October 5, first conference day

Welcome

In cooperation with

european Lithium Institute

BATTERY 2030+

Sponsored by

CEPA

WE KNOW CENTRIFUGES – INSIDE OUT

Fraunhofer ISC

Jan Merckx

- Industrial pharmacist by education, positions in logistics, standardisation and quality management
- Today an independent researcher with a focus on Innovation and the transition to the circular economy
- Active at VIL (Flanders innovation cluster for logistics) and GS1 Netherlands (Global Standardisation organisation)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 957213.

RE2LIVE

Recycling & Remanufacturing of Li-ion Batteries from end of life electric vehicles

COOCK project gesubsidieerd door Vlaanderen is ondernemen

Brussels, 10 December 2020.

Batteries placed on the EU market should become sustainable, high-performing and safe all along their entire life cycle.
This means batteries that are produced with the lowest possible environmental impact, using materials obtained in full respect of human rights as well as social and ecological standards.
Batteries have to be long-lasting and safe, and at the end of their life, they should be repurposed, remanufactured or recycled, feeding valuable materials back into the

The New Circular Action Plan (CEAP)

= policy framework from the EU to promote more sustainable production and consumption

Less Waste, more value

GREEN DEAL

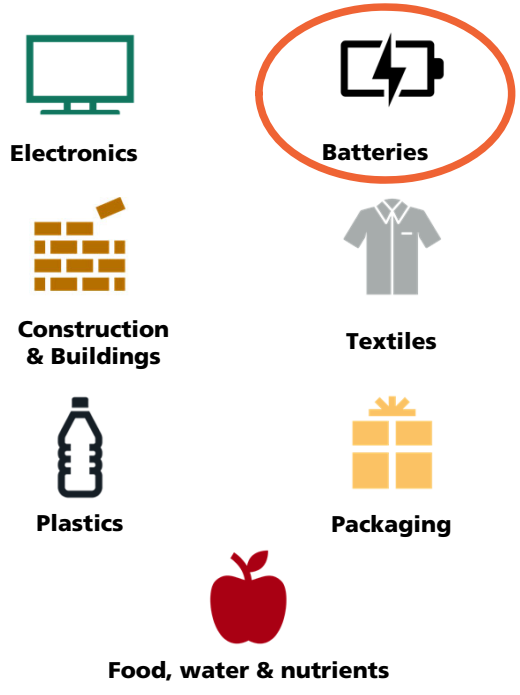
Key Value Chains

(material & energy intensive)

The Sustainable Product Initiative (SPI) – Oct 22

New Battery Regulation

Jan. 22



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RE2LIVE

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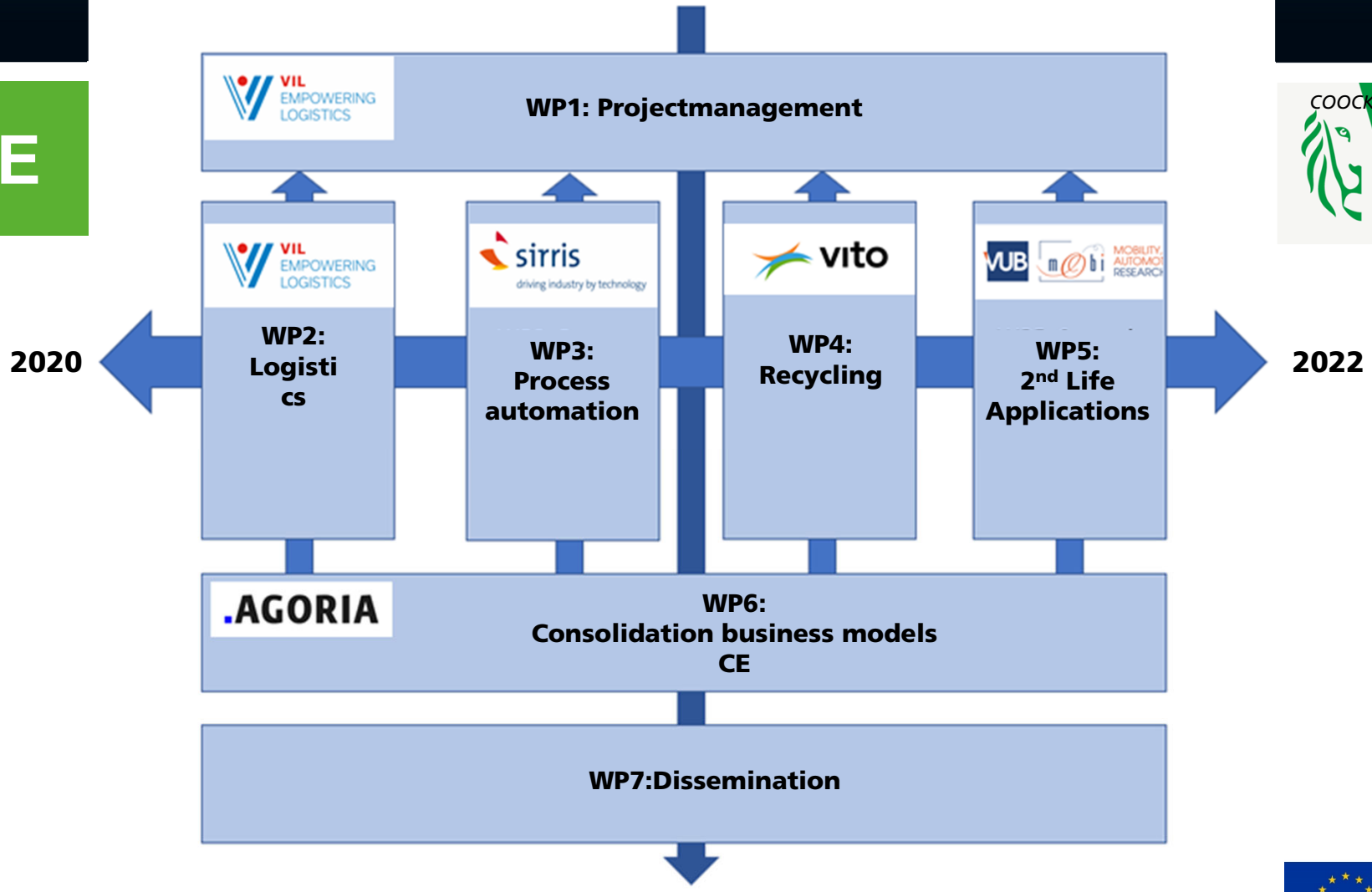
Project Outline

