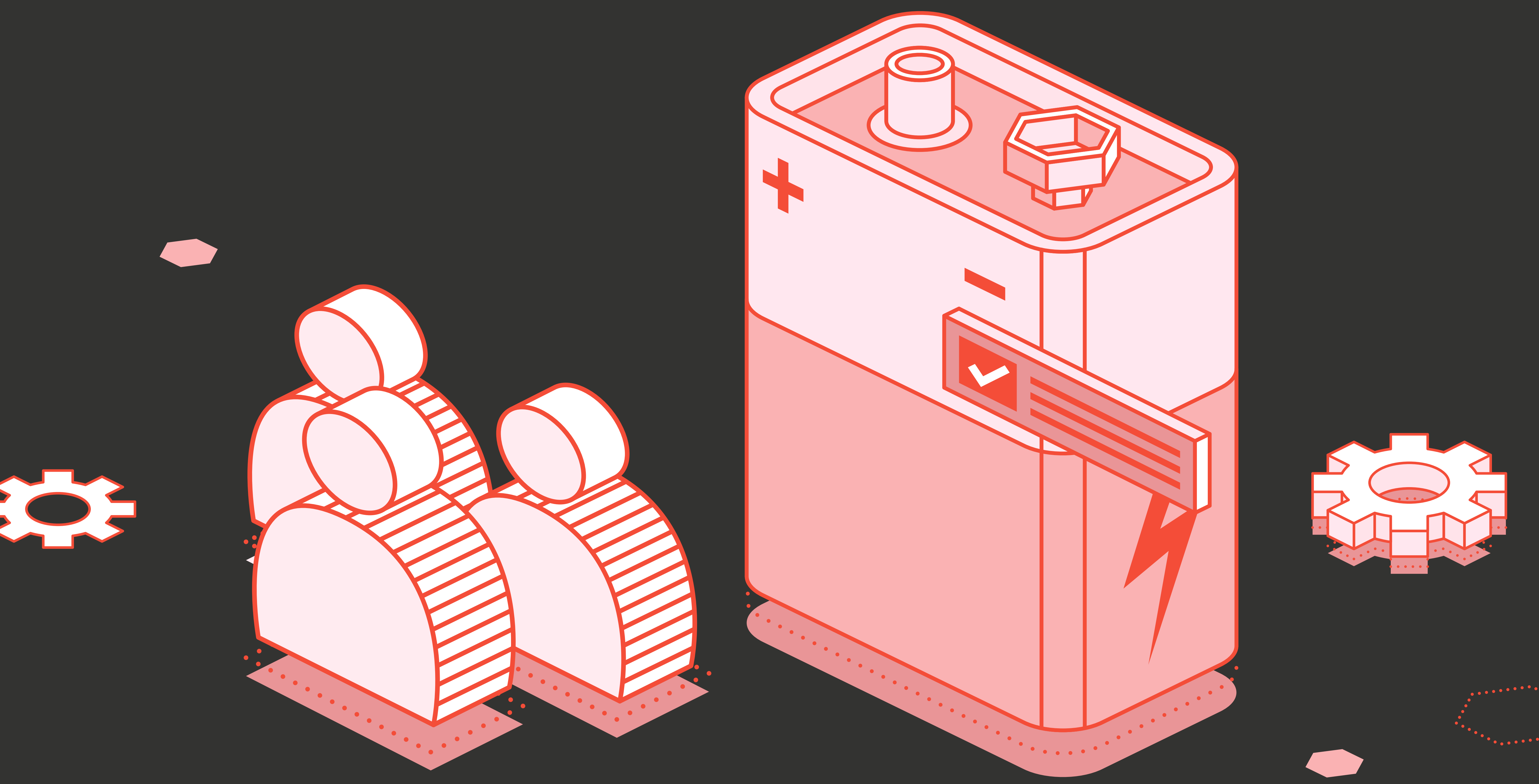
The Data Leader's Guide to EU Digital Battery Passport Compliance

How to Build the Data Infrastructure Required by EU Regulation Before 2027



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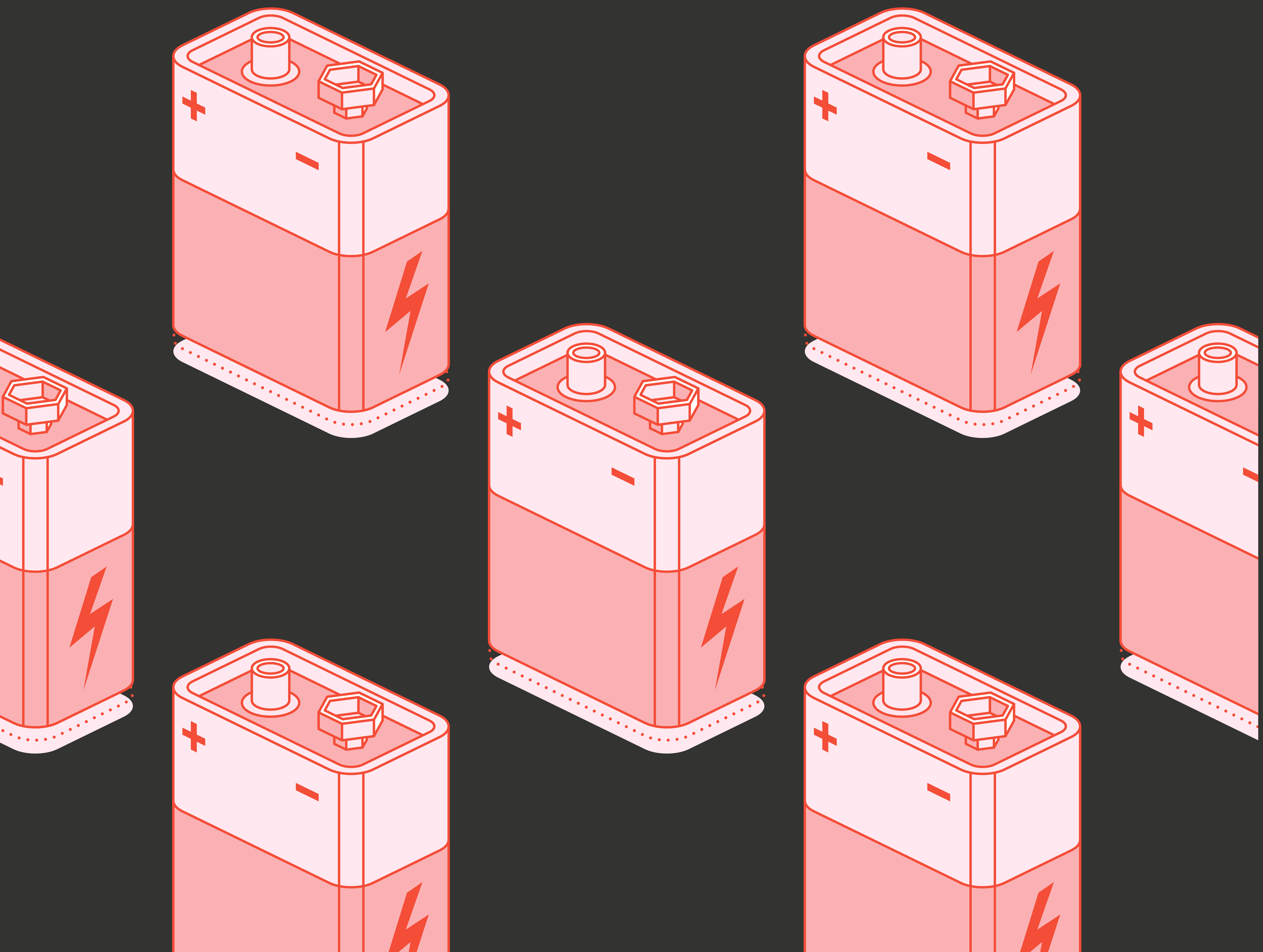


