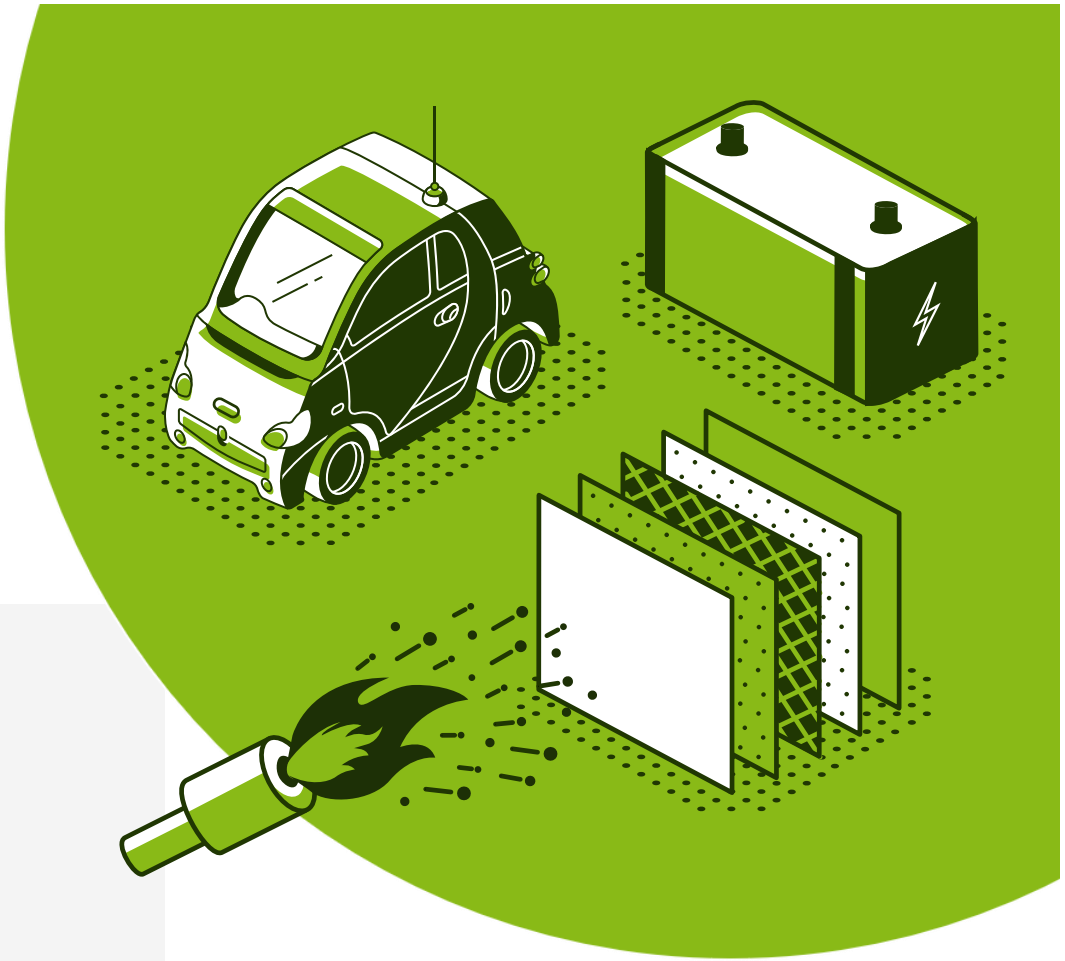
New Joint Partner Project
Start Q4 2026

AZL Aachen GmbH
Excellence in Lightweight Production

Early Bird Discount: 10 %
Onboarding before the Kick-off Meeting



AZL Joint Partner Project:

Benchmarking Fire Protection Concepts for Battery Enclosures

From Today's Production Vehicles to Tomorrow's Thermal Runaway Solutions

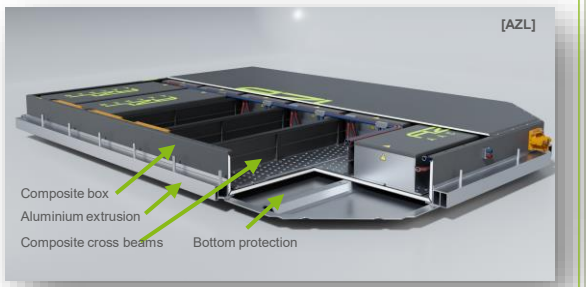
In cooperation with:

