



SAFETY – Ein Schlüssel zur Elektromobilität

explosion

environment

new technology
 fire *grid stability* emission
 energy green house gas

efficient

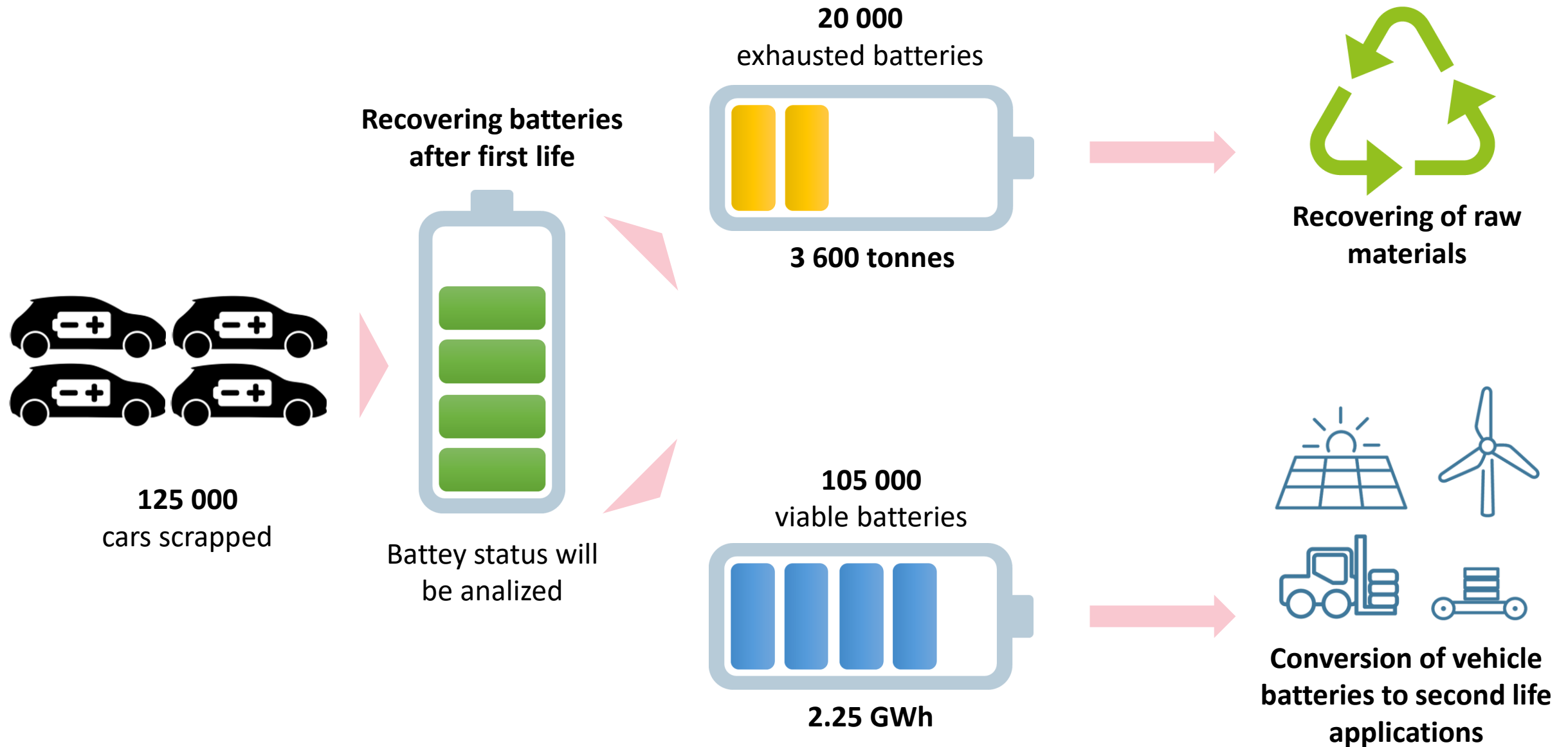