1. Key Obligations and Deadlines

EU Regulation 2023/1542 replaces the 2006 Battery Directive and introduces a comprehensive, phased set of obligations covering the entire battery lifecycle. It applies to all batteries placed on the EU market, regardless of where they are manufactured. Chinese producers, South Korean cell makers, and European pack assemblers are equally subject to the same requirements if their products enter EU commerce.

The regulation is not a single deadline. It is a rolling program of obligations, each with its own data requirements, that culminates in the full DBP mandate in February 2027.

Deadline	Obligation
Feb 2024	Regulation in force — CE marking & labelling requirements apply
Feb 2025	Carbon footprint declarations mandatory: EV batteries
Aug 2025	Due diligence obligations activated (extended to Aug 2027 for some operators)
Feb 2026	Carbon footprint declarations mandatory: industrial batteries (>2 kWh)
Feb 2027	★ Digital Battery Passport mandatory for EV, LMT & industrial batteries (>2 kWh)
Dec 2027	Recycling efficiency & material recovery targets apply
2030–2035	Minimum recycled content targets for cobalt, lithium, nickel & lead

It is worth noting that the due diligence deadline — originally August 2025 — has been extended to August 2027 for many operators, giving additional preparation time. However, the February 2027 DBP deadline is firm. No equivalent extension has been proposed or is expected.

Agility

The Digital Battery Passport is not a static product datasheet. It is a dynamic, individual-level digital record containing two categories of data:

Static data (publicly accessible)

Battery identification: unique ID, manufacturer identity, production date and location, model and type.
Technical specifications: chemical composition, capacity, voltage range, energy density.
Carbon footprint declaration: lifecycle emissions from raw material extraction to distribution,

calculated per manufacturing site and batch, third-party verified. Carbon offsets cannot be used to reduce reported figures.
Recycled content declarations: percentages of recovered cobalt, lithium, nickel and lead. Minimum targets will apply from 2030–2035.
Material due diligence: documented responsible sourcing for cobalt, natural graphite, lithium, and nickel.

Dynamic data (accessible to authorised stakeholders only)

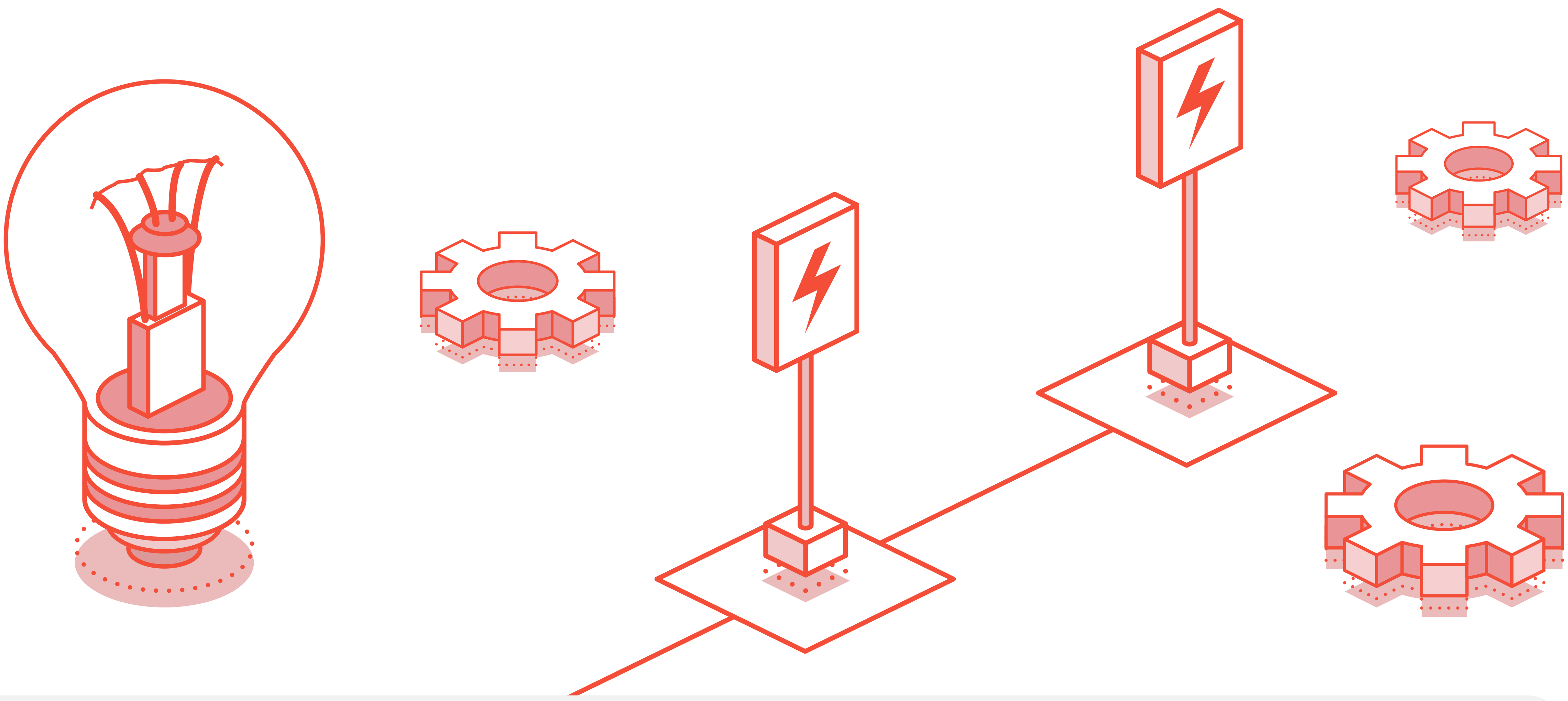
Performance and durability: state of health (SoH), state of charge (SoC), cycle count, capacity fade, electrochemical performance metrics — updated throughout the battery's operational life.
Lifecycle event records: ownership transfers, repurposing events, maintenance and repair records, second-life re-certification data.
End-of-life data: recycling facility, materials recovery yields, date of decommissioning.