RE2LIVE



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Project Re2Live

- This project is situated at the **junction of several transition domains** and can put *Flanders on the map* as a pioneer in the future recycling and reverse manufacturing of automotive batteries.

- **Key topics:**
  - Feasibility study Business model, **logistics** & location, timing and rollout
  - **Automation**: reverse manufacturing, sorting process, recognition type, variety models
  - Diagnosis: state of health battery (pack level, module level) - for **re-use and second life**
  - Design for disassembly and for **re-use & second life**: as a result of the exercise
  - **Recycling** of the different **materials** steams: battery cells, cupper, plastics, printed circuits,...

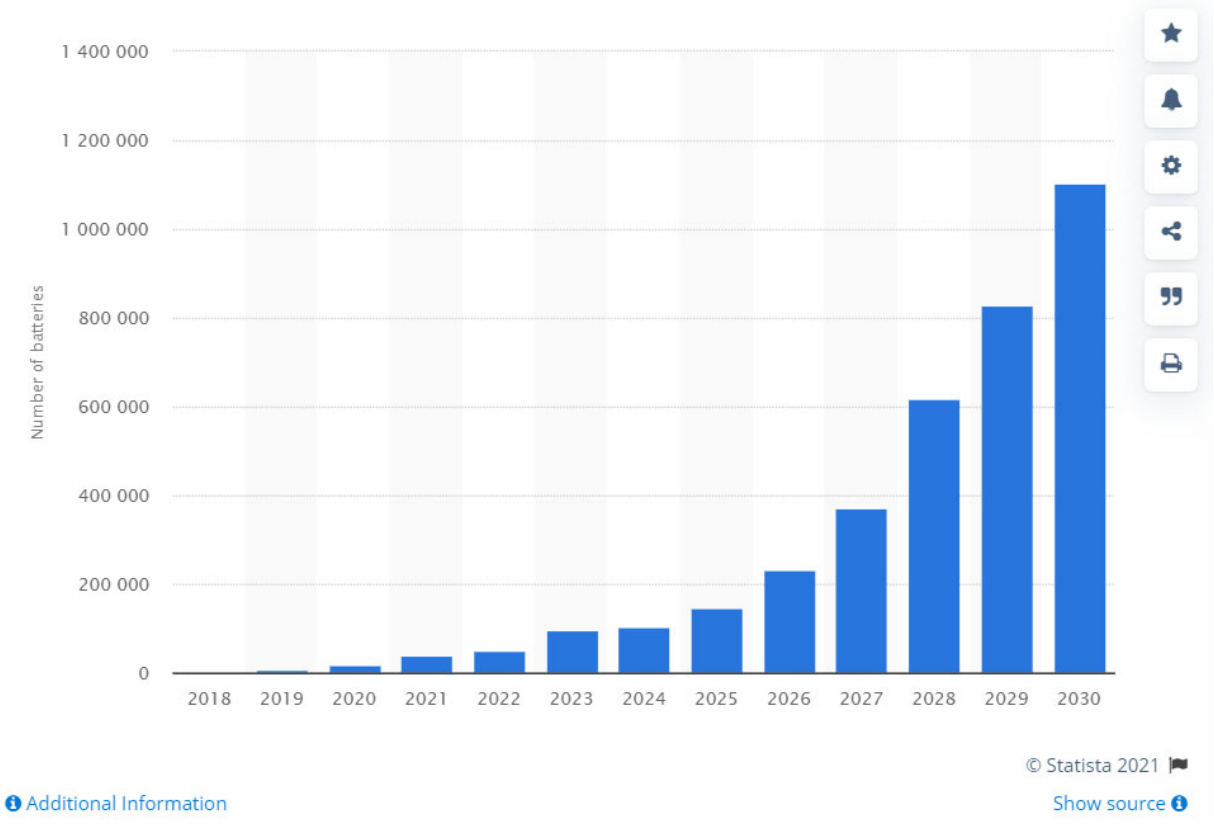
