Power Systems Architecture

Public Technical Overview — Version 1.0 | October 2026 | Project status: Concept / Research / Planning

Project maturity statement. This document describes proposed research directions and engineering concepts. Unless expressly identified otherwise, it does not report verified prototypes, tested performance, established feasibility, or products available for purchase.

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product.

Project purpose and scope

Power Systems is a proposed cross-project architecture for how Praecursor Labs devices receive, distribute, monitor, and conserve electrical power. It is not a single battery product or a claim that a universal power standard has been built. The purpose is to reduce inconsistent assumptions when future wearables, portable computers, field instruments, robots, and laboratory equipment begin development.

The source specification starts with conventional, known power technologies and emphasizes safe, modular, local-first, monitored, and repairable systems. Advanced generators and experimental storage are separate future research handoffs, not prerequisites for the core standard.

Four layers of ordinary power

Device-level power covers individual sensors, handheld electronics, processors, radios, displays, and local batteries. Module-level sharing concerns defined exchanges among compatible wearable or portable subsystems, subject to protection and communication rules. Field-level power covers portable packs and equipment supporting multiple devices. Lab-level power adds managed bench and garage resources with stronger monitoring and safety separation.

The design deliberately differentiates low-power sensors from computational devices, motors, drones, and laboratory equipment: energy capacity, momentary output, thermal behavior, and fault response are not interchangeable merely because each system uses electricity.

A practical DC-centered direction

The specification prefers DC distribution internally, with conventional voltage families for logic, USB-connected electronics, portable charging, and equipment loads. USB-C Power Delivery is an intended interoperability path for suitable handheld and field systems; higher-demand motors and equipment require different protected supply arrangements.

Exact voltage choices in the internal document are design candidates, not a publicly fixed connector or interoperability guarantee. Conversion losses, cable limits, load transients, grounding, and the protection boundary between subsystems must be determined for each physical implementation.

Power management and visibility

Battery and power telemetry are intended to be first-class device data rather than afterthoughts. Candidate observations include charge state, estimated remaining runtime, power source, selected operating mode, load demand, thermal warnings, and relevant battery health or fault signals. Estimates must be labeled as estimates and evaluated against real measurements.

A future dashboard block would display available power data, while local synchronization and logs would help compare consumption across work sessions. Not every device will support every metric; a missing sensor must not become a fabricated reading.

Operating modes and controlled trade-offs

The proposed modes include Eco, Balanced, Performance, Offline, Developer/Debug, and Emergency Low Power. They express preferences between endurance, responsiveness, debugging visibility, and reduced accessory demand. Offline Mode concerns network or cloud dependence, not the elimination of local electrical power.

A mode change is not intended to override component safety. For example, a high-performance preference cannot justify exceeding a thermal or battery-current envelope, and emergency preservation should prioritize safe shutdown and state recovery over continuing optional work.

Where power fits into other projects

Lucid Lenses, Wrist Hub, Smart Band, and AR Gloves would each have distinct power roles, rather than all requiring identical batteries. Lucid Hub is a separate portable workstation candidate. Scanner wands and sensor mesh nodes emphasize measurement and duty cycle; drones and morphing robots introduce more demanding transient loads and independent safety needs.

A smart backpack or field kit could provide an additional managed supply, while the GarageLab would host bench equipment and testing. Smart clothing and experimental computing remain special cases requiring their own constraints and validation, not automatic extensions of the wearable design.

Safety model and stop conditions

The source calls for layered warning and cutoff behavior: identify thermal or electrical irregularities, notify operators, reduce optional loads where appropriate, prevent risky work from continuing, preserve recoverable state when possible, and safely isolate affected systems. Protection cannot rely solely on a software dashboard or an AI assistant.

High-current equipment, volatile systems, and home or garage mains power require separation from everyday portable electronics. Mechanical and electrical design, protective devices, and qualified review must precede any physical test involving substantial stored energy or dangerous failure modes.

Proposed development sequence

Early work is documentation, load classification, telemetry definitions, and dashboard concepts. A laptop or existing handheld provides a realistic validation platform before a custom portable device is designed. Later phases include a sensor-node profile, wearable power planning, external device and scanner profiles, backpack field charging, then robotics and laboratory integration.

Advanced storage or generator research is a later handoff. It should be judged independently by energy accounting and safety evidence, rather than being assumed necessary for the standard power architecture to succeed.

What would count as validation

Useful evidence would include measured input and output power across realistic workloads, repeatable runtime estimates, conversion efficiency, temperature behavior, fault response, recovery after interruption, and safe behavior when incompatible devices or modules are connected. Each result should identify hardware revision, operating state, measurement method, and limitations.

Current status: system planning and documentation. No battery performance, device runtime, common physical connector, or completed cross-device integration is claimed.

Publication boundary: detailed build instructions, private component specifications, hazardous operating procedures, and unverified measurements are not included. All claims are subject to later testing and revision.

Source acknowledgment: Adapted and paraphrased from Praecursor Labs internal project research and architecture documents. Source specifications remain internal; this published overview does not replace them.

Publication: Version 1.0 · October 2026 · Praecursor Labs · Project status remains research/planning. Future revisions may update scope as evidence becomes available.