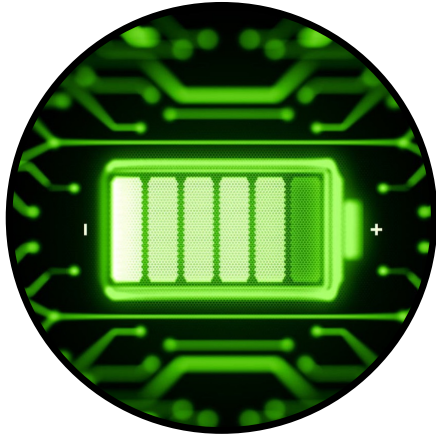


CENTRE FOR
ENERGY INNOVATION

UNIVERSITY
OF TWENTE.



Twente Centre for Advanced Battery Technology

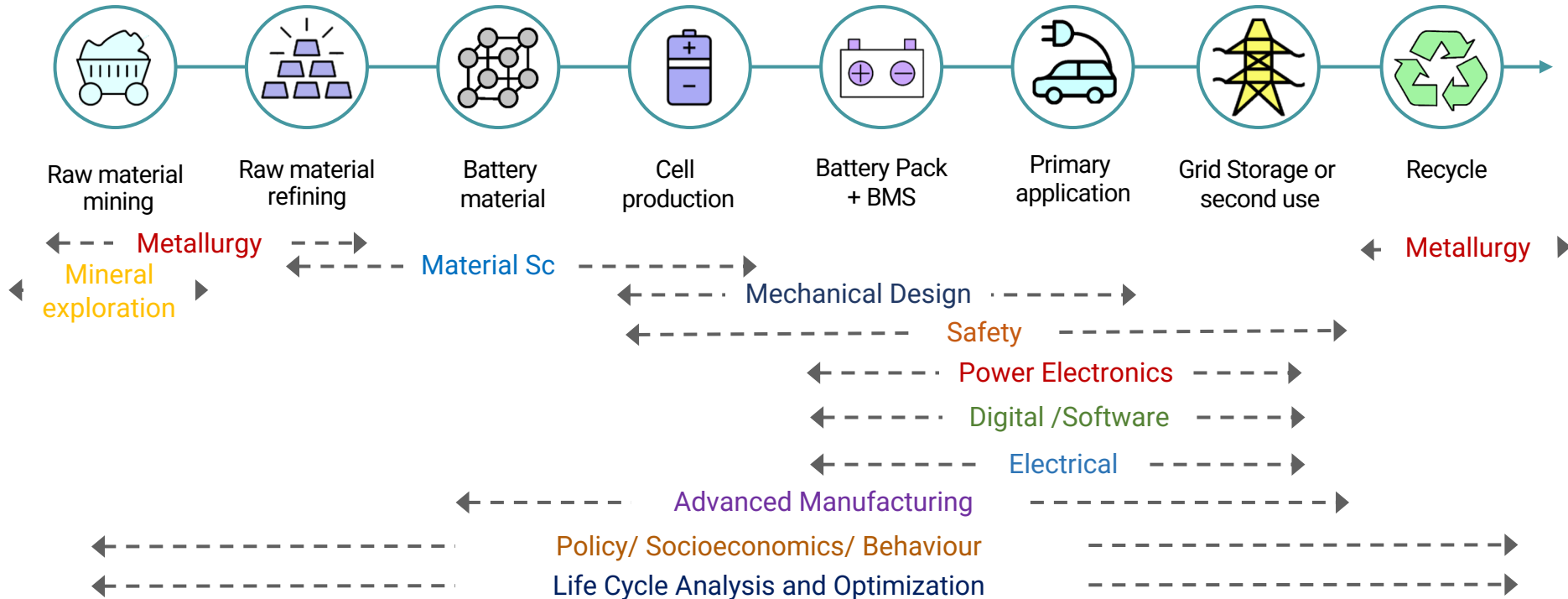
Prof. dr. ir. Mark Huijben

www.utwente.nl/tcabt

TWENTE CENTRE FOR ADVANCED BATTERY TECHNOLOGY



- **Integral approach:** UT competences contribute to batteries challenges all along the value chain, multidisciplinary
- Accelerate the pace of impact with **mission driven roadmaps** together with our partners