Project Outline

Overview Partner Companies

RE2LIVE

COOCK project gesubsidieerd door Vlaanderen is ondernemen

Projected number of electric vehicle (EV) batteries available for recycling in the European Union (EU) between 2018 and 2030



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Process Automation (WP3)

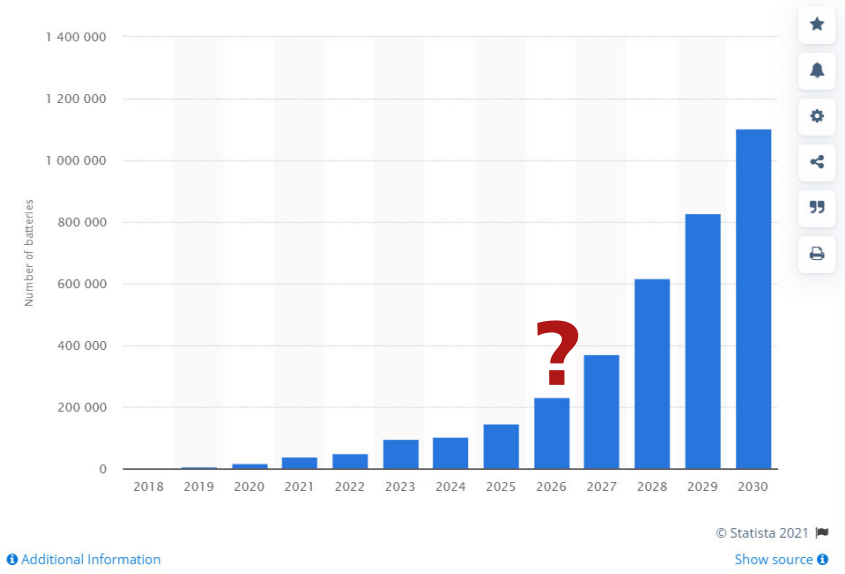
sirris
driving industry by technology

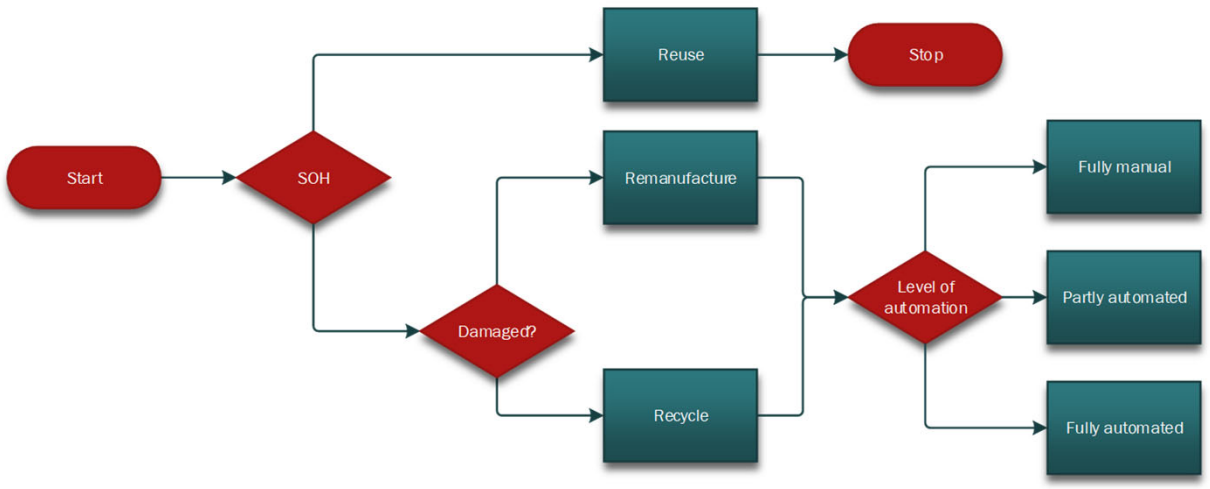
SIRRIS

- The collective centre for and by the technological industry in Belgium
- Help players in the Belgian industry make the right technological choices to achieve sustainable economic growth.
- >160 cross domain engineers

VIL EMPOWERING LOGISTICS · sirris driving industry by technology · VUB · mobi · vito · AGORIA · flux50 ENERGISING THE FUTURE · SIM innovating together