Aachen Center for Integrative Lightweight Production | RWTH AACHEN UNIVERSITY

AZL Background in EV Battery Box Structures

Overview Battery Casing Joint Partner Projects

2020 - 2021



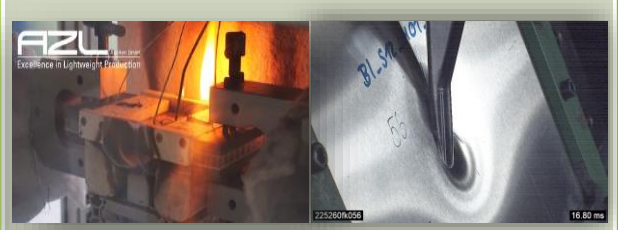
Multi-material battery casing (completed)

- 46 participating companies
- Trends, requirements
- 20 Different design concepts
- CAE optimisations

➔ Up to 20 [%] cost saving
➔ Up to 25 [%] weight saving

over aluminium reference

2021 - 2022



Fire test setup *Bottom impact test setup*

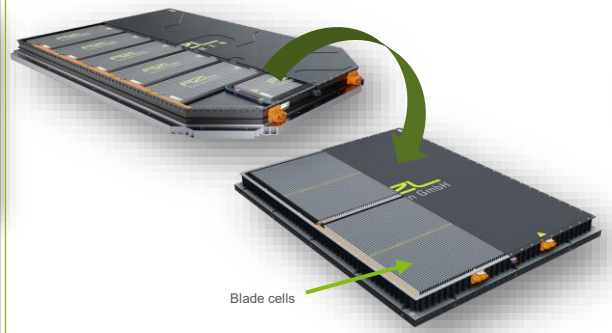
Application relevant fire test set-up (Completed)

- Application relevant Instrumented test method developed
- 50 different materials tested

Oblique angle bottom impact protection (completed)

- Application relevant Instrumented test method developed
- 25 different materials tested

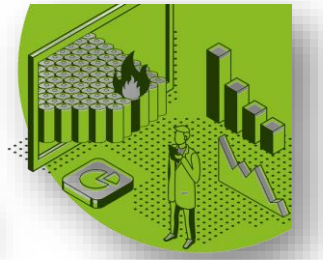
2022 - 2023



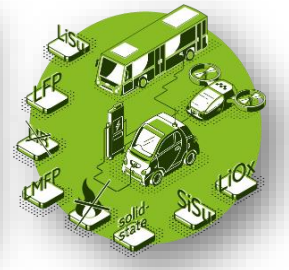
Cell to Pack (Completed)

- Alternative future design concepts
- Direct cell installation into pack
- Cells mechanical characterization (theoretical)
- Contribution of cells to structure

2024 - 2025



Thermal Propagation in BEV Battery Casings



Emerging Battery Storage Technologies

Thermal Propagation in BEV Battery Casings

- Techniques for prediction of cell and casing behaviour after the initial trigger event for thermal propagation

Emerging Battery Storage Technologies

- Insights into emerging battery storage technologies and their impact on design factors for battery casings

Benchmarking Fire Protection Concepts for Battery Enclosures

Fire testing for EV battery casing: Overview

2021 - 2022

Fire test setup

- Application relevant fire test set-up (Completed)
- Application relevant Instrumented test method developed
- **55+ different materials tested**
- **Report of 350+ slides**

Consortium

AsahiKASEI, ASCEND PERFORMANCE MATERIALS, BMW, carcoustics, Celanese, CLARIANT, DIC, faurecia, 台灣塑膠工業股份有限公司 FORMOSA PLASTICS CORPORATION, Frenzelit, HUTCHINSON, lyondellbasell, MAGNA, MARELLI, Mitsui Chemicals, REHAU, Röchling, SCOTT BADER, SEKISUI, SOLVAY, TEIJIN, TORAY

+ anonymous

List of materials types tested:

- Aluminium
- Steel
- Thermoplastics:
  - SGF
  - LGF / LCF
  - Hybrid
  - UD
  - Fabrics
  - Sandwich

  PP, PA, PE, PC, PPS, PK, CPVC, PMMA and Various FR formulations
- Thermosets
  - SMCs
  - Mats
  - UD
  - Fabrics

  Polyester, Epoxy, Phenolic, VE, PU and Various FR formulations
- Protection layers
  - Mica
  - Intumescent coatings
  - Blankets
  - Board
  - Foam