TWENTE CENTRE FOR **ADVANCED BATTERY TECHNOLOGY**

Missions:

I. Next Generation Battery Cells/Packs Integration

Design and realize innovative and integral concepts for battery cell/pack to increase energy density, charging rate and lifetime for mobility, portables and stationary use

II. Advanced Battery Manufacturing

Develop efficient and sustainable battery production processes, factories and supply chains - enabling significant reduction of costs and environmental impact.

III. Towards a Circular Battery Value Chain

Realize a fair and sustainable battery value chain in a social and global context with improved Life Cycle Analysis and recycling

IV. Smart Battery Applications

Optimize mobile and stationary battery applications to enable sustainable energy generation and use, and ensure a resilient grid



EXPERTISE AT UT



**NEXT GEN BATTERY
CELL/PACK**



**ADVANCED BATTERY
MANUFACTURING**



**CIRCULAR
VALUE/SUPPLY
CHAIN**



**SMART BATTERY
APPLICATIONS**

**Advanced Materials/Chemistry
Electronics / Battery Management Systems**

**Integrated Sensors
Embedded software
Thermal Management**

Production Equipment, Process Chains and Factories

Smart Manufacturing/ Digital twins/ Automation

Energy and Resource Efficiency

Upscaling from Lab to Fab

Quality Management

**Raw materials, mining and mineral exploration
(incl. socioeconomics, geopolitics)**

Recycling Methods

Policy and Governance

Business Models and 2nd life Applications

Smart Grid and Energy Management Systems

Power Electronics

Local Energy Communities

(incl. policies, socioeconomics, human behaviour)

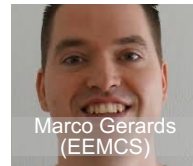
Grid Stabilization (industrial/commercial)

Safety (engineering, testing, certification)

Advanced Mobility Concepts



UT PRINCIPLE INVESTIGATORS (PI) INVOLVED



a growing UT community...

UNIVERSITY
OF TWENTE.

MESA+
INSTITUTE

DIGITAL SOCIETY
INSTITUTE

FRAUNHOFER
PROJECT CENTER@UT



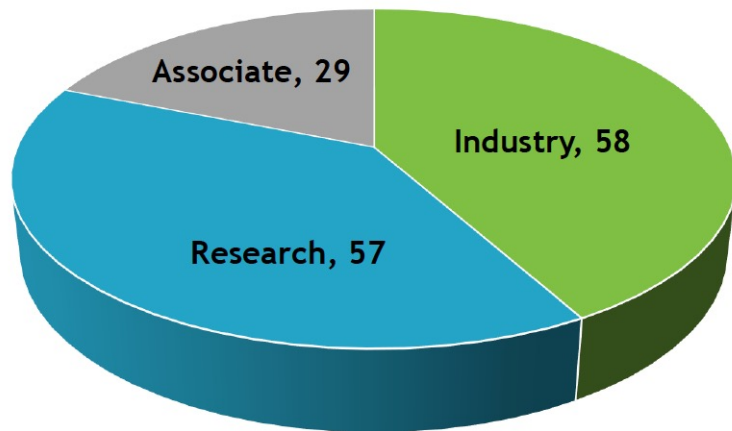
MEMBERSHIP – BATT4EU



Main UT representative : Mark Huijben

- **Provide recommendations for calls for proposals within the Horizon Europe Work Programmes.**
- **Implement and regularly update the Strategic Research and Innovation Agenda (SRIA) for batteries.**
- **Support and oversee the portfolio of projects funded under the Partnership Work Programmes.**
- **Create and reinforce networks between the battery sector, and ensure synergies with other European Partnerships and initiatives.**
- **Support the development of EU regulations on battery standards, safety, and sustainability and actively promote innovation uptake in the market.**