The DBP is not a form you submit once. It is a data system you operate continuously — from the moment of manufacture to the moment of recycling. For data leaders, that distinction changes everything about how the problem must be solved.

Who Bears the Compliance Obligation?

Responsibility sits with the economic operator placing the battery on the EU market. For battery manufacturers selling directly to EU customers or distributors, that means the manufacturer owns the DBP creation and maintenance obligation. The regulation also makes clear that the passport must be accurate and up-to-date throughout the battery's entire life — meaning ongoing obligations, not a one-time data submission.

Manufacturers who supply to OEMs face a parallel challenge: OEMs will demand that incoming batteries have valid, complete passports, and will build supplier qualification criteria around DBP data quality. The regulatory obligation and the commercial pressure point in the same direction.



2. Why DBP Compliance Is a Data Engineering Problem

DBP compliance is frequently discussed in regulatory and sustainability circles as a reporting obligation. It is not. It is a data engineering problem — one of the most complex that battery manufacturers have faced — and treating it primarily as a compliance or legal challenge is the most common reason organisations find themselves dangerously underprepared.

Consider what the regulation actually requires at the data layer:

Individual-level traceability

Every single battery unit must have its own digital record, linked to a unique identifier, tracking its history from a specific manufacturing run through its entire operational and end-of-life journey. This is not product-level or model-level reporting. It is unit-level record management at scale.

Multi-tier supply chain data integration

Carbon footprint declarations must be built from increasingly granular (often batch- and site-level, depending on methodology) data sourced from mining companies, refiners, active material producers, and cell manufacturers — many of whom are in different countries and operating entirely different data systems.

Continuous dynamic data

In-use performance metrics must be appended to the passport record throughout the battery's operational life. This requires data pipelines from BMS systems, IoT telemetry, or vehicle telematics — systems that are often outside the manufacturer's direct control.

Append-only audit trails

Data cannot simply be overwritten. Every update must be logged with a timestamp and the identity of the party who submitted it. This is a specific architectural requirement that most standard ERP or PLM implementations do not natively support.

Role-based access control across organizational boundaries

Public data, authorized-stakeholder data, and confidential-internal data must be served differently to different parties — consumers, certified repairers, recyclers, regulators — without exposing commercial IP.

Cryptographic data integrity

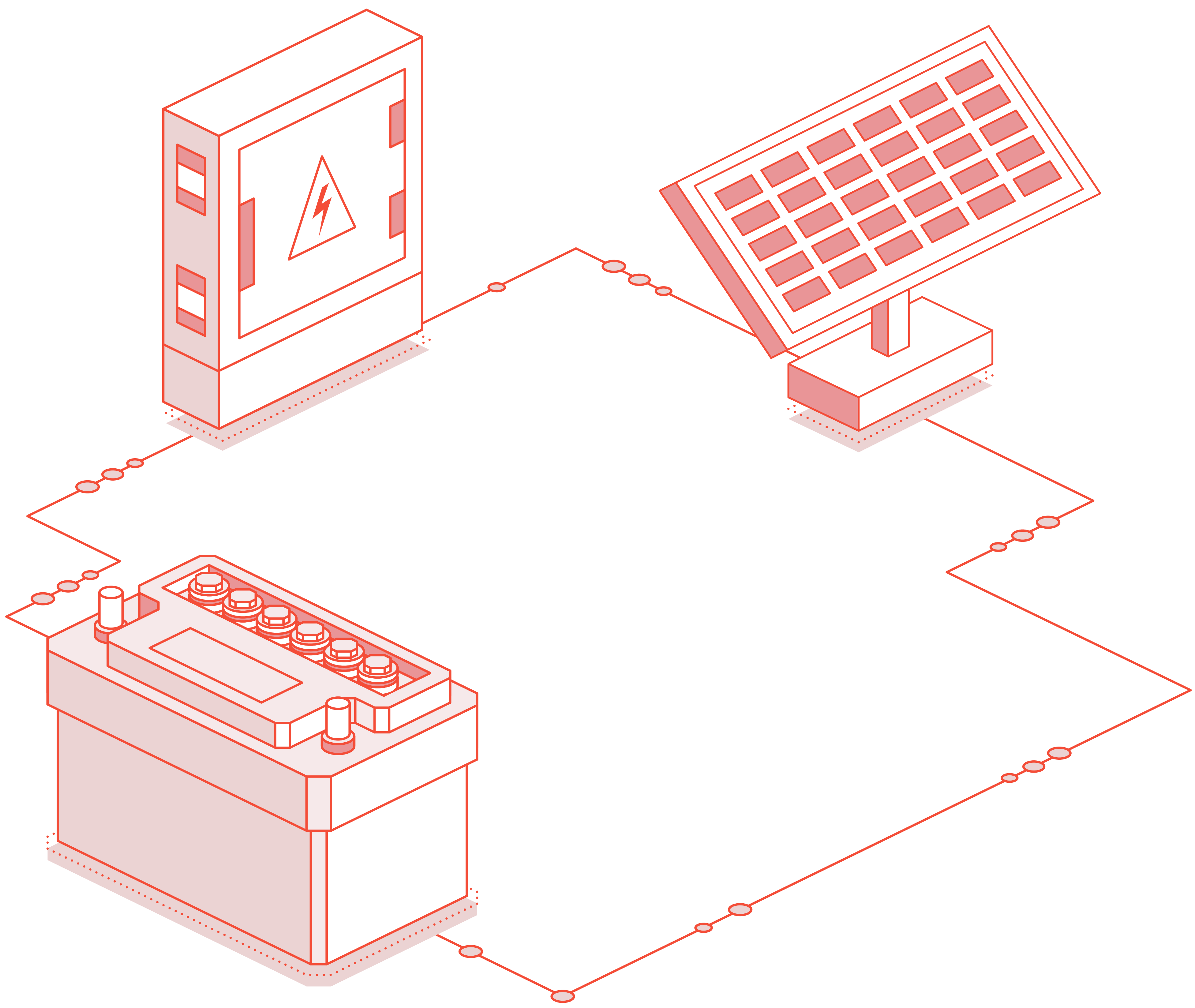
Emerging best practice in leading DBP frameworks are moving towards verifiable credentials — data that is cryptographically signed by its originating party so that downstream users can verify authenticity without centralizing trust.

