

TECHNOLOGY BRIEF

Every Mile Stored

Battery technologies for the Gravity platform

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Gravity transforms vehicle motion into electricity — but capturing energy is only half the system. How that energy is stored determines how efficiently it is retained, how safely it is managed, and how reliably it can be put to work. This brief sets out Gravity's storage strategy: lithium iron phosphate (LFP) as the near-term chemistry, chosen for safety, cost, and durability under heavy cycling; a transition path toward solid-state as it matures; and a deliberately chemistry-agnostic platform designed to adopt next-generation cells without replacing core hardware.

Every mile carries energy. The right storage strategy ensures every watt recovered is retained, protected, and put to work.

The Storage Problem — What Gravity Asks of a Battery

Gravity captures energy from vehicle movement and stores it in an onboard pack. Unlike steady charging from a solar array or a grid plug, the raw energy from suspension compression arrives unevenly — a bump, a compression, a shift in load. In principle that would ask a great deal of a battery: to absorb surges, smooth them into usable charge, and handle many cycles without overheating or degrading.

In practice, however, the Gravity architecture smooths that energy in stages — most of it mechanically, before electricity is ever generated.

Smoothing begins in the hydraulics, not the battery

Gravity's dual-accumulator architecture is designed so that while one accumulator discharges to the turbine, the other is charging from suspension compression — keeping turbine flow near-continuous rather than arriving in isolated bursts. The spinning turbine runner adds further inertia, carrying output through the gaps between pulses much as a flywheel does. By the time energy reaches the electrical stage, it has already been substantially smoothed by the mechanical system itself.

GRAVITY INSIGHT

Because the pulse-smoothing starts mechanically — in the alternating accumulators and the turbine's rotational inertia — the storage system does not have to absorb a raw, spiky signal. It receives an output that is already conditioned before it arrives.

Conditioning the Output — The Capacitor as a Final Smoothing Stage

In Gravity's current architecture, a capacitor buffer sits between the generator and the battery as the last stage of the smoothing chain. Capacitors absorb and release energy almost instantly, acting as an electrical shock absorber that levels any remaining high-frequency variation before it reaches the cells — protecting the pack from stress and helping extend its service life. They are not the primary storage device; they are a conditioning layer ahead of it.

It is worth being precise about the capacitor's role: it is a feature of the present design, not a permanent fixture of the platform. Because the mechanical architecture already does most of the smoothing, the degree of electrical buffering required is modest — and as the turbine-as-flywheel behavior is further developed, a dedicated capacitor stage may be reduced or may prove unnecessary altogether. The smoothing chain is the principle; the capacitor is one current implementation of its final stage.

Think of it as suspension for the electricity — but most of the bumps are already taken out mechanically before the current ever reaches it.

Lithium-ion: the reference point

Conventional lithium-ion batteries dominate today's market, powering everything from electronics to EVs — proven, scalable, and widely available. Industry pack prices reached a record low in late 2025, with the global average around \$108 per kWh (lower in China, higher in North America and Europe), and are expected to continue declining as low-cost chemistries spread.

For Gravity, however, conventional nickel- and cobalt-bearing lithium-ion is workable but not ideal: it carries greater thermal-management demands, a shorter cycle life under frequent charge and discharge, and exposure to volatile, geopolitically concentrated raw materials. A heavy-duty fleet application cycling continuously is better served by a more robust, more stable chemistry.

The Near-Term Choice — LFP: Built for the Duty Cycle

Lithium iron phosphate (LFP) is Gravity's near-term chemistry of choice, and it is the chemistry running in current hardware. Its advantages map directly onto what a heavy-duty fleet application demands:

- **Safety:** markedly more thermally stable than nickel/cobalt lithium-ion, with far lower fire risk — critical for a pack cycling continuously on a vehicle.
- **Durability under cycling:** long cycle life (commonly thousands of cycles), well-suited to the frequent charge/discharge of a motion-capture system.

- **Cost and supply resilience:** built from abundant iron and phosphate rather than scarce cobalt and nickel, giving more stable, geopolitically resilient supply.

The tradeoff is lower energy density than nickel/cobalt chemistries — larger, heavier packs for the same capacity. In passenger EVs that matters; in heavy-duty fleet operations, where cost, safety, and reliability outweigh pack weight, the tradeoff favors LFP decisively. On price, finished LFP packs in 2026 commonly run on the order of \$120–\$280 per kWh depending on application and integration, with cell-level costs well below that and the broader trend continuing downward.

GRAVITY'S STANCE

LFP paired with the smoothing chain described above is the right storage solution for Gravity's initial production deployment — the combination that best balances safety, durability, and cost for heavy-duty fleet duty cycles.

Solid-state: the road ahead

Solid-state batteries replace the liquid electrolyte of conventional cells with a solid material, offering higher energy density, faster charging, and improved safety. The chemistry is still early: costs today remain well above mature lithium-ion, and large-scale automotive production is still scaling, with industry targets pointing toward roughly \$100 per kWh later this decade as volume builds. The direction of travel is clear even if the timeline is not precise — which is exactly why Gravity's platform is designed to adopt it when ready rather than bet on it now.

Integration and Strategy — Beyond Chemistry

Choosing a battery for Gravity is as much about system integration as chemistry. Whatever the cell, the storage system must:

- **Manage heat** — frequent cycling makes thermal management essential to pack life and safety.
- **Survive the road** — vibration, shock, and temperature extremes demand ruggedized packs.
- **Scale uniformly** — what works on one truck must work identically across thousands.
- **Offload efficiently** — stored energy must integrate cleanly with facility batteries and grid interconnections at the depot.

These requirements are sized to Gravity's output: an onboard pack engineered to absorb and hold a modeled 10 kW of continuous net capture over a long operating day, with the conversion chain validated in hardware. The storage system is specified around that conservative modeled figure — not an aspirational one.

Gravity's storage roadmap

Horizon	Strategy
Near term	Deploy LFP packs with the existing smoothing chain, optimized for heavy-duty fleet duty cycles.
Mid term	Transition toward solid-state as cost, availability, and supply chains mature.

Horizon	Strategy
Long term	Remain chemistry-agnostic — evaluate next-generation cells (e.g. sodium-ion, lithium-sulfur) as they reach viability.

Gravity is not betting on a single chemistry. The platform is built to capture motion today on proven LFP while remaining ready to adopt better cells as the market delivers them — without replacing the core hardware.

Conclusion — Where Captured Energy Becomes Usable Power

Gravity captures energy the world has wasted for a century — but it is the storage system that turns that captured energy into usable, dispatchable power. A multi-stage smoothing chain that begins in the hydraulics, proven LFP chemistry matched to heavy-duty duty cycles, and a chemistry-agnostic design that can evolve with the market together ensure the energy is retained, protected, and put to work — today on LFP, and on whatever proves best tomorrow.

Every mile counts. Every watt counts. With the right storage strategy, every mile is stored.

Battery pricing basis: BloombergNEF 2025–26 survey.

Gravity Driven Industries public edition. Figures stated by basis of evidence: measured on physical hardware, modeled in engineering simulation, or identified as not yet measured. Consistent with GDI System Figures — Current Reference v1.1, September 15, 2026.

v1.1 — public edition: internal-distribution marking removed; environmental-conditions wording corrected; energy-creation phrasing corrected; output figure labeled modeled. Supersedes the June 2026 edition for all public use.