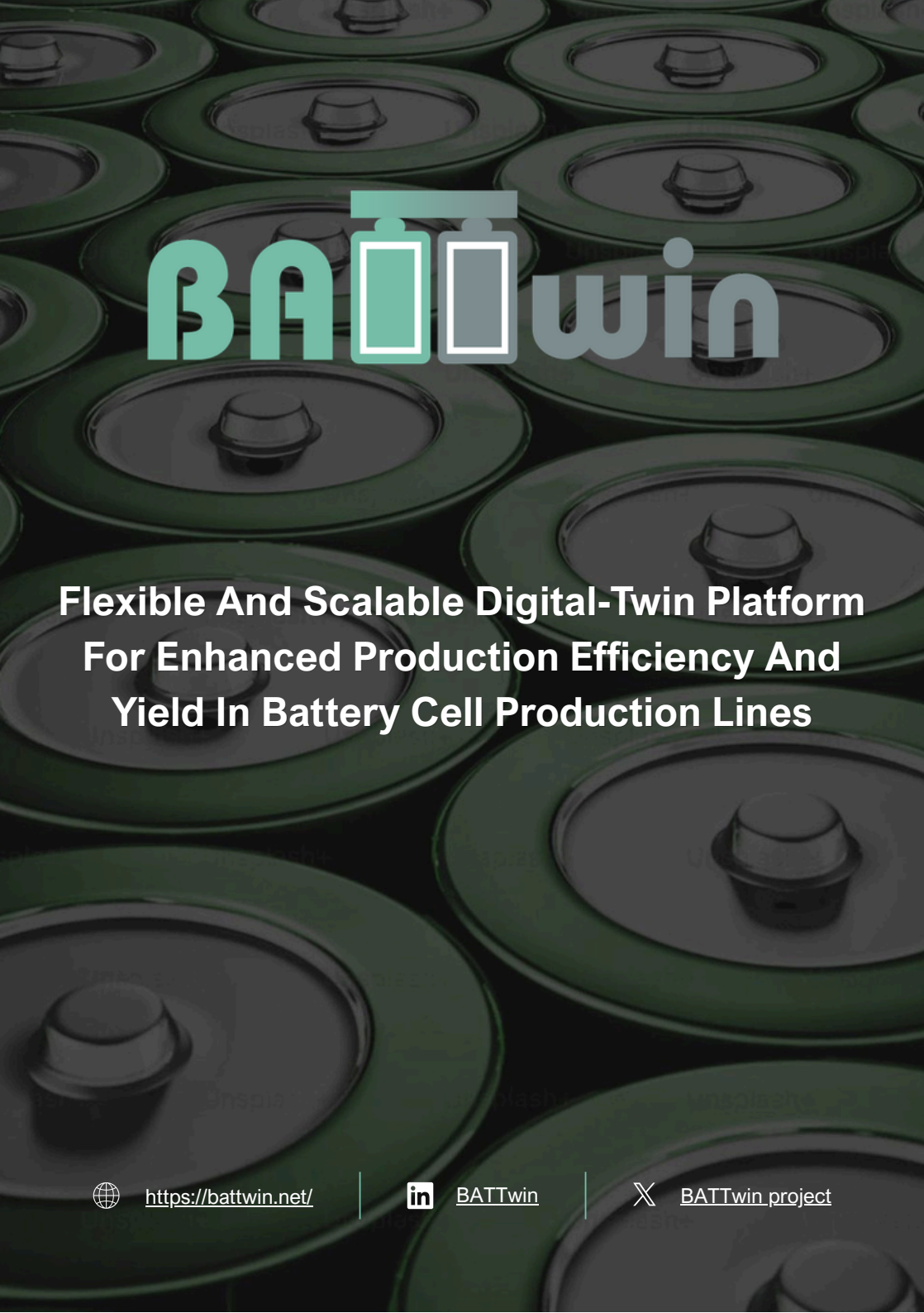

Flexible And Scalable Digital-Twin Platform For Enhanced Production Efficiency And Yield In Battery Cell Production Lines

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BATTwin at a Glance

Objective

BATTwin aims to develop a **system-level digital-twin platform** to enable Zero-Defect Manufacturing in **European lithium-ion battery cell production**, for **enhanced production efficiency and yield**.

Challenges

- More than 80% of battery cell production is located in Asia Pacific.
- European gigafactories face 15–30% scrap rates due to lack of integrated process knowledge, with defects propagating across stages, thus undermining industrial competitiveness.

Expected Impact

- Enable defects root-cause analysis and higher production yields, with reduced waste.
- Boost the European battery supply chain readiness.
- Accelerate learning curves in battery manufacturing.