A note on ERP and MES assumptions

One of the most consistent errors in early DBP planning is the assumption that existing ERP and MES systems can be extended to cover the requirement with moderate configuration effort.
This assumption is almost always wrong. Standard SAP S/4HANA, for example, does not natively support append-only event sourcing, cryptographic data provenance, or multi-tier supply chain data federation. These capabilities require new architectural layers. The ERP or MES is a valuable data source — but it is not, by itself, a DBP platform.
Informatica's analysis of early DPP implementations confirms this: assuming all required data exists in ERP or PLM systems is 'often wrong — data is frequently incomplete or inconsistent.'

The correct framing for a data leader approaching this problem is not 'how do we add DBP reporting to our existing systems?' It is 'how do we design and build a data platform that can ingest, govern, process, and share battery lifecycle data at the unit level, across organizational boundaries, continuously, for up to ten years?'

That is a genuine data engineering program. It requires architectural decisions, integration design, governance frameworks, and operational processes that take time to build correctly — which is why the 12-to-18-month implementation timeline is consistently cited by every practitioner who has worked on it.



3. The Eight Data Gaps That Put Most Manufacturers at Risk

Based on industry evidence and first-hand assessments of battery manufacturers across Europe, the following eight data gaps represent the most common, most consequential, and most frequently underestimated challenges on the path to DBP compliance. The table below summarises typical readiness and compliance risk for each category.

DBP Data Category	Typical Readiness	Common Gap	Compliance Risk
Manufacturing identity data	Strong	Usually captured in MES/ERP	Low
Bill of Materials / chemical composition	Moderate	Exists but rarely export-ready or field-level	Medium
Carbon footprint (batch-level, verified)	Weak	Estimated at product-model level; rarely batch-verified	High
Supplier provenance & ESG certificates	Weak	Requested ad hoc; no structured ingest pipeline	High
In-use performance telemetry (SoH, SoC, cycles)	Variable	Depends on OEM BMS arrangements; often not received back	High
Second-life / ownership transfer records	Very weak	No structured process in most organisations	High
End-of-life recycling yield data	Very weak	Not captured; dependent on recycler data sharing	Medium
Audit trail (who submitted what, when)	Weak	No formal provenance logging in most data systems	High

01 Gap 1: Carbon footprint data is modelled, not measured

The regulation requires granular carbon footprint declarations using PEFCR methodology and third-party verification. Most manufacturers only have annual model-level estimates based on assumed supplier data. The gap is significant, and closing it depends on upstream data quality that is difficult to control.

02 Gap 2: Supplier data pipelines do not exist

Raw material origin, ESG certificates, and emissions data must flow into internal systems in structured, verifiable formats. Today, this is often collected by email, received as PDFs, and entered manually. There are usually no automated pipelines, validation rules, or audit trails. Building them requires time and supplier cooperation.

03 Gap 3: Manufacturing data is not unit-level

MES and ERP systems often track production by batch, not by individual battery. DBP requires a unique ID for each battery linked to production, BOM, quality, and performance data. Adding unit-level traceability is possible, but often disrupts processes and may require new labeling or scanning systems.

04 Gap 4: No structured process for in-use data return

Dynamic DBP data such as State of Health, cycle count, and performance usually sits in OEM BMS or telematics systems, not with the manufacturer. Most manufacturers lack a formal process or technical connection to receive and update this data. Closing the gap requires commercial alignment and system integration.

05 Gap 5: Data silos prevent a unified view

Critical data is often spread across disconnected systems: MES for production, ERP for suppliers, quality tools for tests, and PLM for design. These systems rarely support DBP-ready data exchange. Creating one passport record per battery requires integration architecture many companies still lack.

06 Gap 6: No append-only audit trail

Standard databases overwrite old records. DBP compliance requires a clear history of every update—who changed what and when. This needs an append-only architecture designed from the start, as adding it later can be costly.

07 Gap 7: IP protection and transparency are in conflict

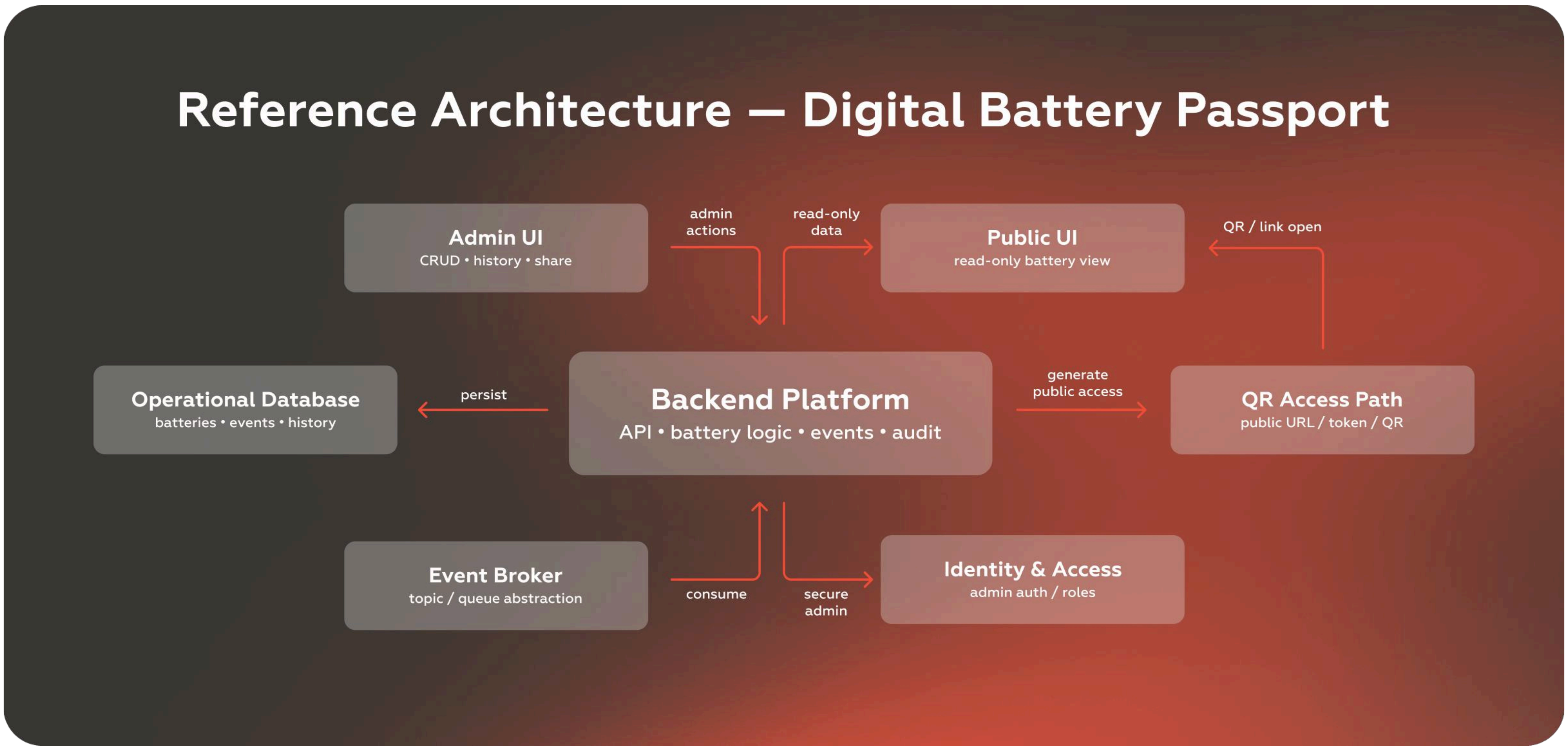
Sensitive data such as chemistry formulas, material composition, and supplier identities may overlap with DBP disclosure requirements. Sharing this information creates commercial risk. Platforms need tiered access controls for public users, regulators, partners, and internal teams.