AZL JetBlast Fire Test Rig (2025-2026)

AZL JetBlast Fire Test Rig

Designed to simulate jet flame and hot particle impact on battery enclosure materials during thermal runaway

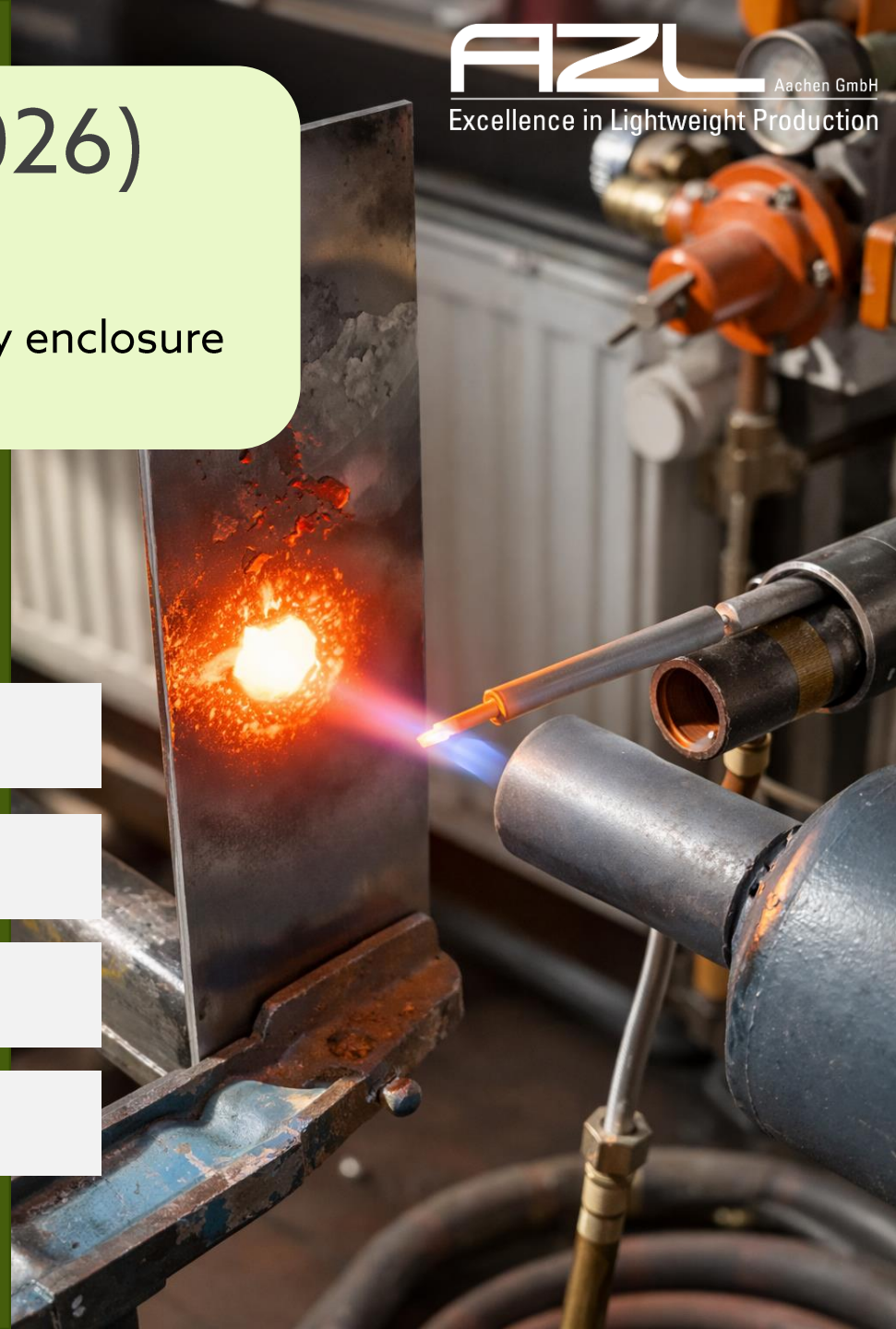
- One of a kind burner capable of high velocity jet and hot particle blasting
- 2 generic representative test profile
  - NMC (~1300 °C + Blasting)
  - LFP (~800 °C + Blasting)
- 3 stage system level thermal runaway simulation in one test profile
- In collaboration with 2 OEM
- 35+ different materials tested in previous project