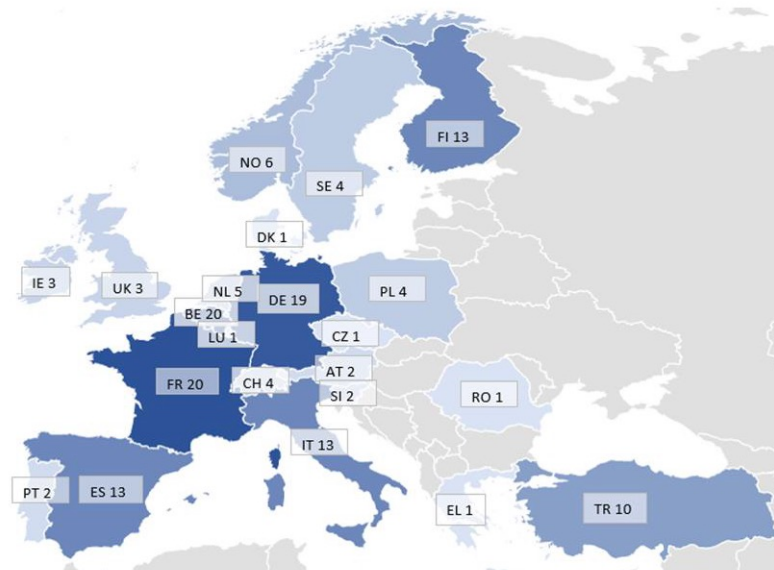
BEPA MEMBERS - Overview



Total number of BEPA members: 144

Update 22.03.2021

Geographical distribution of BEPA members





VOORBEELDEN VAN REGIONALE SAMENWERKING

VDL ENERGY SYSTEMS (VDL ES) - ALMELO

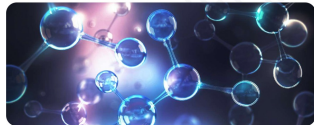
VDL ES ontwikkelt een dynamische testlocatie voor duurzame energie-technologien: opwekking, opslag en transport.



Samenwerking met de Universiteit Twente

Energy Garden-NL

onderzoek
testlocatie
waterstof
energietransitie
energieopslag



Energy Garden-NL wordt een 'dynamische testlocatie'. Een plek waar bedrijven, onderzoekers en studenten uitgebreid kunnen experimenteren rond toegepast onderzoek op het gebied van het genereren, opslaan en transporteren van duurzame energie. Een levendige testlocatie met de focus op de energietransitie, waterstoftechnologie en grootschalige industriële toepassing.



ACCUMULATE consortium



Europese Unie



Europees Fonds voor Regionale Ontwikkeling



ACCUMULATE

Ontwikkeling van nieuwe lithium-ion batterypacks met aandacht voor hergebruik, recycling en (brand)veiligheid.

Contour

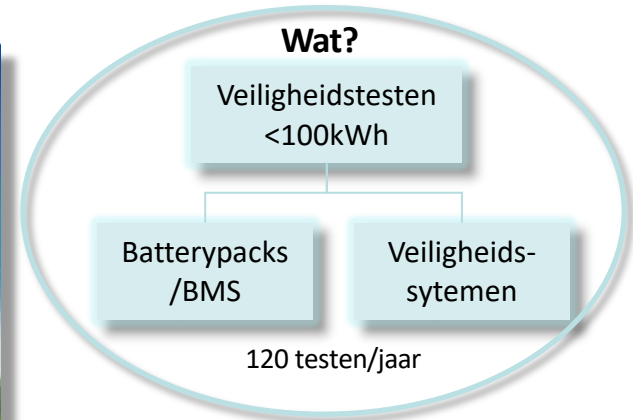


UNIVERSITEIT TWENTE.

