched **ChargeScape**, a joint venture that connects electric vehicles to the power grid, enabling smart charging, demand response and future V2G services. Through a partnership with **Leap**, the platform is helping build one of the largest EV-focused Virtual Power Plants in the United States.

Similar initiatives are taking shape elsewhere. **Volkswagen**, through its energy subsidiary **Elli**, is connecting EVs and home batteries to European electricity markets via its Managed Battery Network, enabling automated energy trading and V2G services. **Tesla** has also established itself as a global leader in Virtual Power Plants, integrating EVs, Powerwall batteries, and solar systems to provide grid services while generating value for both the company and its customers.

The economic potential of this model depends less on fleet size alone than on the scale, flexibility, and availability of distributed energy assets. Organizations operating large electric fleets, centralized depots, stationary battery systems and renewable generation typically realize the greatest value, as they can aggregate these assets and participate in multiple electricity market programs. Research suggests that participation in V2G and VPP programs can generate hundreds of dollars of annual revenue per vehicle, while commercial fleet studies have reported more than 10% improvements in energy-related economic value, depending on electricity market design, asset availability, and operational flexibility. While these revenues alone rarely justify the required infrastructure investments, they represent an additional value layer built on top of energy assets that already deliver operational savings, improved resilience and higher asset utilization. As fleets and their energy assets continue to scale, participation in electricity markets becomes an increasingly attractive source of incremental revenue.

While the business opportunity is compelling, capturing it requires significantly greater technological and organizational maturity. Beyond advanced energy infrastructure and intelligent energy management systems, organizations must integrate with electricity markets, aggregators, utilities and regulatory frameworks. Sophisticated forecasting capabilities, automated trading platforms, cybersecurity and compliance with local energy regulations become critical components of successful implementation. However, for organizations that successfully develop these capabilities, participation in energy markets unlocks entirely new revenue streams while increasing the return on investments already made in infrastructure.

This model is particularly relevant for organizations operating large electric fleets, extensive charging networks or significant distributed energy assets with sufficient scale and flexibility to participate in electricity markets. For these organizations, energy evolves beyond an operational resource or infrastructure investment into a strategic business capability. As electricity systems become increasingly decentralized and AI-driven, the ability to intelligently monetize energy flexibility is likely to become an important source of competitive advantage.

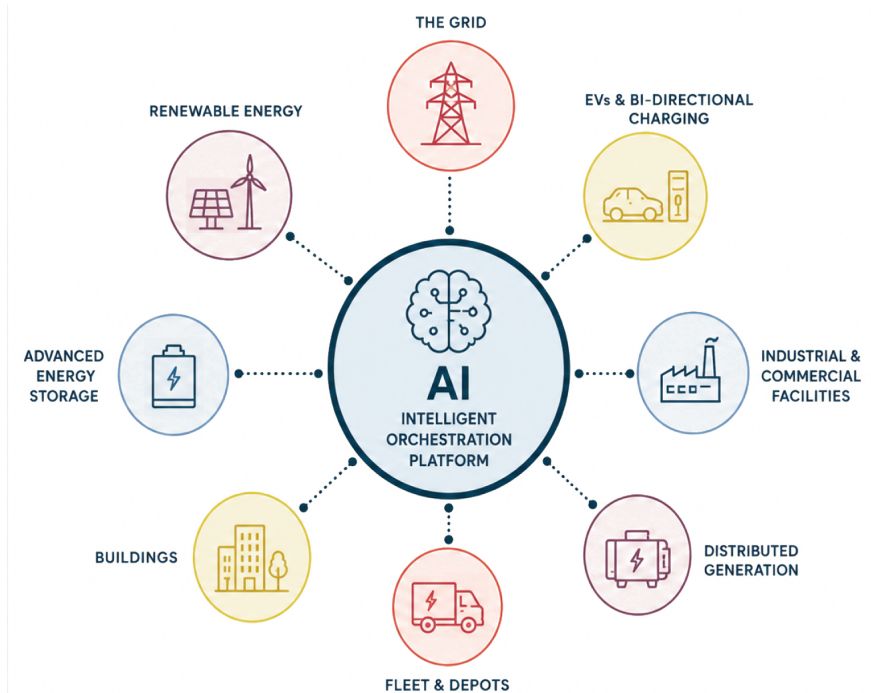
LEVEL 3

Virtual Power Plants (VPP)

A Virtual Power Plant (VPP) connects distributed energy resources and flexible assets into a single, intelligent network.