Jet velocity >300 m/s

Flame Temperature ~1300 °C

Blast temperature >500 °C

Particle velocity ~150 m/s

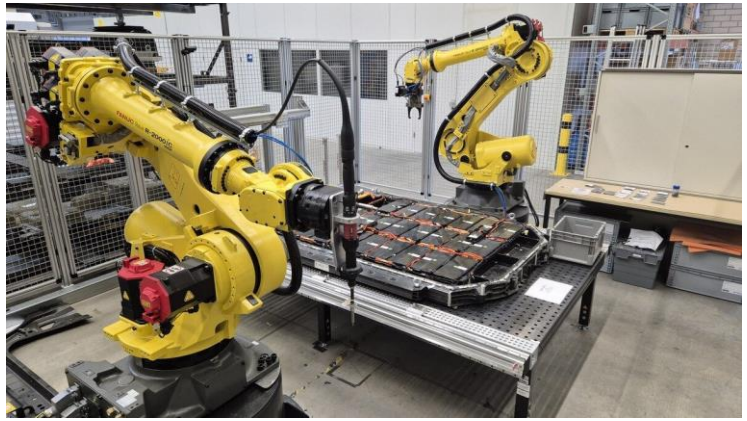


AZL Aachen GmbH
Excellence in Lightweight Production

Benchmarking Fire Protection Concepts for Battery Enclosures

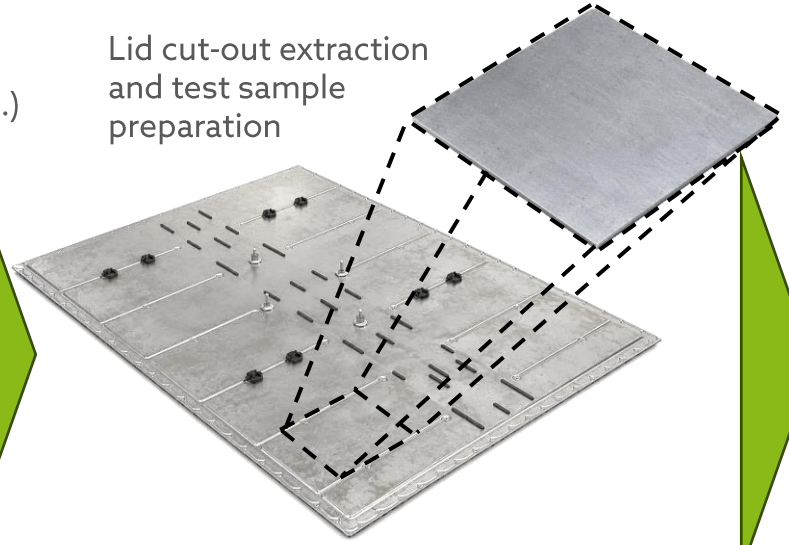
How it works

Production EV Lids (scrap EVs, partner institutions etc.)

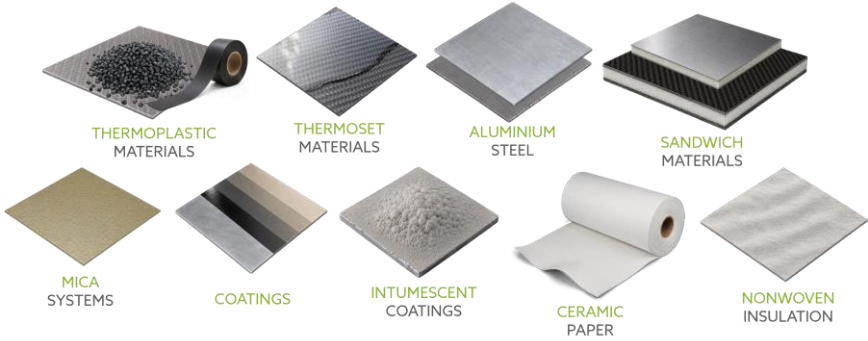


Battery Casing Disassembly [PICTURE PEM]

Lid cut-out extraction and test sample preparation

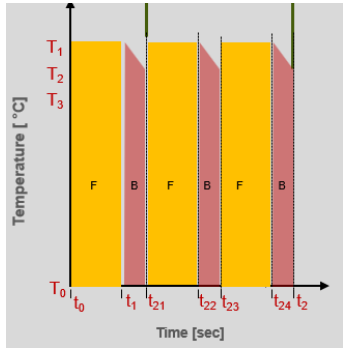


Future Solutions (Material Suppliers /OEMs)



