

## Task 52: EVs and Circularity

Workshop 2 Summary:

# EV traction e-motors and circularity: Activities, uncertainties, expectations

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## Task 52: Workshop 2: 'EV traction e-motors and circularity'

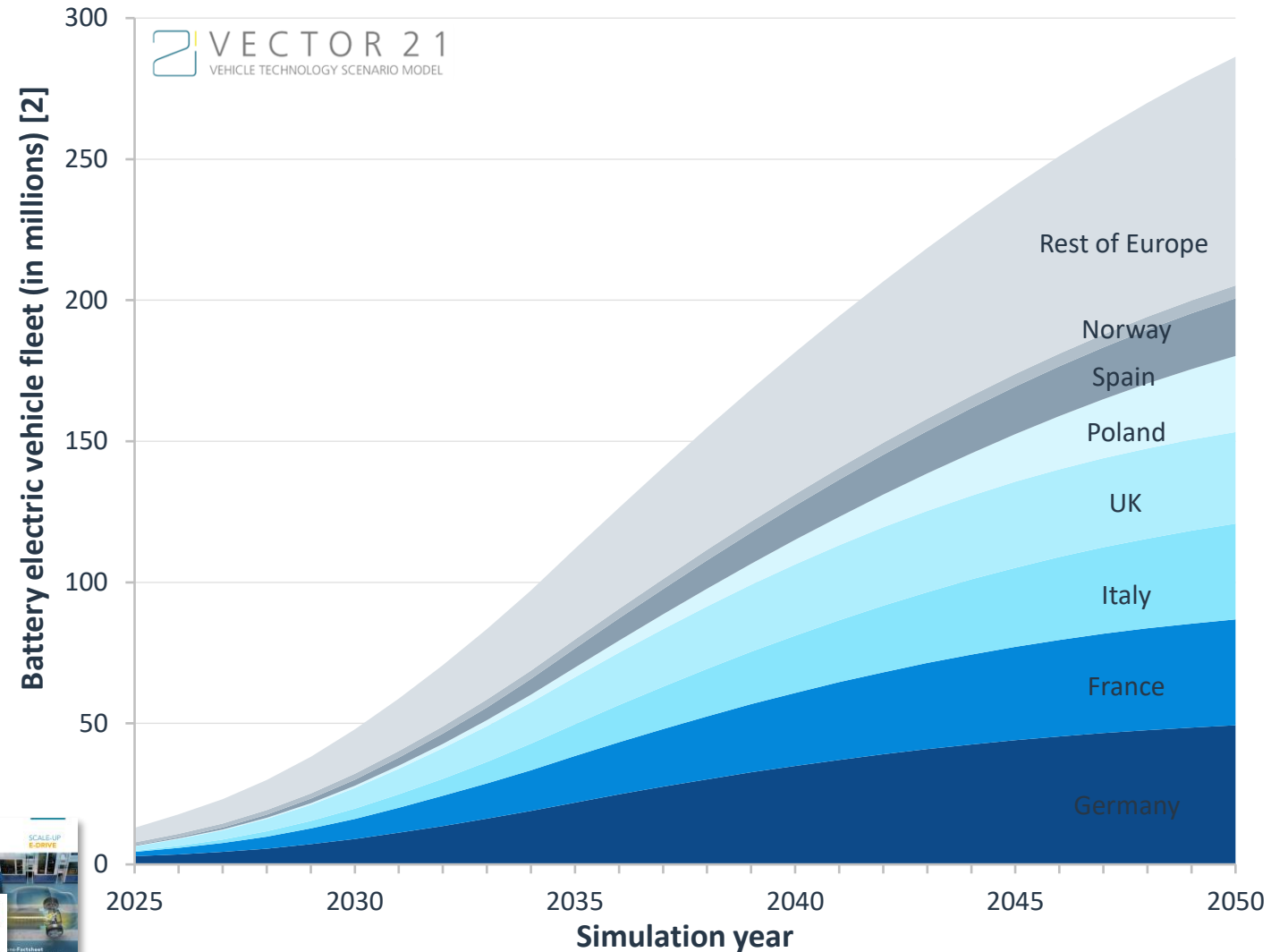
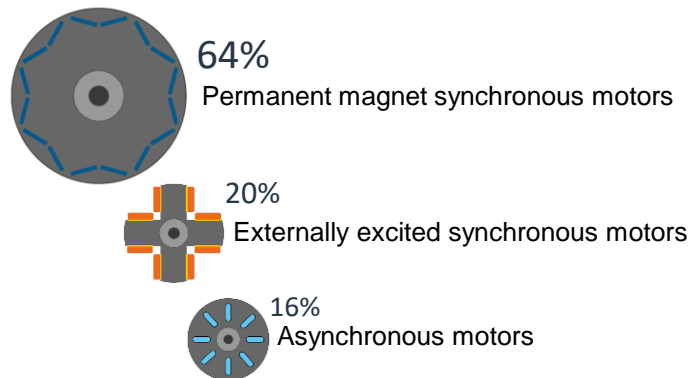
### Overview