An AI-powered platform forecasts demand and supply, optimizes dispatch, and orchestrates energy flows in real time.

By coordinating these assets, VPPs balance the grid, integrate more renewable energy, and create new revenue opportunities through energy markets and flexibility services.



Level 4: Integrated Mobility & Energy Companies

The fourth and most advanced level represents a fundamental strategic shift in which energy evolves from a supporting capability into a core business domain. Rather than simply consuming electricity, building energy infrastructure, or participating in electricity markets, mobility companies begin developing and commercializing dedicated energy products, services and business models that create value for customers far beyond their own mobility operations.

At this stage, organizations leverage their expertise, infrastructure, digital platforms and customer relationships to build integrated mobility and energy offerings. These may include public charging networks, Energy-as-a-Service (EaaS) solutions, stationary battery storage systems, renewable energy generation, AI-powered energy management platforms, Virtual Power Plants (VPPs) programs, smart home and commercial energy solutions, or fully integrated charging and energy ecosystems. The objective is no longer limited to optimizing internal energy use, but it is to establish energy as an independent source of revenue, customer engagement and long-term competitive differentiation.

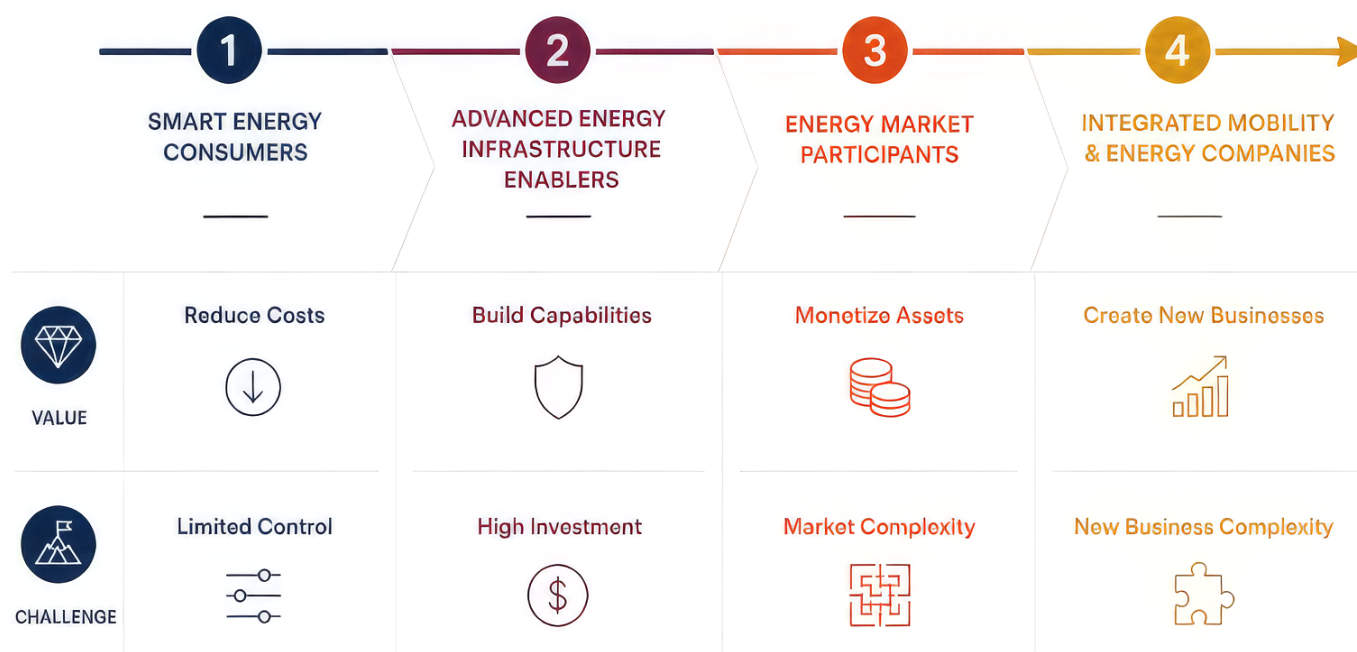
Several automotive companies have already established dedicated energy businesses alongside their traditional mobility operations, although they remain at different stages of maturity. **Tesla** has built the industry's most advanced mobility-energy business, offering stationary battery storage, solar energy systems, Virtual Power Plant programs, and AI-enabled energy management solutions through its integrated energy division. In 2025, Tesla's Energy Generation and Storage business generated approximately \$12.8 billion in revenue, representing around 13.5% of the company's total revenue, demonstrating that energy can evolve into a substantial standalone business. **Ford** and **General Motors** are pursuing a similar long-term vision through **Ford Energy** and **GM Energy**, offering stationary battery storage, bidirectional charging, home energy systems, and integrated energy management solutions that extend the value of their electric vehicles. While these businesses currently contribute only a small share of overall revenue, they represent strategic investments designed to create future growth platforms, strengthen customer relationships and position both companies to capture opportunities at the intersection of mobility and energy.