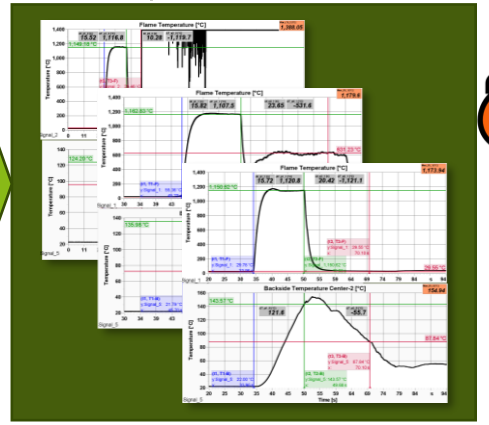
NMC Testing ~1300 °C + hot blasting

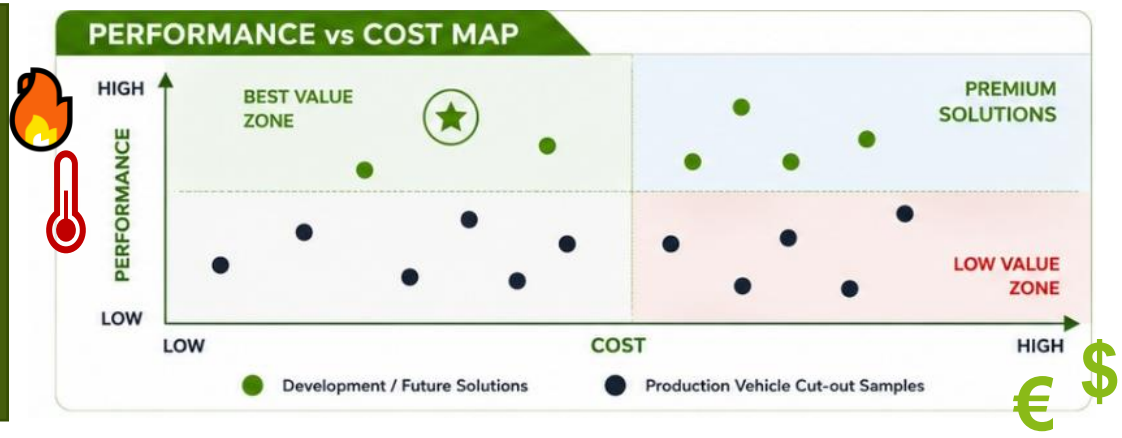
LFT Testing ~800 °C + hot blasting



Unified database

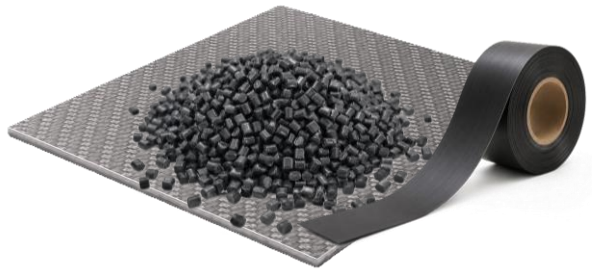
Direct Comparison Current vs future



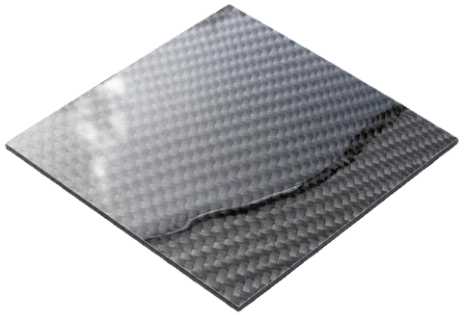


Benchmarking Fire Protection Concepts for Battery Enclosures

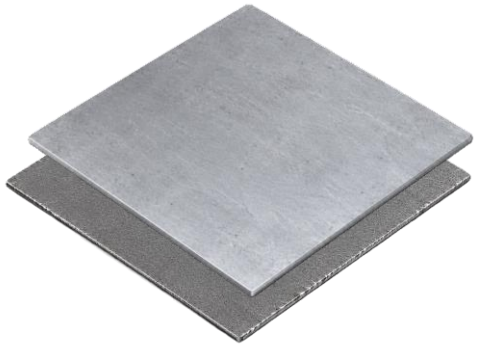
Potential Materials for Test Campaign



THERMOPLASTIC
MATERIALS



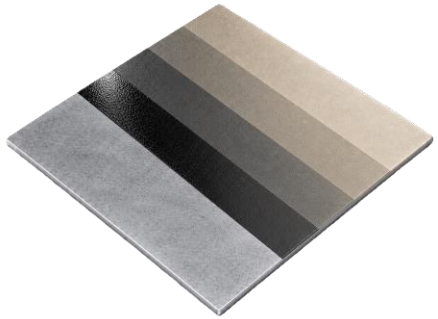
THERMOSET
MATERIALS



ALUMINIUM
STEEL

SANDWICH
MATERIALS

MICA
SYSTEMS



COATINGS

INTUMESCENT
COATINGS

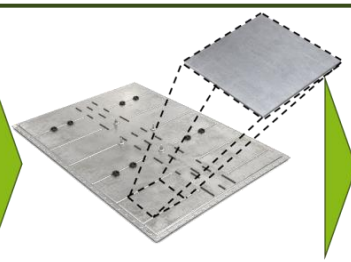
CERAMIC
PAPER

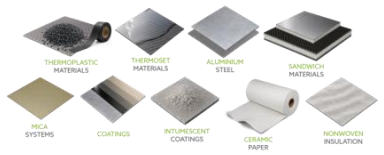
NONWOVEN
INSULATION

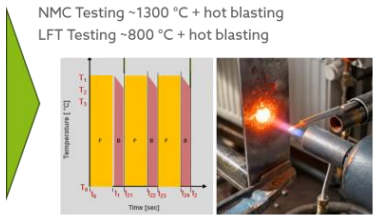
JPP: Thermal Runaway Testing for Battery Casings

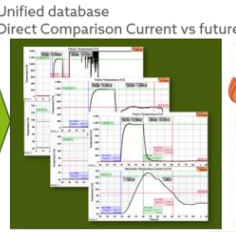
Work Packages

Battery Casing Disassembly [PICTURE PEM]









WP1: Application Requirements & Concept Portfolio

- Definition of battery-casing applications and thermal-runaway threat scenarios
- Analysis and documentation of production EV enclosure solutions
- Identification of future materials, stack-ups and structural concepts
- Definition of performance requirements and benchmark KPIs