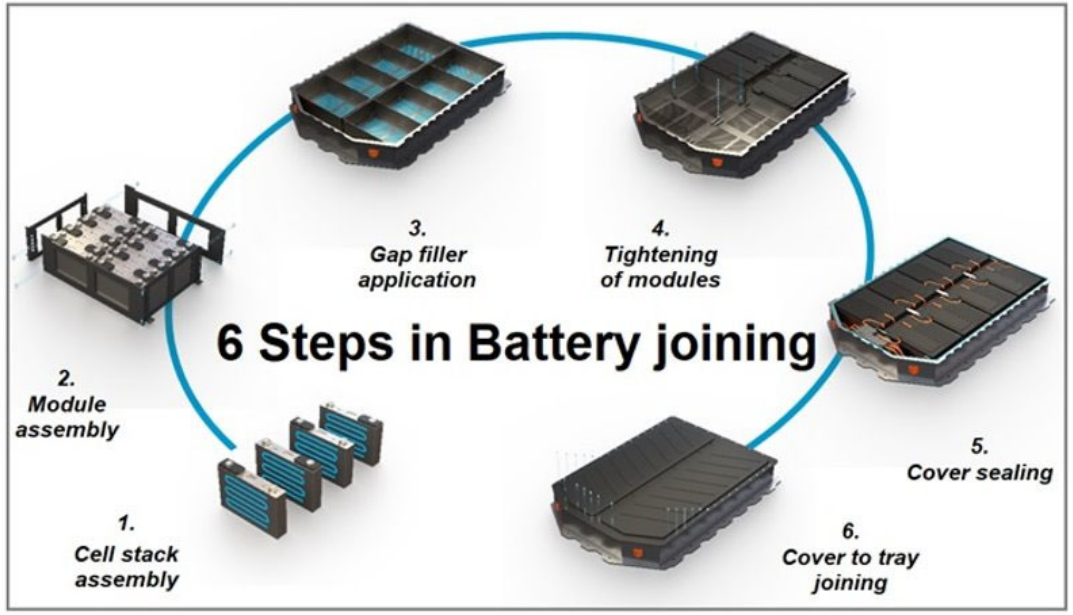
When to automate the process? Decision tree





Challenges

- **Lack of standardisation**
  - Across producers, but also across models
  - Use of unique and variety
- **Difficulty in obtaining CAD models from producers**
- **Differently sized modules**
- **Structural batteries – No modules**
- **Damaged battery packs**



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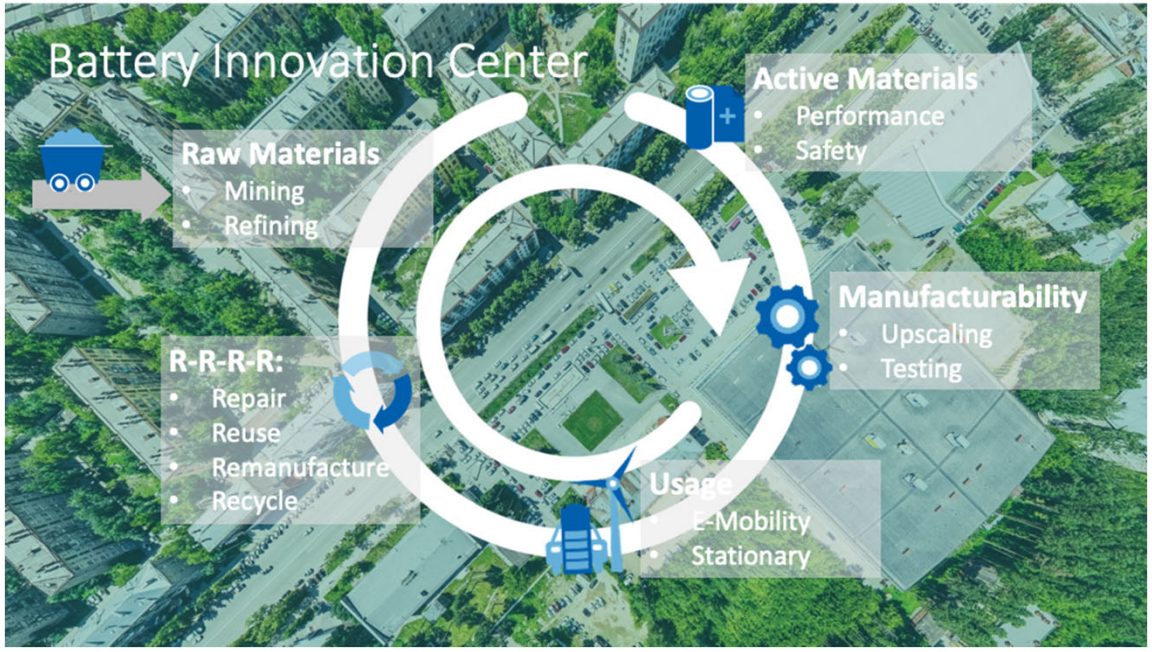
Second life batteries (WP5)