TWENTE SAFETY CAMPUS

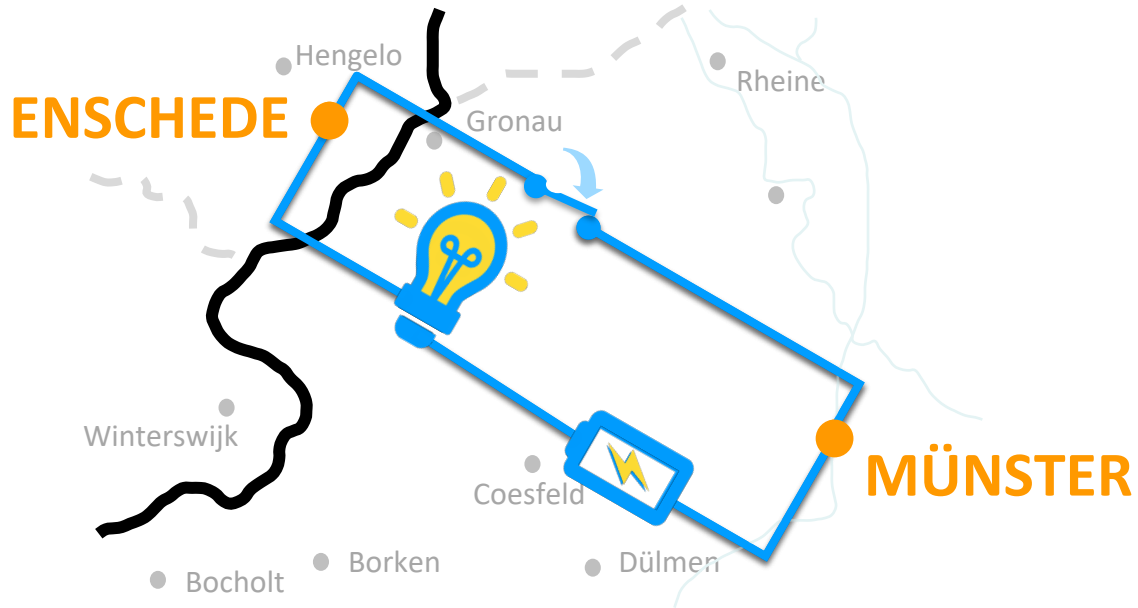


Battery Safety Test Center – Technology Base Enschede



Cross-border collaboration

Enschede (NL) – Münster (DE)