- Finalization of sample portfolio and project test scope

WP2: Test Method Development & Benchmark Protocol

- Development of representative NMC and LFP test profiles
- Definition of standardized coupon-specimen and test-fixture configuration
- Harmonization of conditioning, instrumentation and evaluation procedures
- Validation of test repeatability using reference specimens
- Definition and approval of the experimental test matrix

WP3: Experimental Coupon Benchmarking & Failure Analysis

- Screening of materials under identical conditions
- Coupon-level benchmarking of production-derived and future battery-casing concepts
- Assessment of penetration, temperature, erosion and residual protection
- Analysis of failure mechanisms and protection principles
- Generation of a unified benchmark database and performance ranking

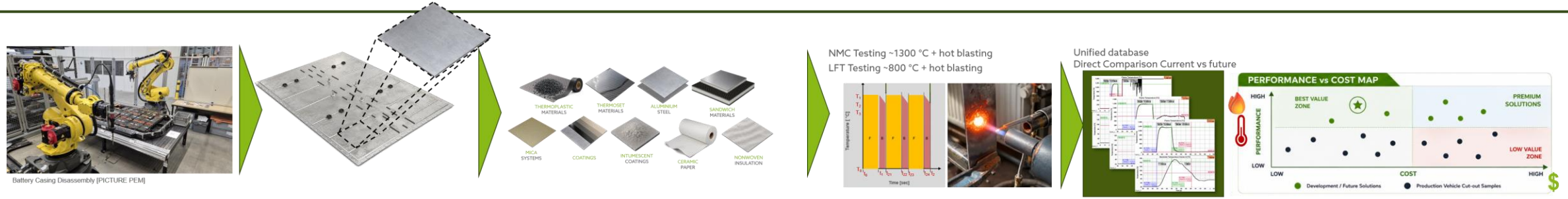
WP4: Design Translation, Cost Assessment & Industrialization

- Performance-to-weight and performance-to-cost assessment
- Manufacturing, joining and scalability evaluation
- Sustainability and recyclability assessment
- Development of material-selection maps and enclosure design guidelines
- Industrial recommendations and future technology roadmap