Coordinated by Politecnico di Milano

6.9M €

From Dec. 1st, 2023 to May 31st, 2027

A 4-Layer Architecture

1

Multi-sensor data acquisition & management layer, supported by data semantics through a Digital Battery Passport data model.

2

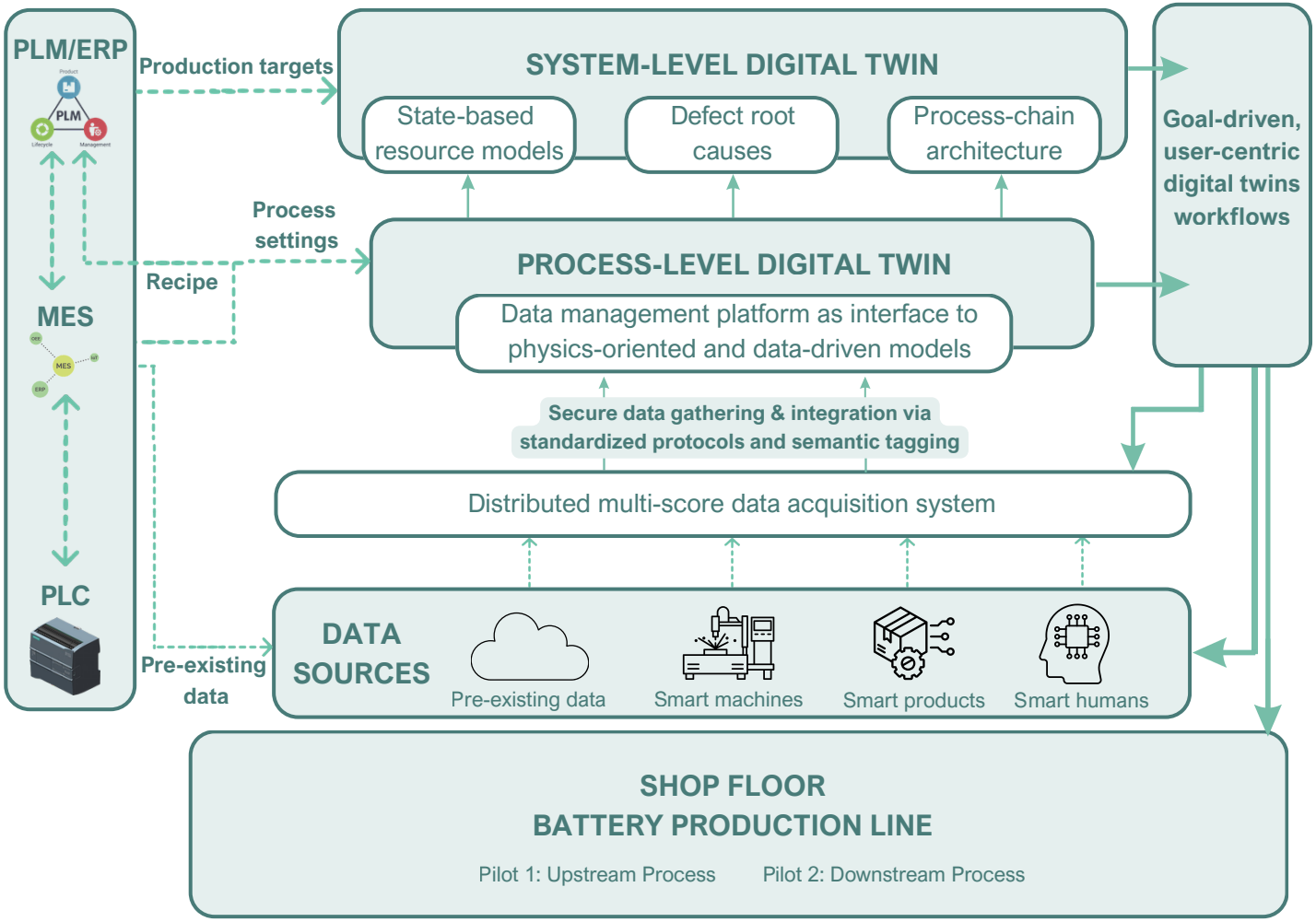
Process-level digital twins, modelling the critical stages electrode manufacturing critical stages, cell assembly & conditioning through multi-physics, data-driven & hybrid approaches.

3

User-centric, goal-driven digital twin workflows, increasing the explainability of digital twins & driving the user in system design and control.

4

System-level digital twins, based on simulation and analytical modelling.