Achieving this level requires significant long-term investment, new organizational capabilities and a broader strategic vision. Beyond deploying energy infrastructure, organizations must invest in dedicated product development, software platforms, digital services, manufacturing capabilities, customer support, regulatory compliance, sales channels and ecosystem partnerships. For leading mobility companies, these investments are typically measured in hundreds of millions, and in some cases billions, of dollars over multiple years, reflecting the scale required to establish energy as a meaningful standalone business. Companies must also develop expertise across energy technologies, digital platforms, customer-facing energy solutions and electricity markets while building partnerships throughout the energy ecosystem.

The business opportunity extends well beyond electricity sales. By combining mobility products with energy services, companies can create recurring software and service revenues, increase customer lifetime value, strengthen customer loyalty and establish integrated ecosystems that are significantly more difficult for competitors to replicate. Rather than competing solely on vehicle performance or price, organizations begin competing on the value of an end-to-end mobility and energy ecosystem.

This approach is best suited for organizations with substantial financial resources, strong technology capabilities, and the ambition to expand beyond traditional mobility markets. While implementation is complex and typically requires years of sustained investment, it offers the greatest opportunity for long-term value creation. As mobility and energy continue to converge, companies operating at this level are no longer adapting to the energy transition, they are actively shaping it, positioning themselves as integrated mobility and energy providers for the decades ahead.

The Value–Complexity Tradeoff



Conclusion: From Energy Transition to Strategic Transformation

The convergence of mobility, energy and AI is reshaping the future of the mobility industry. Electrification is changing how vehicles are powered, AI is transforming how energy is generated, managed and consumed, and rapid innovation across both industries is creating new opportunities for value creation far beyond transportation itself. As a result, energy is no longer simply an operational input. It is becoming a strategic capability that will increasingly influence competitiveness, resilience, customer value and long-term growth.

There is no single model that every mobility company should follow. Some organizations will create significant value by becoming smarter energy consumers, while others will build advanced energy infrastructure, participate in electricity markets, or establish entirely new energy businesses. The appropriate level of participation will depend on each company's strategy, assets, customer base, capabilities and long-term ambitions.

At the same time, it is important to recognize that this report is built on the assumption that the long-term future of mobility will be predominantly electric. At the time of writing, the EV market is experiencing a period of uncertainty. In some regions, particularly the United States, changing government priorities, reduced incentives and shifting investment decisions have slowed the pace of electrification and encouraged some companies to explore alternative pathways. Nevertheless, the prevailing industry view remains that electrification represents the long-term direction of mobility, even if the transition takes longer than previously anticipated.

For that reason, the strategic questions explored throughout this report remain highly relevant. Whether electrification accelerates rapidly or progresses more gradually, organizations will eventually need to determine how they intend to position themselves within the emerging mobility-energy ecosystem and what capabilities they must develop to succeed.

Every mobility organization should therefore begin answering a common set of strategic questions:

- **What role do we want to play in the future energy ecosystem?**
- **Which physical assets do we already have, or need to develop, to support that strategy?**
- **Which technological capabilities are missing?**
- **How should our business model, partnerships and organizational capabilities evolve to capture value from the convergence of mobility and energy?**

Companies that begin addressing these questions today will be better positioned to adapt as the two industries continue to converge. The winners will not necessarily be those with the largest fleets or the most charging stations, but those that combine physical infrastructure, intelligent software, AI capabilities and a clear strategic vision to create value across both mobility and energy.