VUB mobi MOBILITY, LOGISTICS & AUTOMOTIVE TECHNOLOGY RESEARCH CENTRE

Achiles · ASSURED · BAT4EVER · Batteries 2020 · BATTERY 2030+

BATTLE · EVOLVER · CoFBAT · fitgen · Five VB

GHOST · GREEN ENERGY PARK · HiPERFORM · IMAGE · obelics

ORCA FURTHER GREENER BETTER · panda · Rez LiVe Project · SELFIE · SPARTACUS

upscale · VISION-xEV

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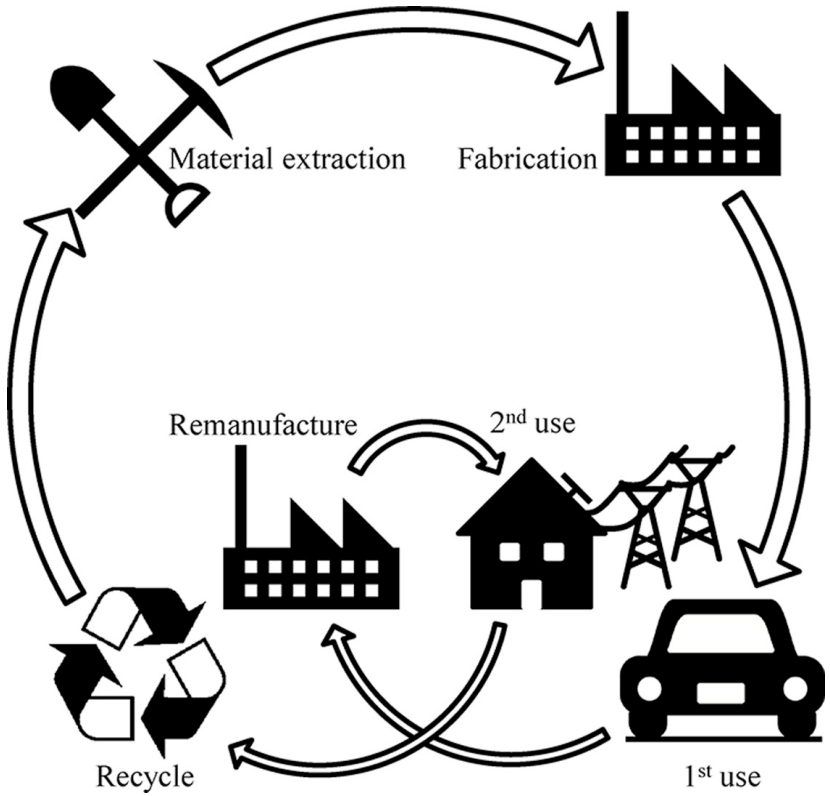
Second life batteries (WP5)



Source: https://doi.org/10.1016/j.jenvman.2018.11.046

T5.1 Scoping of the 2nd life batteries value chain

- What is the state of art of 2nd life applications?
- What will the EV fleet composition be in the future?
- Which batteries will be available (amount, chemistries, capacity, …)?

T5.2 Technical framework for 2nd life batteries

- How to assess the technical feasibility of 2nd life batteries application?
- Which are the main standardization and safety issues and how could they be overcome?

T5.3 Economic and environmental feasibility of 2nd life battery applications

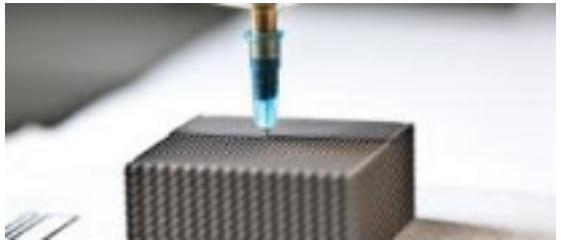
- **Are 2nd life applications economically and environmentally viable?**
- How can these 2 aspects be improved in the future?

Recycling (WP5)