- Online Workshop, 3.5 h
- We aimed for practitioners, industry representatives and experts
  - First hand information
  - Most recent activities
  - Key challenges and opportunities
- 50 participants from OEM, TIER1, recycling industry, research, consultancy
- Guests from BMW Group, Porsche, BOSCH, JRC – EU focus etc.
- Interests also from US and Canadian companies



## Market ramp-up of the battery electric vehicle fleet in Europe

- 2024: 6 Mio BEVs
- By 2050: **more than 250 Mio.** BEVs expected
- Powertrains differ by battery chemistry and electric drive [1]:



[1] The shares given are based on the number of electric motors installed in vehicle models currently available in Germany. Based on Samuel Hasselwander; Benjamin Frieske; Hagen Spielmann; Michael Nankemann (2023): Transformations-Factsheet "Technologische Trends E-Motor". Projektbericht. 20 S. doi: [10.60563/5qdp-dc30](https://doi.org/10.60563/5qdp-dc30).  
 [2] Simulated results based on: Gabriel Möring-Martínez; Murat Senzeybek; Samuel Hasselwander; Stephan Schmid (2025): Quantifying the impact of fleet turnover on electric vehicle uptake in Europe. In: Transportation Research Part D: Transport and Environment 147, S. 104945. DOI: [10.1016/j.trd.2025.104945](https://doi.org/10.1016/j.trd.2025.104945).

# AGENDA

2:00

## Welcome

Introduction of EV TCP & Task52

Introduction to the workshop

2:15

## Part I: Introductory Presentations

2:15

State of the art of electric traction motors - design and components

2:35

Stepwise approach towards circular e-motors

2:55

The current situation of eol e-motors in the United States

3:15

## Part II: Breakout Sessions

3:15

1. Session: Technology choice and design of e-motors, incl. design for recycling

3:15

2. Session: End-of-life treatment of e-motors, different approaches

3:15

3. Session: Hurdles in improving circularity – current practices and conditions

4:15

## Part III: Discussion of results and closing

4:15

Presentation of breakout sessions results

5:15

Final comments and farewell

5:30

-- End of workshop --



Institute of  
Vehicle Concepts

Gerfried Jungmeier (Joanneum)

Stephan Schmid (DLR German Aerospace Centre)

Christian Wachter (DLR German Aerospace Centre)

Rainer Pamminger (TU Wien)

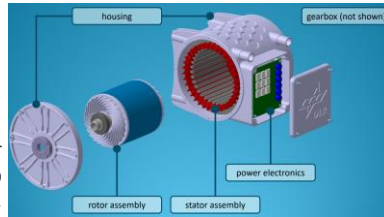
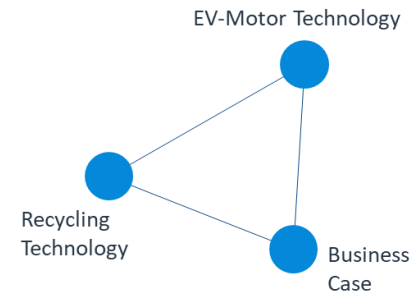
Linda Gaines (Argonne National Laboratory)



Invitation, 4 pages: Intro, agenda, evtcp, partner promotion

# Electric Vehicles and Technology Collaboration Programme

## Part I: Introduction to the topic



Ref.: C. Wachter (2026) workshop presentation.