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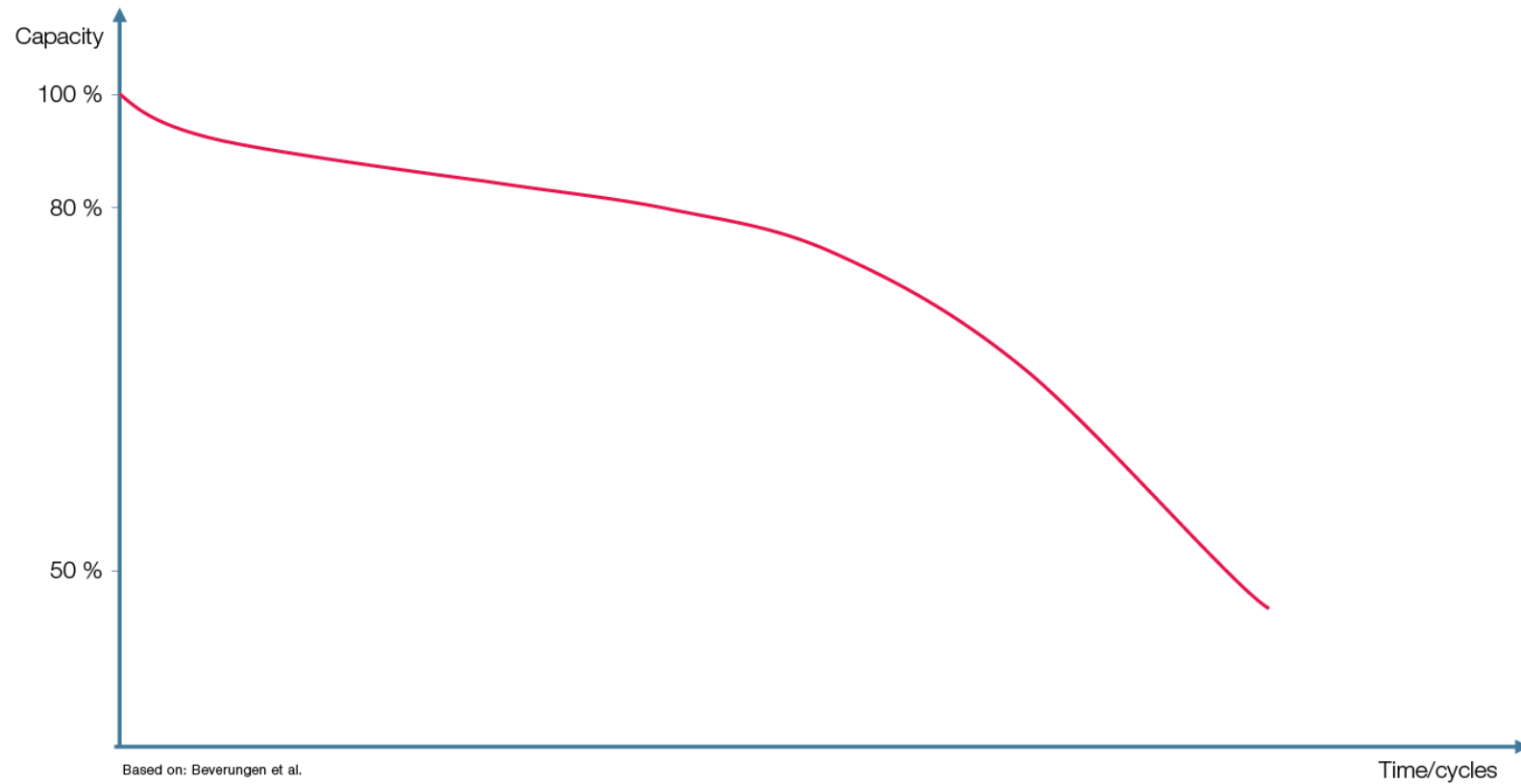
vehicle to grid *cobalt mining* powerful
 electricity Li resources charging time