08 Gap 8: Ownership of the data problem is unclear

DBP spans sustainability, procurement, engineering, IT, and legal teams. In many companies, no single owner is clearly responsible. This often delays progress. Clear ownership, governance, and a dedicated programme lead are essential before implementation begins.

4. A Practical Data Architecture for DBP Compliance

A compliant DBP data platform is not a single tool or a vendor product. It is a layered architecture that spans your existing enterprise systems, your supplier network, and your relationships with downstream stakeholders. What follows is the reference architecture Crunch-IS uses as the starting point for DBP platform design — a modular blueprint that can be adapted to fit SAP-based, cloud-native, or hybrid IT landscapes.



Platform Layer	Purpose	Key components
Layer 1 Ingestion	Pulls data into the platform from every source across the battery lifecycle.	MES/ERP systems · Supplier portals & APIs · IoT / BMS telemetry · LCA & carbon footprint tools · Third-party verification services
Layer 2 Repository	A cloud-based data lake or warehouse — the single source of truth for all DBP data.	Append-only audit trail · Battery-ID-keyed schema · Tiered access control (public / authorized / confidential) · Encryption at rest & in transit
Layer 3 Processing	Transforms raw data into compliance-ready outputs.	Compliance rules engine · Carbon footprint calculator (PEFCR) · Analytics & due diligence reporting · Lifecycle state management logic
Layer 4 Sharing	Controls how DBP data is accessed by authorized stakeholders and regulators.	QR-code dynamic lookup · Partner APIs (OEM, recycler, regulator) · Verifiable credential signing · Role-based access portal

01 Layer 1 — Ingestion: Connecting the Value Chain

The ingestion layer is where the most significant integration engineering occurs. It must connect four distinct source categories:

Manufacturing systems. MES and ERP integration to capture production-point data — unique battery serial numbers, Bill of Materials at the cell and module level, quality test results, and initial electrochemical performance metrics. The system must generate a DBP record stub automatically at the moment each battery is produced.

Supplier portals and APIs. Standardized interfaces for tier-1 and tier-2 suppliers to submit structured data: raw material batch IDs and origin records, ESG compliance certificates, site-specific carbon emissions data, and responsible sourcing declarations for cobalt, lithium, nickel, and graphite. Suppliers that cannot submit structured data must be supported with web-form portals that perform validation at the point of entry.

BMS and IoT telemetry. Real-time or periodic data streams from batteries in use. For manufacturers who have established data-return agreements with OEM customers, this layer receives state-of-health, state-of-charge, cycle count, and thermal event data from vehicle telematics or industrial BMS systems and appends it to the live DBP record.

External verification services. Integration with third-party LCA tools and notified body certification systems to pull in verified carbon footprint calculations and compliance certificates as they are issued.

02 Layer 2 — Repository: The Single Source of Truth

All ingested data lands in a secure, cloud-based data store designed specifically around the DBP data model. Three architectural decisions matter most here:

- **Battery-ID-keyed schema:** every data record is linked to a unique battery identifier as the primary key, with related structures for material data, performance metrics, lifecycle events, and compliance documents.
- **Append-only event sourcing:** updates are stored as new events, never overwrites, preserving the complete history required for regulatory audit.
- **Access-tiered storage:** data is partitioned and access-controlled by classification level — public, authorized-stakeholder, and confidential-internal — so that the platform can serve different views to different parties without manual data preparation.

03 Layer 3 — Processing: Turning Data into Compliance

The processing layer transforms raw ingested data into compliance-ready outputs. The critical components are a compliance rules engine that automatically validates each battery's data completeness against DBP field requirements and raises alerts for missing or non-conforming data before the battery ships; a carbon footprint calculation engine that computes lifecycle emissions from ingested supply chain data using PEFCR methodology; analytics and reporting tools that generate the annual due diligence report, compliance dashboards, and performance trend analysis; and lifecycle state management logic that tracks status transitions — manufactured, in-use, repurposed, recycled — and triggers appropriate data actions at each stage.