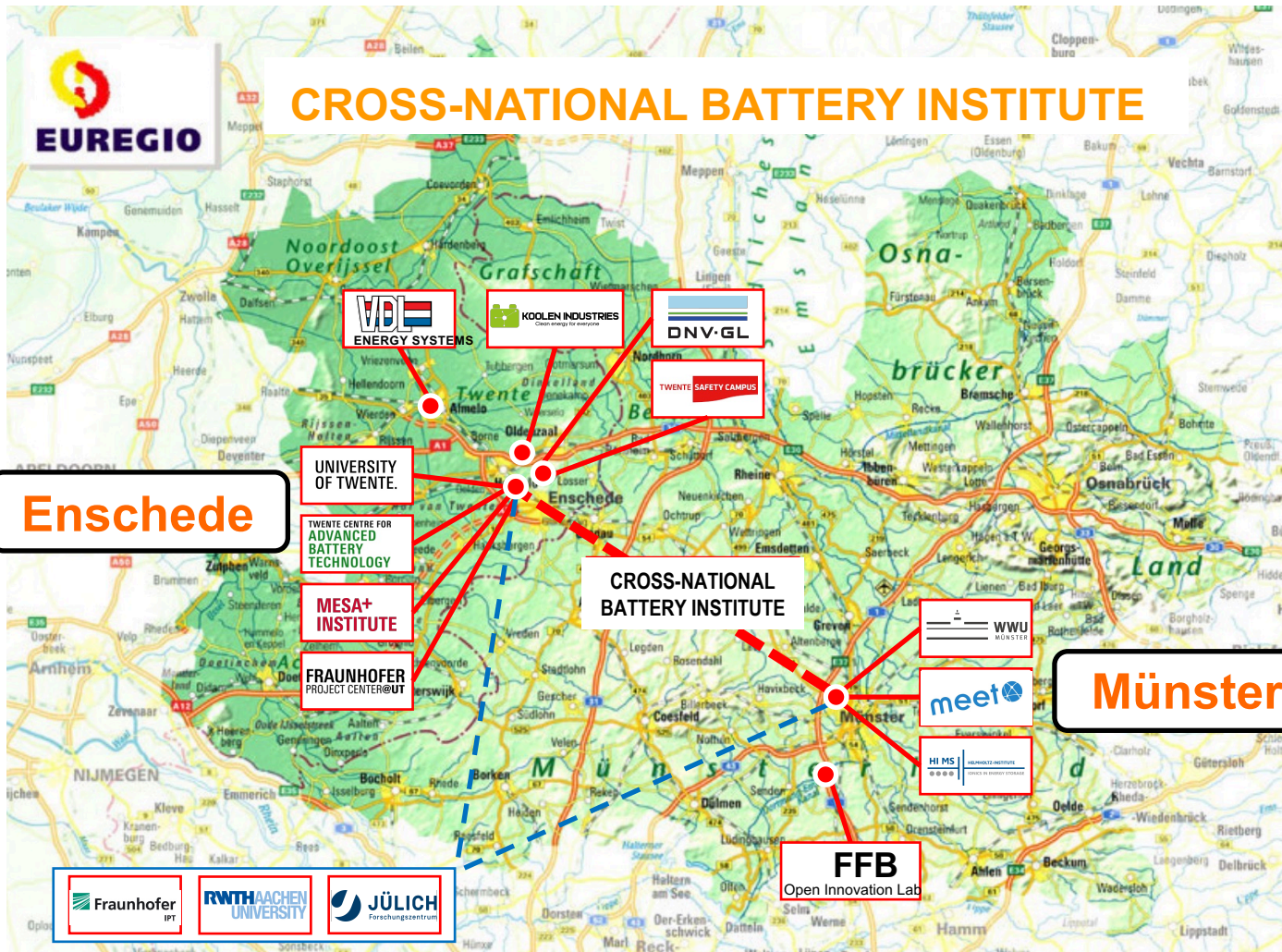


CROSS-NATIONAL BATTERY INSTITUTE



Enschede

Münster



CROSS-NATIONAL BATTERY INSTITUTE



COOPERATION UT/FPC WITH FFB MUNSTER



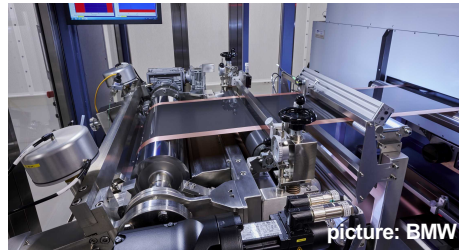
Research Fab Battery Cells (Forschungsfertigung Batteriezele – FFB) in Münster/Germany



Fraunhofer Project Center (FPC) at the University of Twente in Enschede/the Netherlands

- Complementary competencies: FFB – battery cell manufacturing, FPC: advanced manufacturing technologies and methods
- Fraunhofer IPT is close partner for both FFB and FPC
- Close spatial (distance approx. 80km) and political proximity (EUREGIO region)

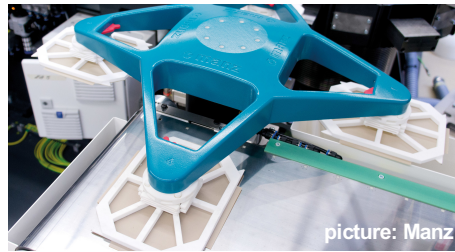
COOPERATION UT/FPC WITH FFB MUNSTER



Electrode Production

Mixing, Coating, Drying,
Calendaring

continuous/batch process



Cell Assembly

Stacking, drying, can cutting
forming, electrolyte filling, sealing
(takes place in dry room)