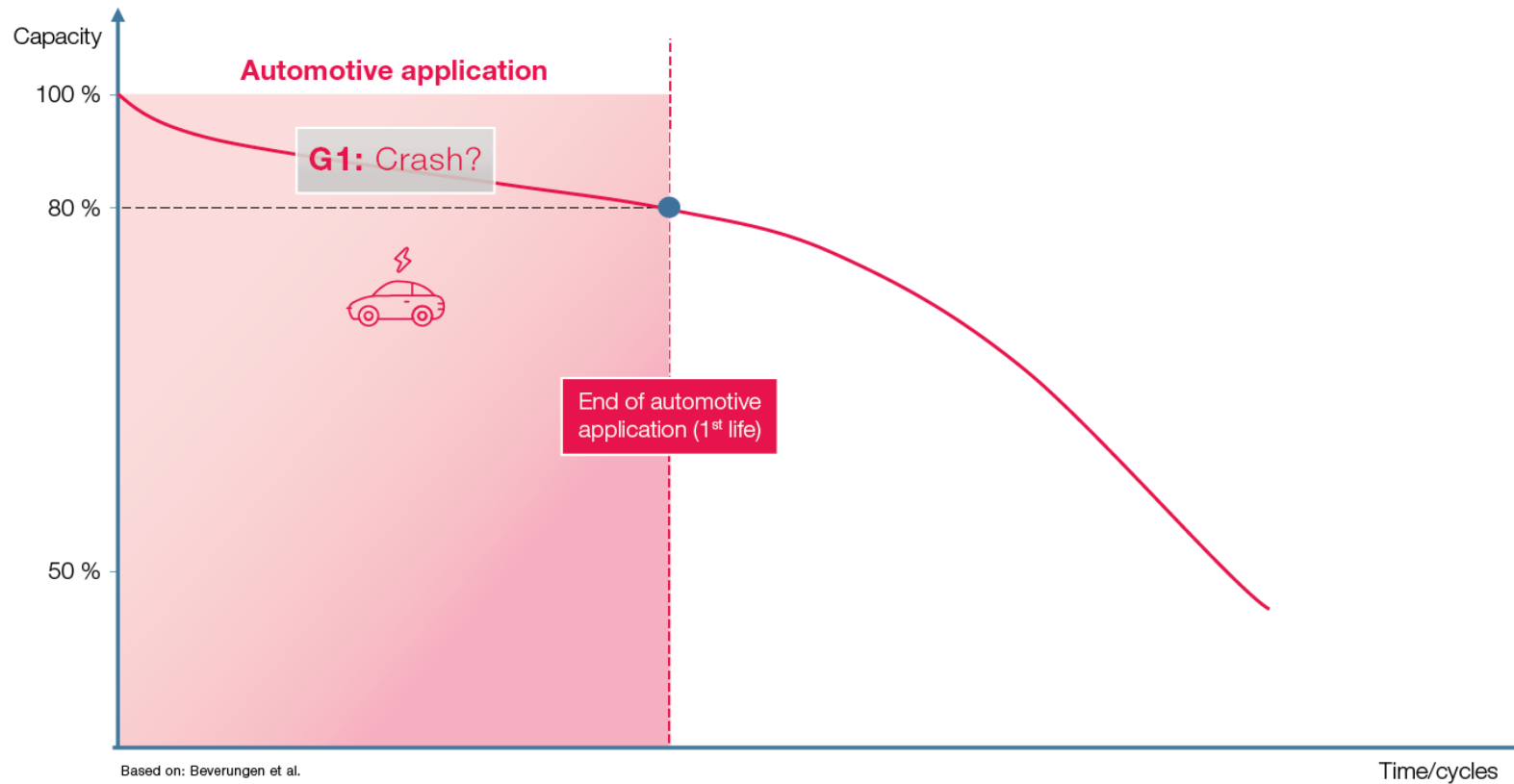


What can we expect in 2030?



