Credentialising the Life-cycle of Batteries

Digital Product Passport’s traceability by verifiable evidences.

Turing Certs for TUV Rheinland DPP

Necessities

- **Data carriers**
- **Unique identifiers** for people, companies, products, packaging, raw material, etc. and their verification.
- Physical digital link, **look-up mechanism**
- **Access right management**
- **Interoperability** (technical, semantic, organisation), including data exchange protocols and formats and Data processing (introduction, modification, update)
- **Data storage**
- Data authentication, reliability, and integrity and data security and privacy

Necessities

Area of Standardisation	Turing's Execution
Data carriers	OpenID, W3C DID, QR CODE, RFID.
Unique identifiers for people, companies, products, packaging, raw material, etc. and their verification.	OpenID + W3C DID. Addtionally eID (National ID, HealthID, Email, Mobile, 2FA) for People. Additionally EntityID (COI, LEI, vLEI, S&P Numbers, DUNS) for Legal Entity.
Physical digital link, look-up mechanism	SHA256 Hash relevance and RSA eSign relevance between Data carriers and Unique identifier.
Access right management	Principle of Least Privilege. Role-based access control system. Access right restricted by time-length and role.
Interoperability (technical, semantic, organisation), including data exchange protocols and formats and Data processing (introduction, modification, update)	Data Exchange Protocol: W3C DID, OpenID4VC. Data Representation Protocol: JSON, RESTful, OpenID4VP. Data Privacy Protocol: ISO27001, USO27701, GDPR. Emission Calculation Protocol: The ones suggested by TUV Rheinland. (or D&B and CRIF.)
Data storage	Raw Data Storage: Issuer Parties and Standardization Party. Hash Data Storage: Public / Permission-based Blockchain.
Data authentication, reliability, and integrity and data security and privacy	- Authentication: eIDAS, RSA. - Encryption: AES256. - Integrity: SHA256. - Privacy: GDPR. Potentially zero trust and zero-knowledge proof.