UNIT SUSTAINABLE MATERIALS @VITO

Waste Recycling Technologies

Ceramic and Shaping Technologies



ADVANCE – LCA/LCC and circular business models

Umicore

With a unique position in clean mobility materials and recycling

umicore

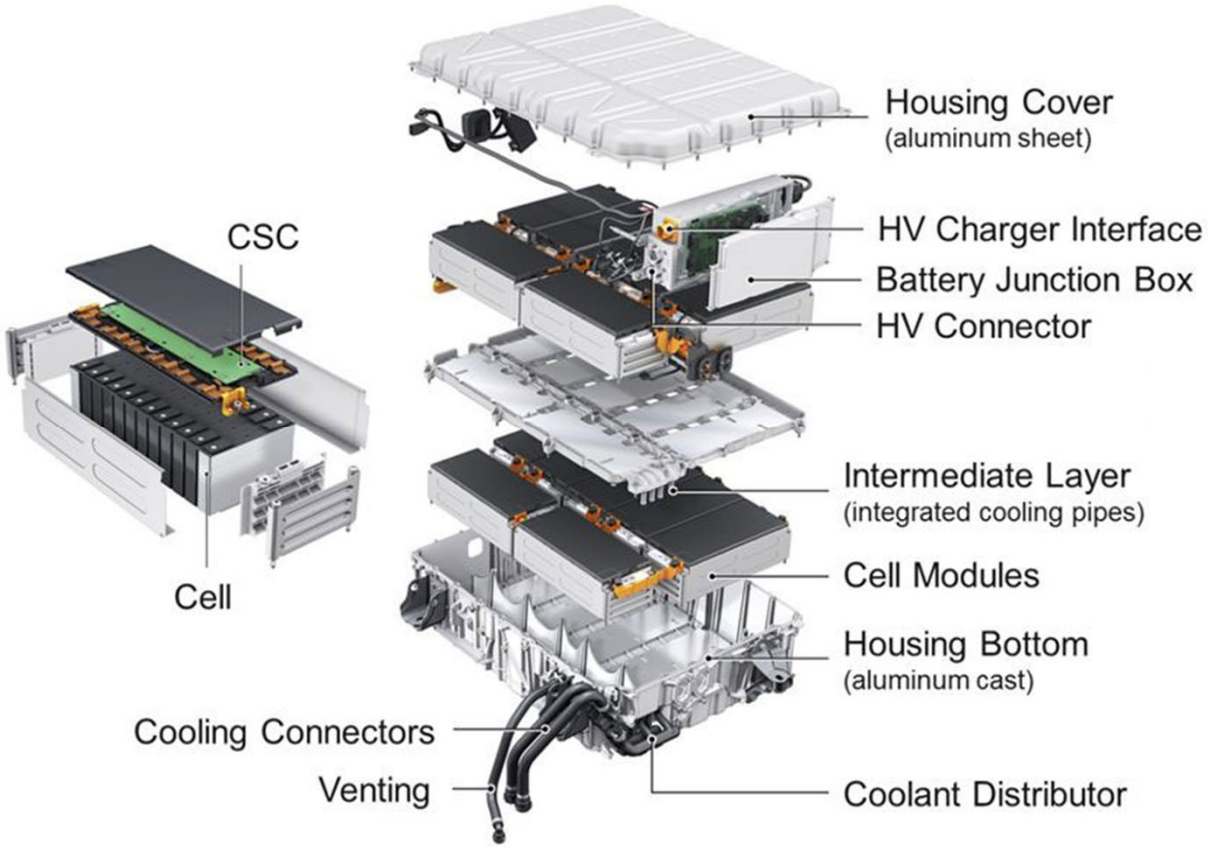
Present across all drive trains and offering sustainable closed-loop services

Impressions

umicore

PMR Hoboken recycling plant, Belgium

Recycling (WP4)



Source: https://eitrawmaterials.eu/autobatrec2020-innovation-project-for-smart-recycling-of-waste-traction-batteries-from-electric-vehicles/

T4.1 Battery recycling processes

- **Which materials and how can they be recycled?**
- Current state-of-the-art and novel developments?
- Current Flemish EoL EV LIBs recycling landscape?

T4.2 Battery recycling in a circular economy

- **Sustainability of current recycling processes?**
- Which circular strategies and/or circular business models are applicable?

T4.3 Demonstrator concepts

- Techno-economic evaluation of recycling process concepts for a maximal valorisation of materials

Which materials and how can they be recycled?

Ethical issues with lithium-ion batteries

DR Congo and cobalt

Cobalt miners in the DRC are subject to dangerous working conditions as a result of the industry's lack of regulation (Credit: Julien Harneis/Flickr)

Environmental problems in South America

In Salar de Atacama, mining activities consumed up to 65% of the region's water, causing havoc for local farmers (credit: Francesco Mocellin)

Logistics (WP2)

1. Data collection
2. Supply chain collection
3. Supply chain for recycling materials
4. Business model
5. Hub - location and logistics concept
6. Optimization supply chain - e.g import / export

Logistics (WP2)

- **Logistics is an important factor in the EOL process**
  - It is estimated to be responsible for up to 50% of the costs (international projects)

Logistics (WP2)