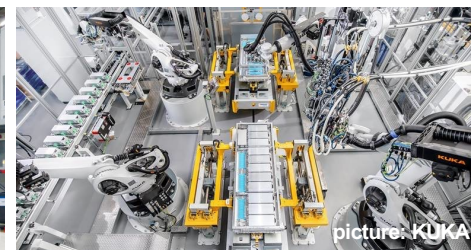
discrete manufacturing



Formation/Finishing

Electro-chemical activation and
testing

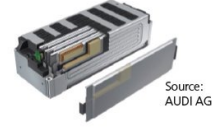
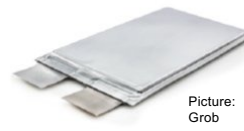
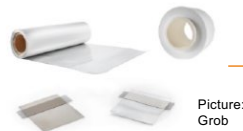
batch process in test/charging rigs



Module/pack assembly

Assembly of cells and further
components to modules, contacting

discrete manufacturing



Dutch National Science Agenda

National research program on battery materials



DUTCH NATIONAL BATTERY MATERIALS RESEARCH PROGRAM

National Science Agenda, 8 years, 10 MEuro

Knowledge partners

- 5 universities
- 5 universities of applied sciences
- TNO – Holst Centre
- TNO – ECN
- MEET Munster
- Forschungszentrum Jülich