Collection of production EV samples and preparation of specimens

Benchmarking Fire Protection Concepts for Battery Enclosures

Project Time Plan



€ Participation fee: 19.500 €

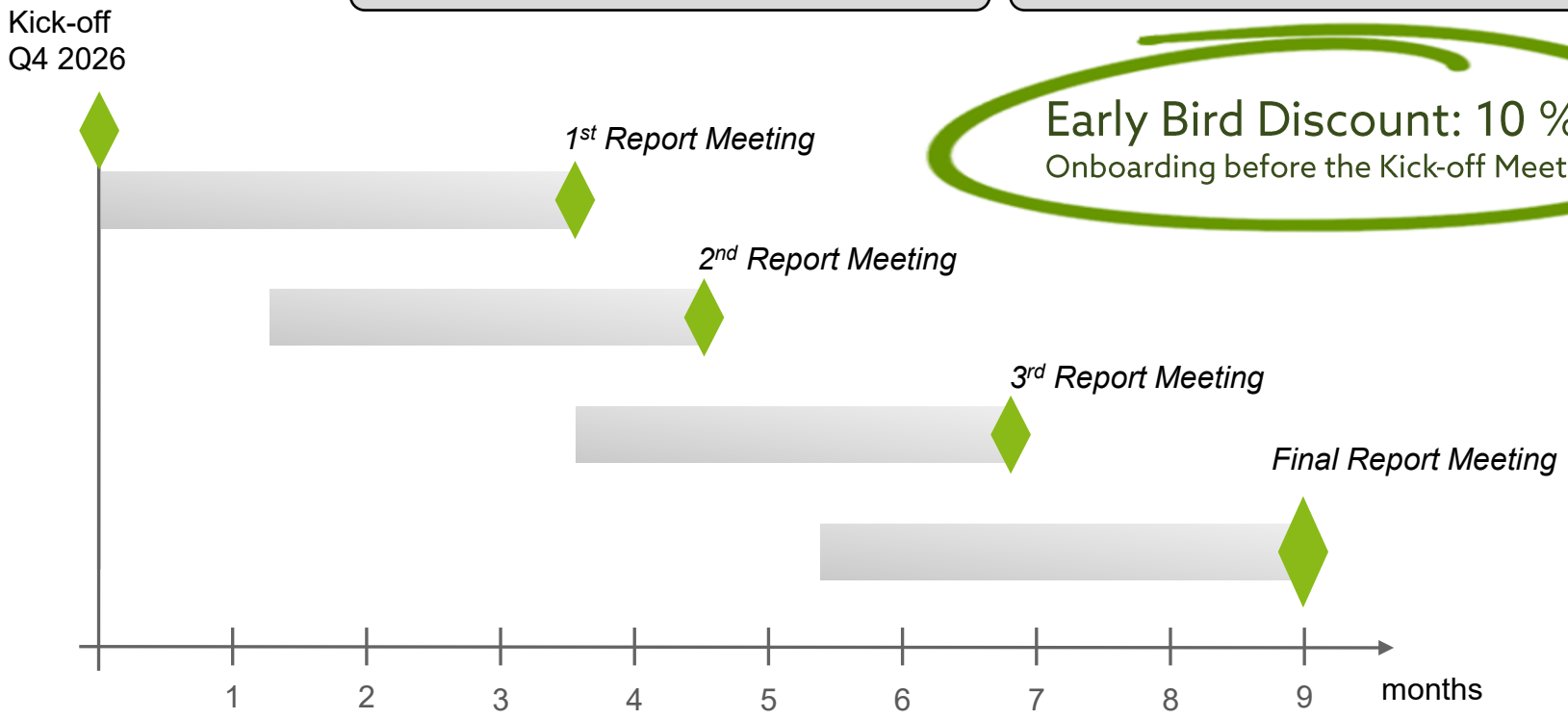
€ Participation fee AZL Partner: 15.920 €

WP1: Application Requirements & Concept Portfolio

WP2: Test Method Development & Benchmark Protocol

WP3: Experimental Coupon Benchmarking & Failure Analysis

WP4: Design Translation, Cost Assessment & Industrialization



Early Bird Discount: 10 %
Onboarding before the Kick-off Meeting

CONTACT US WITH YOUR REMARKS AND QUESTIONS!

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