1. Data collection
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5. Hub - location and logistics concept
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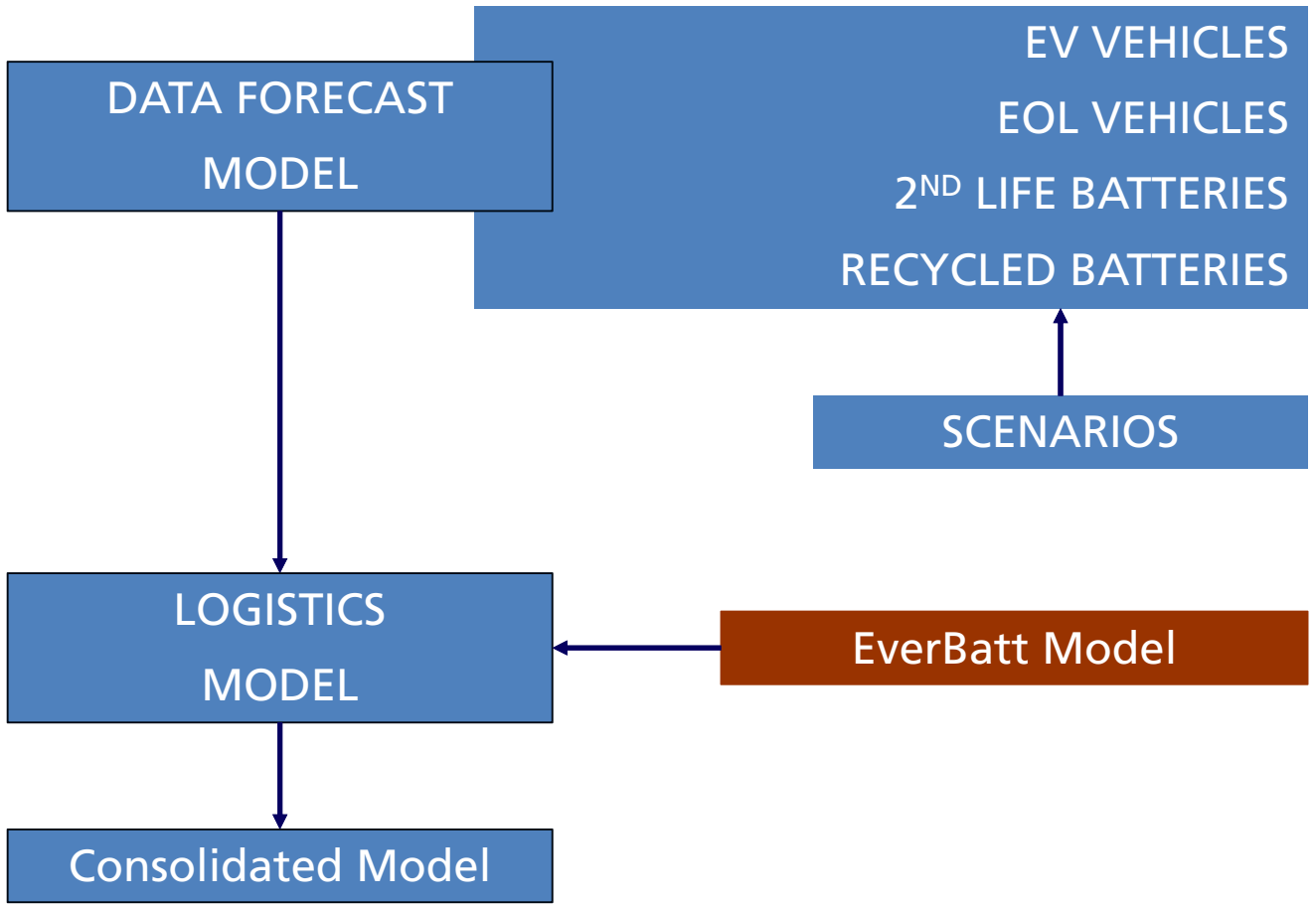


Scenarios

- BAU (business as usual) – current trends continue: more cars, more distance, slightly more electric cars
- EV – rapid switch to electric vehicles: from 2030 all new cars will be electric, more cars, more km's
- DEV – combination of car-sharing and electric vehicles: by 2030, 55% of new cars will be electric, 40% will be autonomous vehicles (without driver) of which 25% will be shared vehicles, more cars, more kilometers
- H2 – rapid switch to hydrogen cars: up to 2024 more electric cars as in the EV scenario, from 2025 more new cars on hydrogen, from 2030 all new cars sold will run on hydrogen, more cars, more kilometers
- MVP – much fewer trips: 40% fewer kilometers compared to 2015, fewer cars, more alternative transport, no increase in shared cars, slightly more electric cars
- DV – much more shared vehicles and shared use of vehicles: a very large share of shared cars and a doubling of the average occupancy rate (in 2015 an average of 1.33 people in a car), huge boost in the number of shared cars, much fewer cars, slightly more electric cars, the same number of kilometers traveled by car