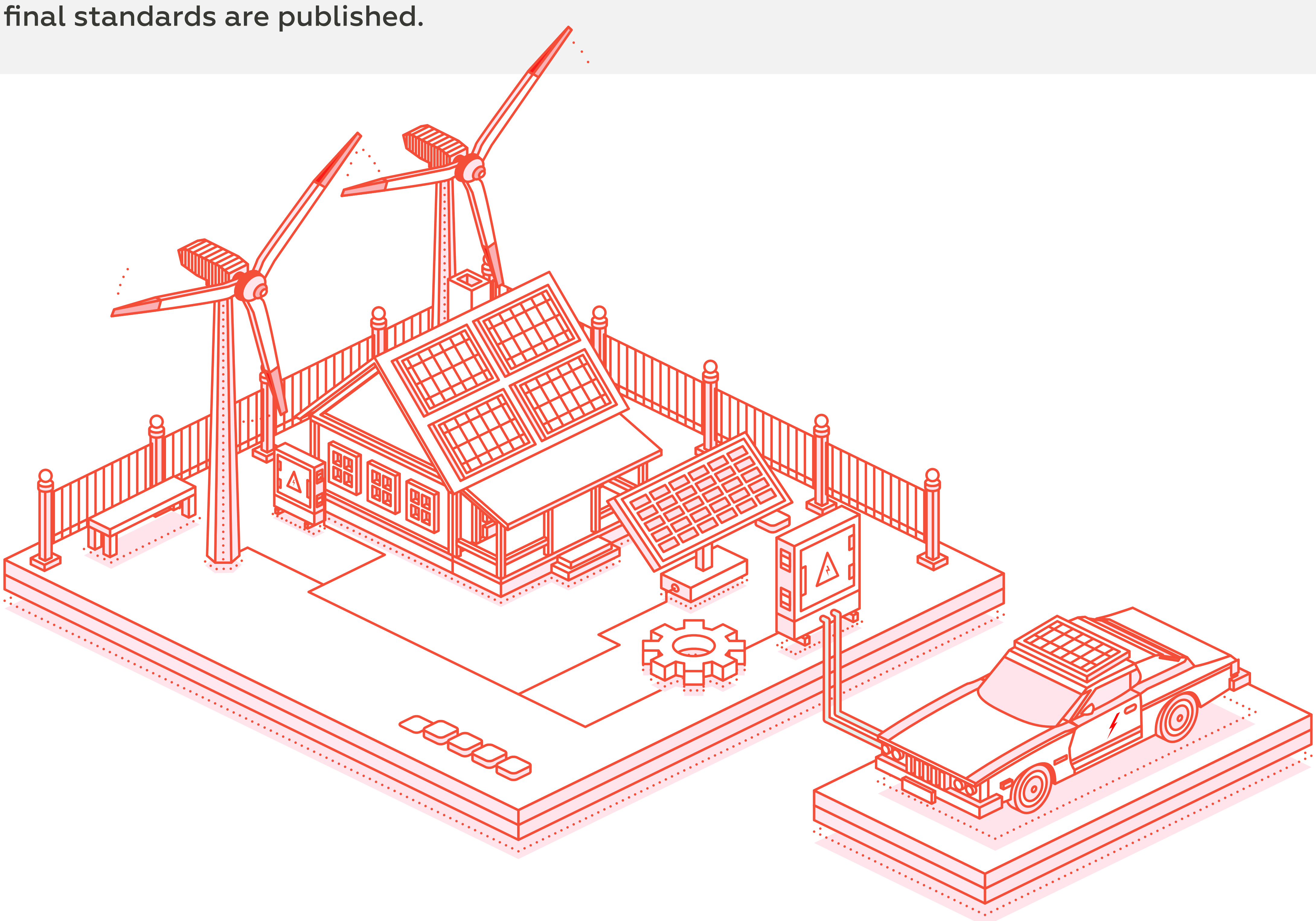
04 Layer 4 — Sharing: Controlled Access at Scale

The sharing layer governs how DBP data is served to external parties. The QR code on each battery links to a dynamic lookup that serves the appropriate data view based on the authenticated identity of the requester. Partner APIs allow OEM customers to pull manufacturer passport data directly into their own systems, and recyclers to push end-of-life records back. Regulatory reporting feeds allow EU market surveillance authorities to receive periodic submissions. Verifiable credential signing ensures that data can be authenticated by downstream parties without requiring a centralized trust authority.

A note on standards alignment

The DBP technical standards landscape is still evolving. The Battery Pass Consortium has produced data schema guidance. The Global Battery Alliance (GBA) has developed a Battery Passport Rulebook. Catena-X provides relevant infrastructure for automotive-sector data exchange. ISO/IEC standards for digital product passports are still being finalized.

The practical implication: organizations should design their data architecture to be standards-aware and adaptable, using open schema formats (JSON-LD, GS1 EPCIS 2.0) and API-first integration patterns that can be updated as delegated acts formalize technical requirements. Avoid proprietary data structures that will require expensive rework when the final standards are published.



5. From Compliance Obligation to Data Platform Advantage

There is a version of DBP compliance that is purely defensive: build the minimum viable data infrastructure to avoid regulatory penalties, treat it as a cost, and move on. Most organisations that take this approach will find that their minimum viable solution is more expensive and more disruptive than they expected — and that it delivers no business value beyond avoiding fines.

There is a different version: one where the data infrastructure built for DBP compliance becomes a strategic asset that your organisation would want even if the regulation did not exist.

The data you build for compliance is the data you need for everything else

Unit-level battery traceability, verified carbon footprint by supplier and facility, real-time performance telemetry, supply chain provenance at the material batch level — these are precisely the data assets that underpin every circular economy business model, every second-life battery programme, every premium ESG product positioning claim, and every OEM supplier qualification process that is becoming standard in the EV supply chain.
The battery manufacturers that build this infrastructure for compliance will have it as a foundation. Those that do not will need to build it anyway within the next few years, at higher cost and under greater commercial pressure. Compliance is an accelerant, not just a constraint.

Transparent data becomes a commercial differentiator

OEM procurement teams are increasingly requiring DBP compliance credentials as a supplier qualification criterion — not just because the regulation mandates it, but because it de-risks their own supply chain. A battery manufacturer that can provide a complete, verified passport for every battery it ships is materially easier to do business with than one that cannot. As the regulation becomes universal, DBP quality will become a differentiator between suppliers, not a baseline expectation.

Similarly, in ESG-driven investment environments, the ability to demonstrate auditable supply chain compliance with EU regulation reduces perceived risk and improves access to green financing instruments.