The Cycle

Battery cell maker
Mining
Refining
Cathode production

Battery

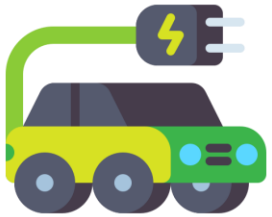
Manufacturing

Recycling
Direct recycling
Pyro process recycling
Hydro process recycling

Second life
Installed in windmill

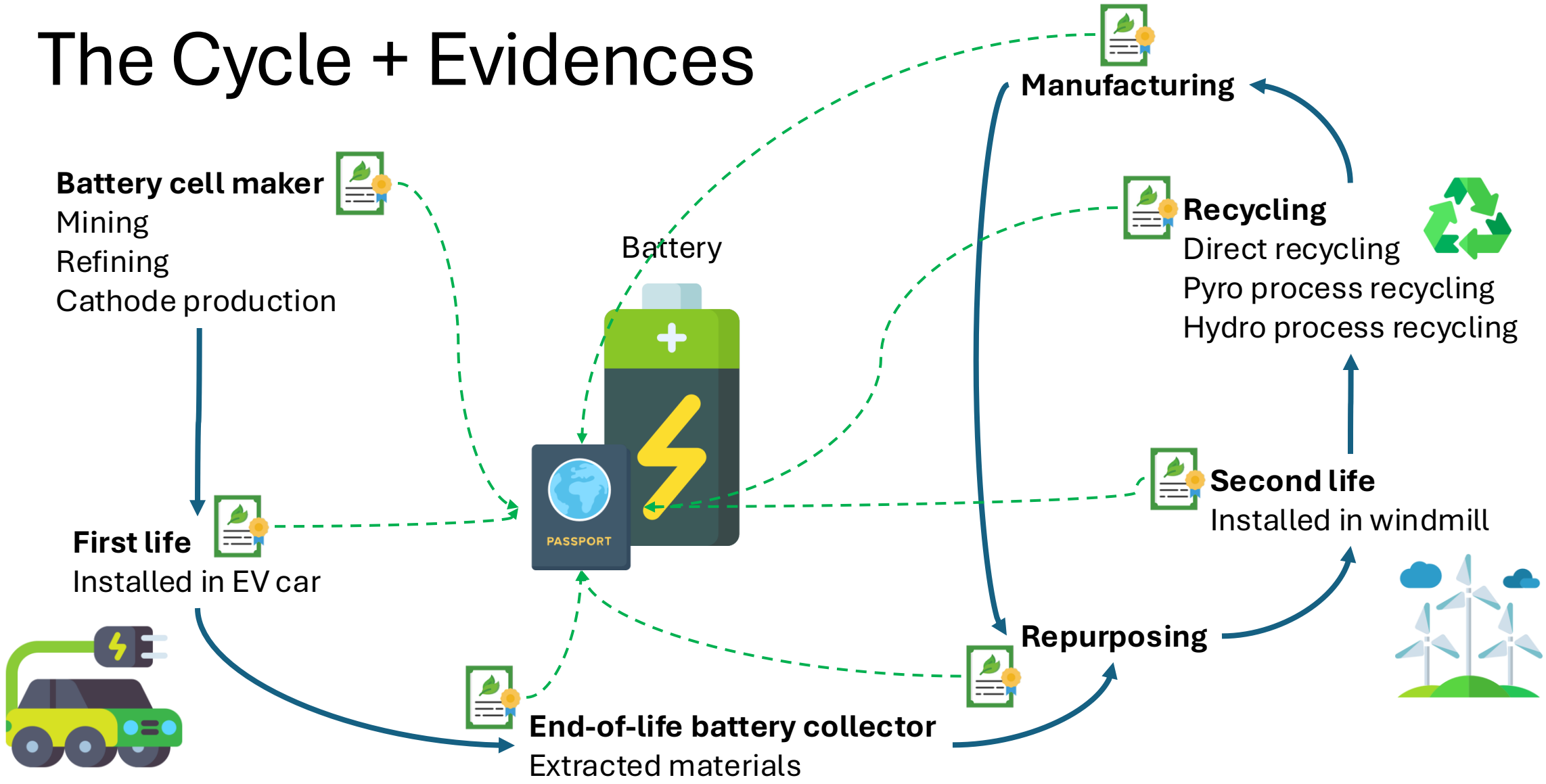
Repurposing

First life
Installed in EV car



End-of-life battery collector
Extracted materials

The Cycle + Evidences



For each verifiable credential / evidence

Authenticity
eIDAS & RSA eSignature

Integrity
SHA256 Hash Comparison

Confidentiality
AES256 Encryption

Interoperability
W3C DID & OpenID4VC

Compliance
GDPR & ISO27001 & ISO27701

Access Control
RBAC & ID/Entity Verification

Summary
Each Product has a unique identifier that collects verifiable credentials from authorized entity through the life-cycle. Each verifiable credential has its own access control list of allowance.

Standardizer Dashboard (Admin)

TÜVRheinland®
Precisely Right.

- Batch of Product identifiers, IDs.
- Batch of Manufacturer entity identifiers.
- Can manage the access control list of all Manufacturers regarding their accessible section of the Product ID.
- Can retrieve information from all sections.

Manufacturer Dashboard (Content Creator)

- Batch of Product identifiers, IDs.
- Can create/update/delete/retrieve information about the dedicated section of Product IDs by e-signing a verifiable evidences to the ID.
- Can retrieve information from the other sections managed by the other manufacturers, when the access is granted.

End-user Dashboard (User)

- 1 Product identifier, ID.
- Can retrieve information from all sections of the specified Product ID which is labeled as User-Viewable.

Legislator Dashboard (Auditor)

- Batch of Product identifiers, IDs.
- Batch of Manufacturer entity identifiers.
- Can retrieve information from a range of sections from all Product when the access has been granted by Standardizer within a span or time. The access right will be withdrawn after the expiration.

Questions for the next step

- Timeline, specs, and scope.
- Differentiation from SGS DPP.
- Potential PoC on Battery DPP with controlled scope.