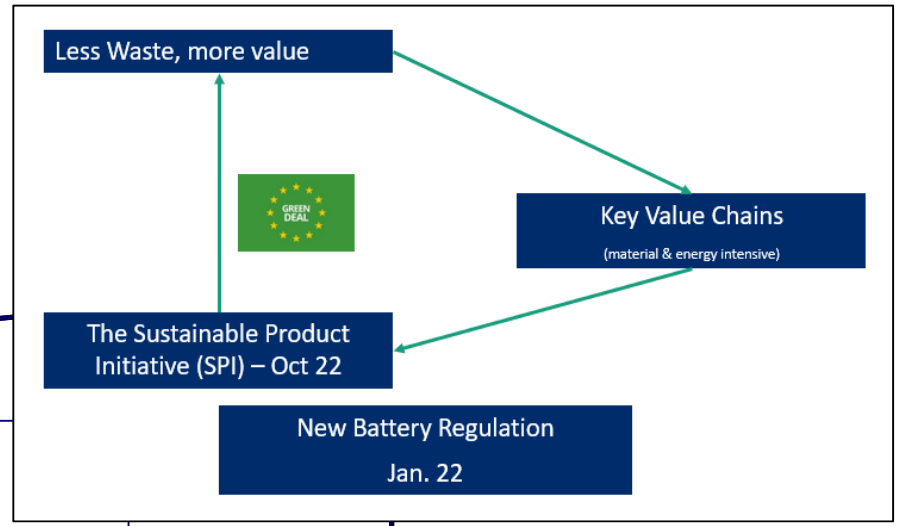
- Combination of DEV and DV: faster introduction of electric cars, from 2030 55% of all new cars will be electric, more shared cars, doubling of the average occupancy rate, more cars, more kilometers
- Combination of DEV and MVP: faster introduction of electric cars, from 2030 55% of all new cars will be electric, 40% fewer trips by car, fewer cars

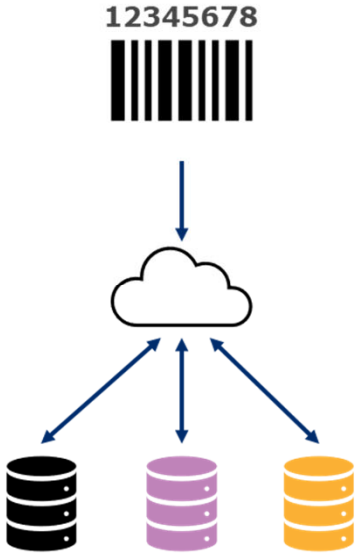
Challenges

- **Are we aligned to the ‘exploding’ requirements**

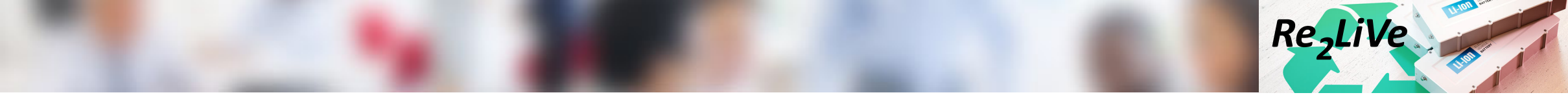
- Regulations on dangerous goods transport (national & international)
- Storage and transport
- Packaging
- Logistic Service Providers
- Training
- Data Transparency – Battery Passport

Battery Passport





- … a **unique identifier** with basic information; this is kept on a centralised registry.
- a **URL** (Uniform Resource Locator) … combined with a tag (QR code, RFID,..) the company, consumer or public authority can **connect directly ….**quantitative and qualitative, static and dynamic, standardised and *machine readable* data.
- Agreed standards and protocols streamline the delivery of the product information and systems interoperability based on
  - *common ontologies and classifications,*
  - *And agreed protocols*.



WP 6: Consolidated Model

- **What s investigated?**
  - Consolidation: bringing together the elements and results from logistics, automation of the dismantling process, remanufacturing and re-use of batteries and recyling strategies of the different materials;
  - Identifying the interactions between the different parts of the value chain and its impact on the process flow;
  - Align with transition to a more circular economy

  - Opportunities and Challenges for companies, related to the value chain of end of life batteries
  - Viability of the overall business model
  - *Which policy actions are required?*

Final Notes

Green Deal: Sustainable batteries for a circular and climate neutral economy

BATTERIES EUROPE
Working Groups

GLOBAL BATTERY ALLIANCE
BATTERIES POWERING SUSTAINABLE DEVELOPMENT

BATTERY 2030+

EUROPEAN BATTERY ALLIANCE | EBA250

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Research

Astrabat	HIGREEW	SOLSTICE	INSTABAT	MAGIT	…
SAFELiMOVE	MELODY	HYBRIS	SENSIBAT	Addionics	…
SOLiDIFY	3believe	HyFlow	SPARTACUS	INDUEYE 2.0	…
SUBLIME	COBRA	iSTORMY	BAT4EVER	EHSTACK	….
CoFBAT	HYDRA	ALBATROSS	HIDDEN	MobilityPlus	….
ECO2LIB	SeNSE	HELIOS	BATTERY 2030PLUS	NanoBAT	….
NAIMA	DEFACTO	LIBERTY	MIGHTY	PAT4NANO	…..
CompBat	MODALIS2	MARBEL	SEED	SYMPHONY	……
SONAR	LiPLANET	Current Direct	Programmable Matter	3D-PRESS	……
Baliht	LOLABAT	SEABAT	Worlds of Lithium	MotionEst	……
CuBER	SIMBA	BIG-MAP	NANOSTACKS	NanoEvolution	…….

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With this proposal, the Commission also aims to boost the circular economy of the battery value chains and promote more efficient use of resources with the aim of minimising the environmental impact of batteries.

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re2live.be

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