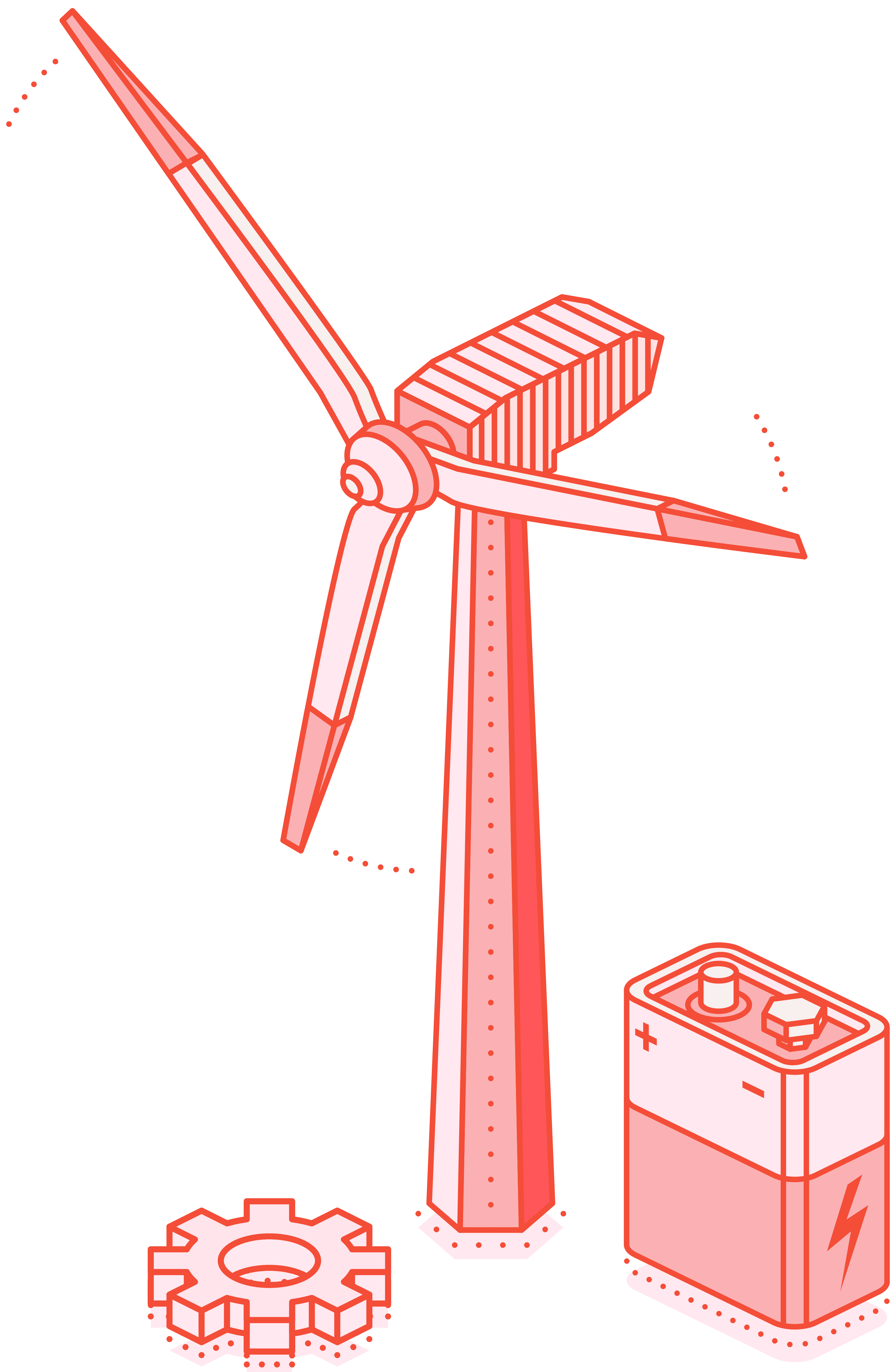
Operational intelligence as a by-product

The process of building DBP data infrastructure — multi-tier supply chain visibility, unit-level production traceability, performance telemetry pipelines — typically surfaces operational intelligence that was not previously accessible. Manufacturers working through DBP preparation programmes have identified cost reduction opportunities in material sourcing by discovering which suppliers have the highest embedded carbon, warranty management improvements from accessing field performance data, and root-cause analysis acceleration from having complete traceability records when quality issues arise.

The platform becomes the foundation for what comes next

DBP is the first mandatory Digital Product Passport in EU history. The Ecodesign for Sustainable Products Regulation (ESPR) will extend digital product passports to textiles, electronics, steel, aluminium, and construction materials in the coming years. The data governance patterns, integration architecture, and platform capabilities built for DBP compliance will be directly reusable for these future requirements.

Organisations that build a robust, flexible data platform for DBP compliance are not just solving a 2027 problem. They are building the data foundation for a decade of product regulation that is moving in the same direction.