### EV-motor technologies - design and components by Dr. Christian Wachter, DLR

- Explained basic principles and design choices  
Incl. types of machines/rotors, types of stators, disassembly sequence, impact of material choice, impact of design decisions
- Introduction to part II, breakout session; „There is a choice“

### Stepwise approach towards circular e-motors: by Dr. Rainer Pamminger, TU Vienna

- Case-study on a heavy duty e-motor (RHODAS EU project)
- “3C” Climate, Circularity, Criticality – you need to know the business model before

### EV Motors: research insights, up- & downstream, from the US by Dr. Linda Gaines, ANL

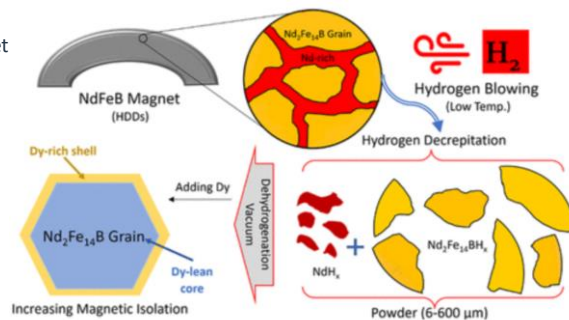
- R&D to reduce rare earth crunch: alternative sources, more efficient processing and use, material substitution, EOL recycling
- Shared examples on magnet fabrication methods, direct reuse or remanufacturing
- Advantages, challenges, limitations e.g. high demand growth

**Circular Economy is..**

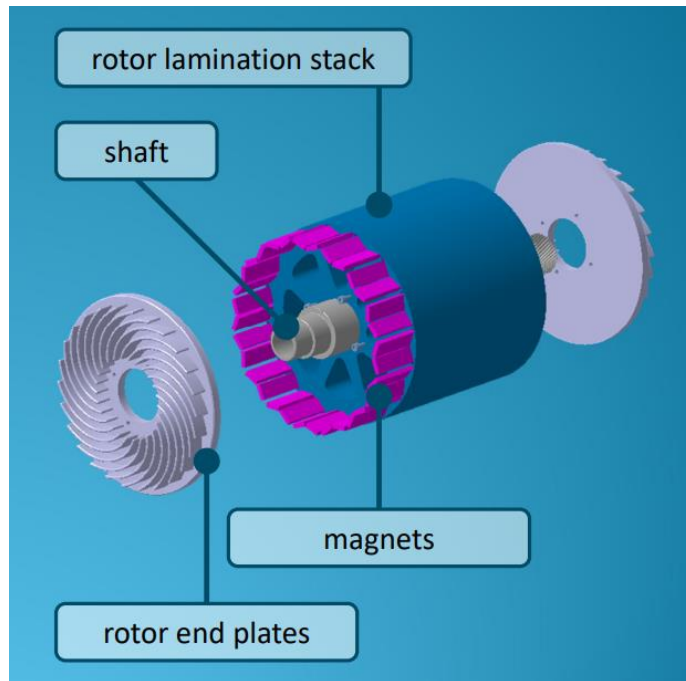
... an **economic system** whereby the **value of products, materials and other resources** in the economy is **maintained for as long as possible**, enhancing their **efficient use** in production and consumption, thereby **reducing the environmental impact** of their use, minimising **waste** and the release of **hazardous substances** at **all stages of their life cycle**.

Ref.: R. Pamminger (2026) workshop presentation.

NdFeB-Magnet  
Hydrogen  
Decrepiation



## Part II/ Breakout 1: Technology choice and design of e-motor



Ref.: C, Wachter, DLR (2026)  
workshop presentation.



### Topics: (result of a vote of the group)

- Where is electric motor technology heading?
- What limits disassembly, reuse, product value, retention, of electric machines?