Enabling Next Generation Battery Systems for Mobility

Dutch technical universities : Delft, Twente and Eindhoven

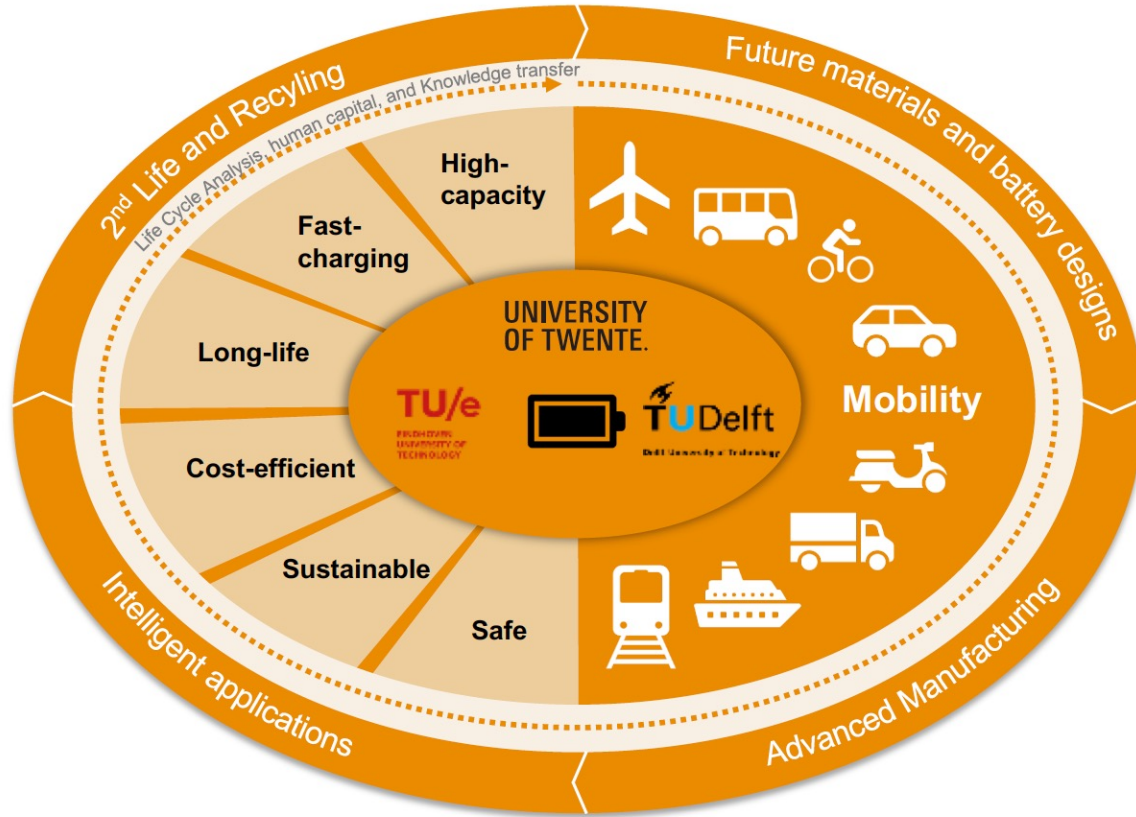


NWO-LTP (PPP) proposal

Enabling Next Gen Battery Systems for Mobility

- 4TU to develop NWO Long Term Program (LTP) “Enabling Next Gen Batteries”
- address the key challenges in future battery demand (high-capacity, fast-charging, long-life, safety, sustainability, cost-efficiency), by joining the material developments in next generation battery chemistries, advanced design and manufacturing for cell and packs up to the design of electrical vehicles and related applications (maritime, automotive, aerospace and e-bikes)
- LTP characteristics:
 - Public Private Partnership 10yrs
 - Targeted total budget proposed: 80Meu
 - requiring cash/in-kind contributions from industry as well as academic partners
 - private commitment required pre-proposal 2.5Meu/yr for first 5 yrs
 - pre-proposal deadline **May 28th** 2021 (final proposal June/July 2022)

Enabling Next Generation Battery Systems for Mobility

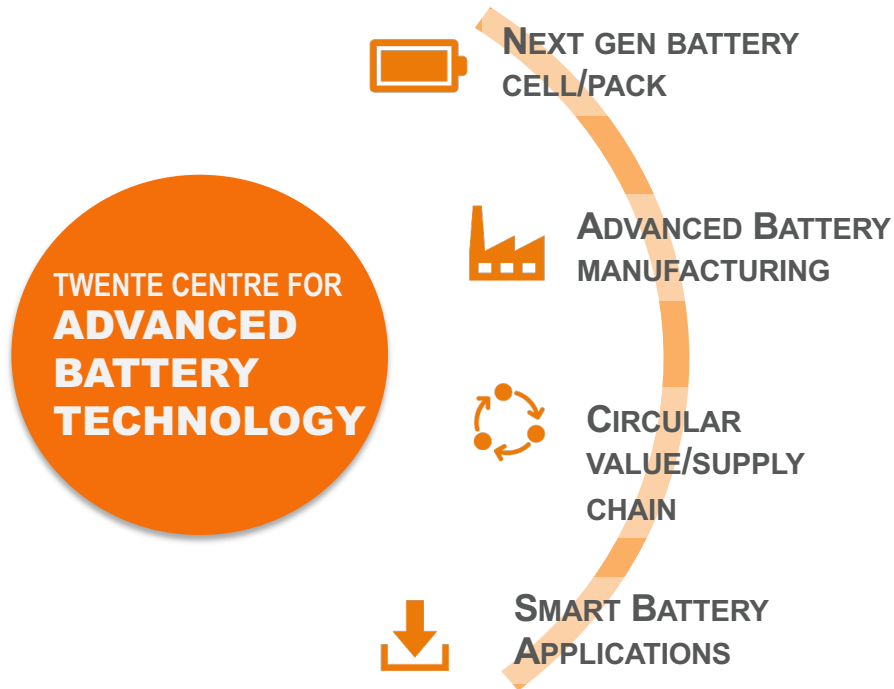


Program lines

	Automotive	Maritime	Aerospace	Heavy Duty	Bikes
1. Future Material Chemistries					
2. Innovative Battery designs					
3. Advanced Battery Manufacturing					
4. Intelligent applications and systems					
5. Recycling and 2 nd Life					
6. Life cycle analysis					
7. Human Capital, Knowledge transfer					



TWENTE CENTRE FOR **ADVANCED BATTERY TECHNOLOGY**



GET IN TOUCH !

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