PLM/ERP
Production targets
SYSTEM-LEVEL DIGITAL TWIN
State-based resource models
Defect root causes
Process-chain architecture
Goal-driven, user-centric digital twins workflows
Process settings
Recipe
PROCESS-LEVEL DIGITAL TWIN
Data management platform as interface to physics-oriented and data-driven models
MES
Secure data gathering & integration via standardized protocols and semantic tagging
Distributed multi-score data acquisition system
PLC
DATA SOURCES
Pre-existing data
Smart machines
Smart products
Smart humans
Pre-existing data
SHOP FLOOR
BATTERY PRODUCTION LINE
Pilot 1: Upstream Process
Pilot 2: Downstream Process

Industrial Validation

The BATTwin **system-level digital twin** is to be **tested** in **two industrial pilot environments**, covering different battery chemistries and geometries, demonstrating the flexibility and scalability of the solution towards Zero Defect Manufacturing in European battery cell production.

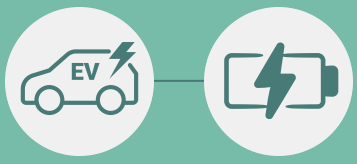
Use-Cases

VERKOR

- 150 MWh/year for **automotive applications**
- NMC, pouch cells
- Focus on notching & stacking process steps

SUNLIGHT
POWER IS KNOWLEDGE

- 100 MWh/year for **energy storage applications**
- LFP, prismatic cells
- Focus on mixing, coating, calendering & slitting process steps



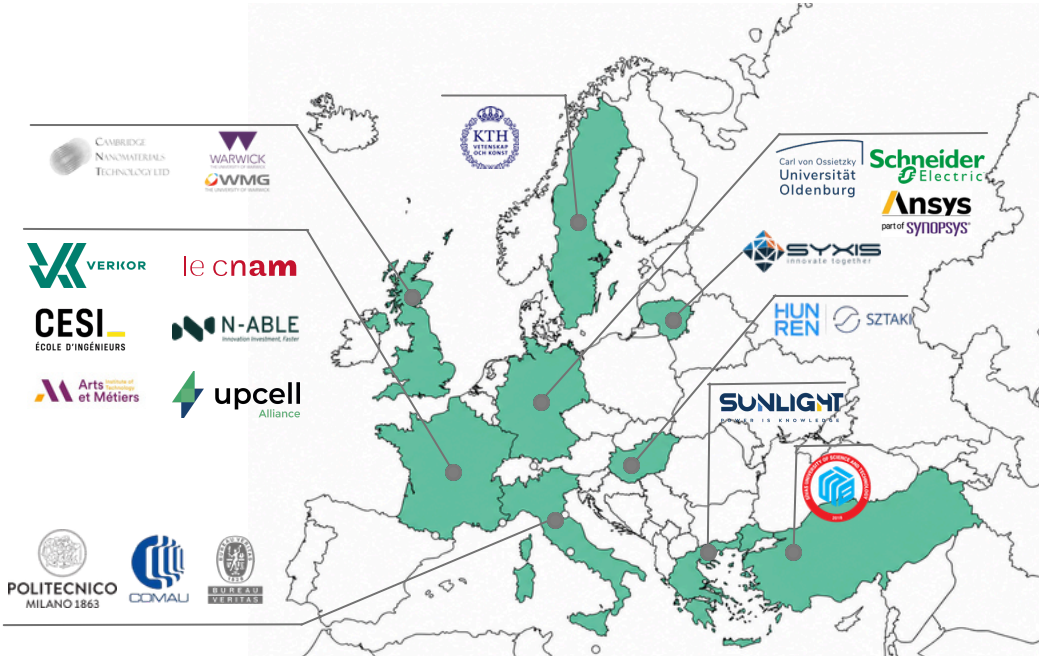
Consortium

The BATTwin consortium brings together 19 organisations from 9 countries across Europe and beyond, combining strong scientific, industrial, and commercial expertise. This diverse partnership aims to advance and accelerate the uptake of digital twin technologies to improve performance in battery cell production lines.

9 countries

19 partners

42 months



Battery 2030+ Collaboration

BATTwin joined the **BATTERY2030+** initiative, collaborating with EU-funded projects to advance the objectives of the European Green Deal, the UN Sustainable Development Goals, the European Action Plan on Batteries, and the SET Plan.

As a flagship European research initiative, BATTERY2030+ is driving the development of next-generation batteries that are safer, more sustainable, and higher performing. By accelerating battery innovation and supporting the establishment of a competitive and sustainable European battery manufacturing ecosystem, the initiative plays a key role in enabling the transition to a climate-neutral and circular economy.

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Innovate UK

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