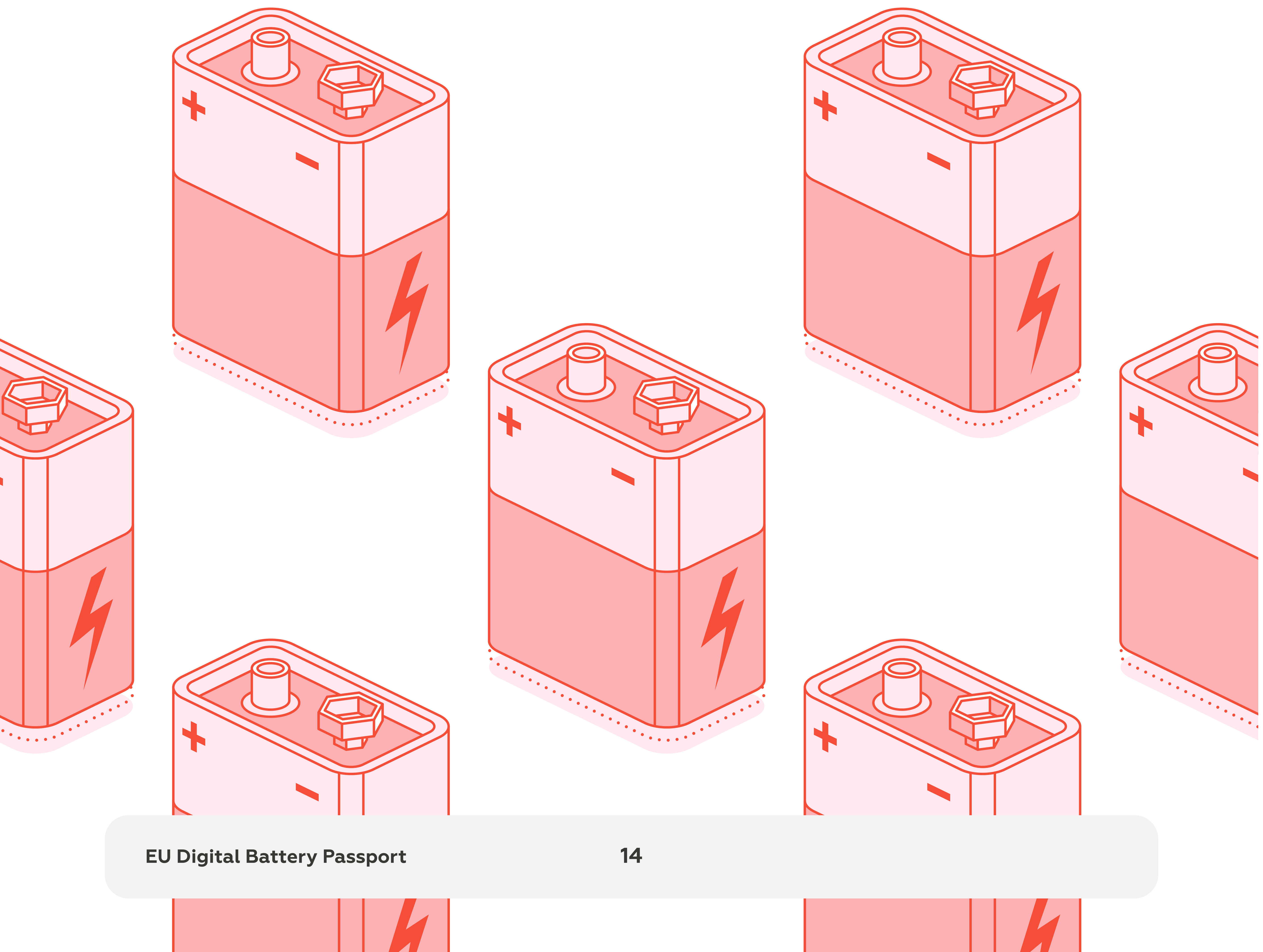
6. Conclusion

The Digital Battery Passport is not approaching. It is here. The carbon footprint declarations it depends on are already mandatory for EV batteries. The due diligence obligations are in effect. And in less than ten months, every EV and industrial battery above 2 kWh placed on the EU market must carry a compliant digital record — or it cannot be sold.

For data leaders at battery manufacturers, the question has moved past 'should we prepare?' to 'do we actually know what preparation requires, and are we moving fast enough to get there?'

Most organizations are not. The structural data gaps — fragmented supply chain data, absence of unit-level traceability, no verified carbon footprint at the batch level, no audit-ready provenance logging — are pervasive and take time to resolve. The 12-to-18-month implementation timeline cited consistently across the industry is not a worst-case estimate. It is the baseline for an organization that knows what it is doing and has made the architectural decisions correctly from the start.

The organizations that will meet the February 2027 deadline without disruption are those that begin with an honest, expert-led assessment of where they actually stand — and use that assessment to build a program that addresses the right problems in the right order.

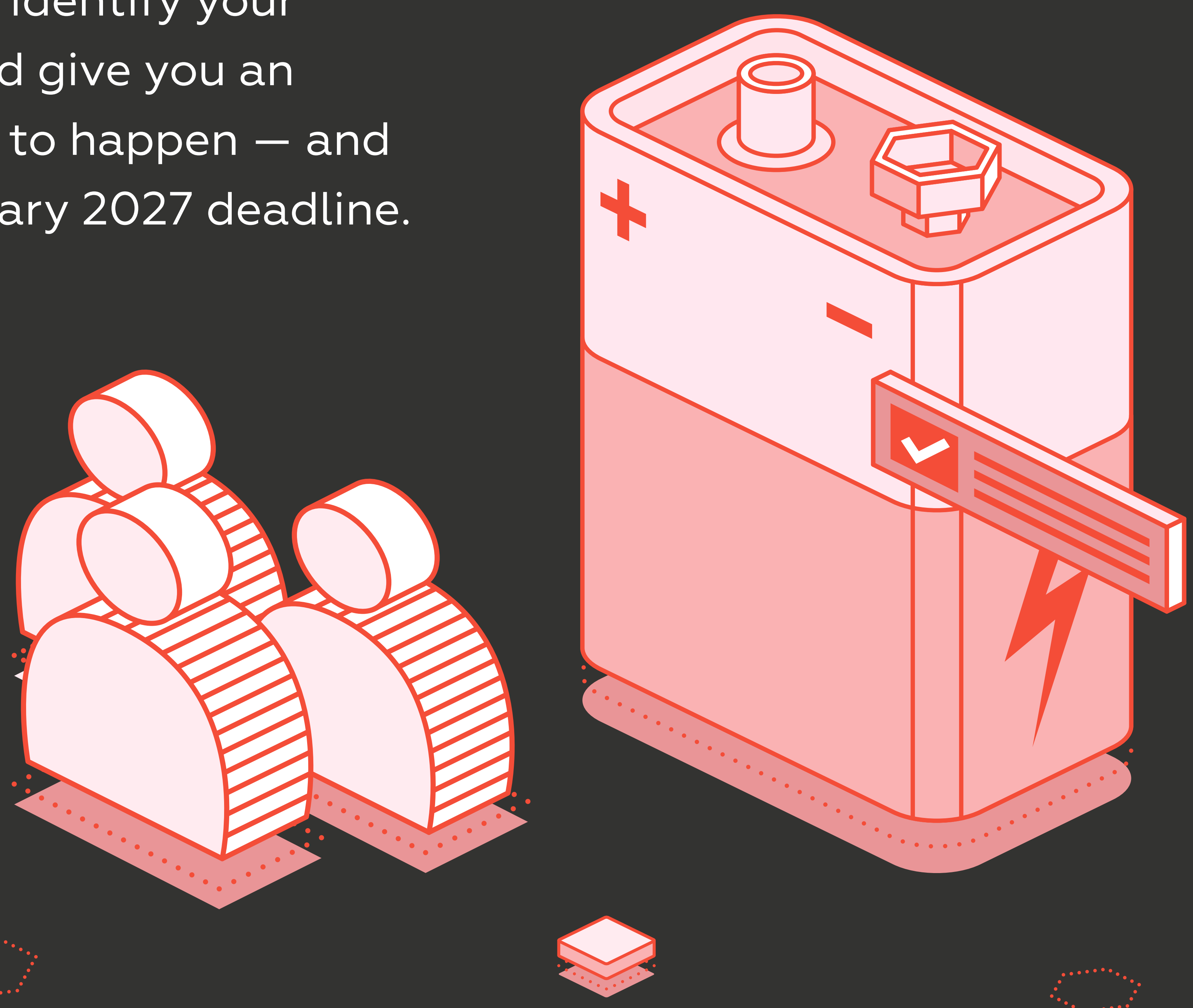


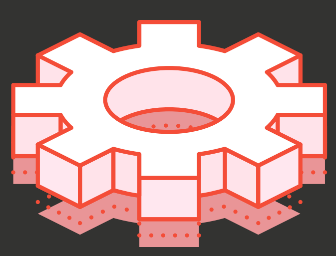
Not sure where you stand?

Book a free 45-minute DBP Discovery Call with Crunch-IS

We will map your current data landscape against DBP requirements, identify your three highest-risk gaps, and give you an honest view of what needs to happen — and by when — to hit the February 2027 deadline.

START YOUR PROJECT





About Crunch-IS

Crunch-IS is a data engineering and platform consulting firm specializing in regulated industries. We work with manufacturers, industrial operators, and technology businesses to design and build the data infrastructure they need to meet complex regulatory obligations — and extract lasting commercial value from the process.

Our work in DBP compliance draws on deep expertise in data platform architecture, supply chain data integration, IoT and telemetry pipelines, and EU product regulation. We combine engineering rigour with practical knowledge of how battery manufacturers actually operate — their systems, their constraints, and their data realities.