### Insights:

- Reluctance machine was discussed as a technical solution to balance efficiency, rare-earth-demand and recycling
- Information needs for dismantlers, re-use and recycling: “Machine Pass” was discussed:
  - who needs to know what/you has access to what?
  - needs to be part of business model in order to be successful

## Part II/ Breakout 2 : EoL treatment of e-motors

**Topics:** different EoL strategies

- **Comet traitement**
  - Electric vehicle stream
  - Current approach: not automated, manual dismantling
  - High costs, business case not secured
- **CEA:** input on process and challenges of magnet recycling

**Insights:**

- Key to establish EoL markets (regardless of R-strategy) is the commercialization and scaling of these activities
- Pilots in PM recycling and e-motor reusing exist
- Positive business cases have to be realized throughout the supply chain
- Technical barriers in EoL treatment still have to be faced (e.g. automatization, standardization) to create cost-efficiency



## Electric Vehicle Stream



Ref.: Simon Coen, Comet Traitements SA (2026): Recycling strategy for REE, workshop presentation.

*EoL magnets in the crucible before melting*

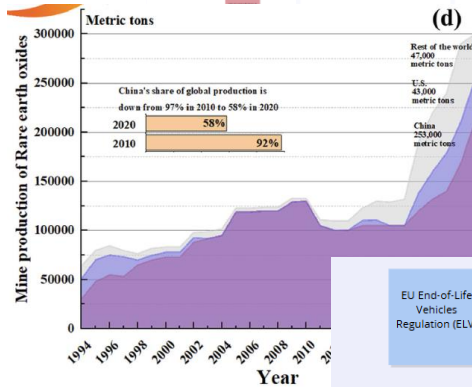
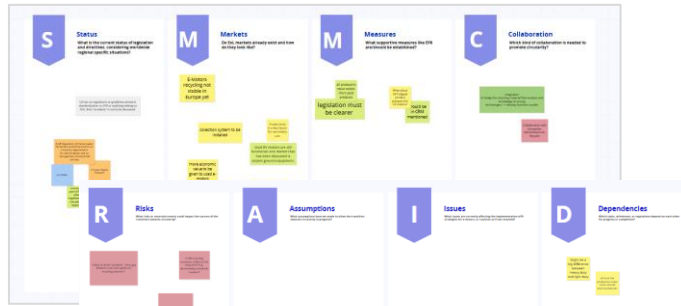
*Partial and full melting to obtain a new alloy*



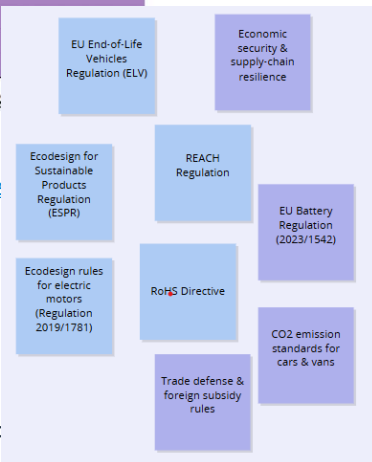
Ref.: O. Tosconi, CEA-LITEN (2026): Recycling of NdFeB magnets, workshop presentation.

# Electric Vehicles and Technology Collaboration Programme

## Part II/ Breakout 3: Legislation, economic conditions and standards



Ref.: Li, Z. et al. (2024)  
<https://doi.org/10.1016/j.jre>



### Topics:

- Approach/Template used:
  - **Status / Markets / Measures / Collaboration**
  - **Risks / Assumptions / Issues / Dependencies**

### Insights:

- Regulation for Circularity of EV motors indirect
- Economic value of recycled material needs to be competitive to virgin material
- Risks of contradiction in regulation: e.g. efficiency vs. circularity
- R-Strategies might differ between Light and Heavy Duty
- ‘Valley of death’ risk: still years for recycling streams to grow





## Task 52, Workshop 2: 'EV traction e-motors and circularity'

### Summary

- Circularity aspects for EV motors differ from batteries
- Less focus, less developed, design choices available
- Regulation less explicit (so far)
- Business models still to be developed

### Next steps

- First thoughts on next Workshop in Task 52, possibly in person workshop, near Paris.



[evtcp.org](http://evtcp.org)