Numbers based on: elementenergy report - Batteries on wheels: the role of battery electric cars in the EU power system and beyond (2019)





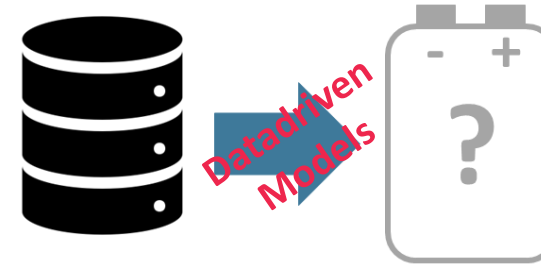
G1: Assessment of the safety status of automotive LIB in a crash, considering the product history ("First Life")

Cell 2 reduced Cell



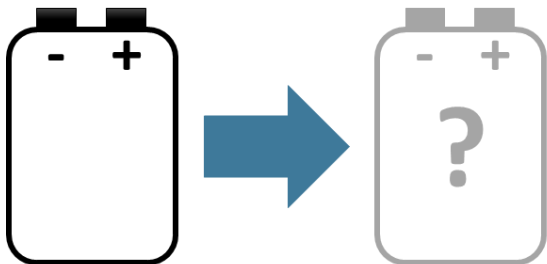
- Reduce calculation effort without compromising fidelity

Data 2 Cell



- Reduce modelling effort

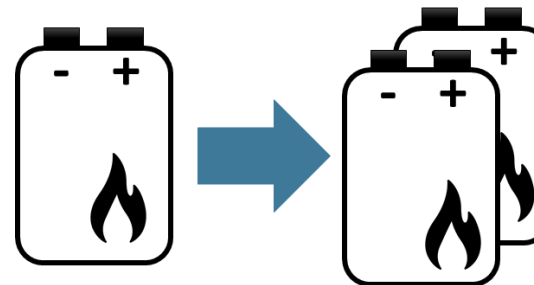
Cell 2 Cell



- Physical and fidelic
- Identify sensitive parameters

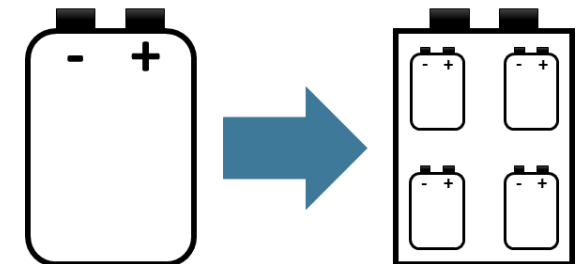


TR 2 TP



- Identify difference between single cell and stack

Cell 2 Module



- Fidelic and fast
- Identify sensitive parameters

– Research Testing LAB (opened 2020)

- **Safety behaviour** of energy storage systems (e.g. Li-Ion cell) and electric components
- Feature: Handling of **safety critical situation** (e.g. battery cell TR caused by crash test situation)



Electro/Thermal Test – AGING

Cooperation AVL List GmbH – TU Graz



– Focus:

- **Investigation of the battery behaviour** on electric, thermal and mechanical loads
- Laboratory controlled environment to **reduce involved factors** (e.g. diff. temp.)
- **Reproducibility** of test design and **precise measurement** and setting of loadings

BATTERY-CONCEPT

*BEYOND STATE-OF-THE-ART
test bench technology*



SafeLIB
Experimental

= **BSCG**
BATTERY SAFETY CENTER GRAZ

Electric Preparation -
CONDITIONING

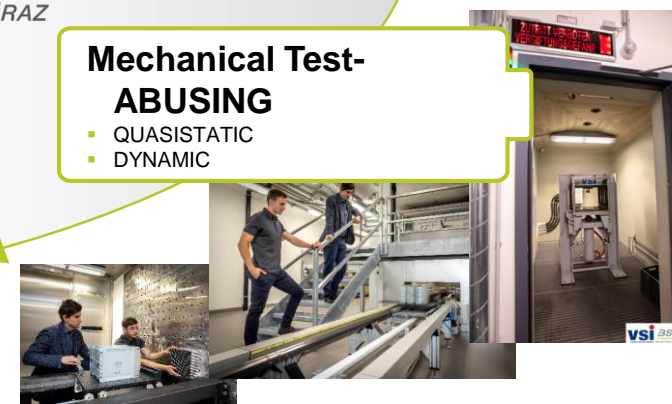


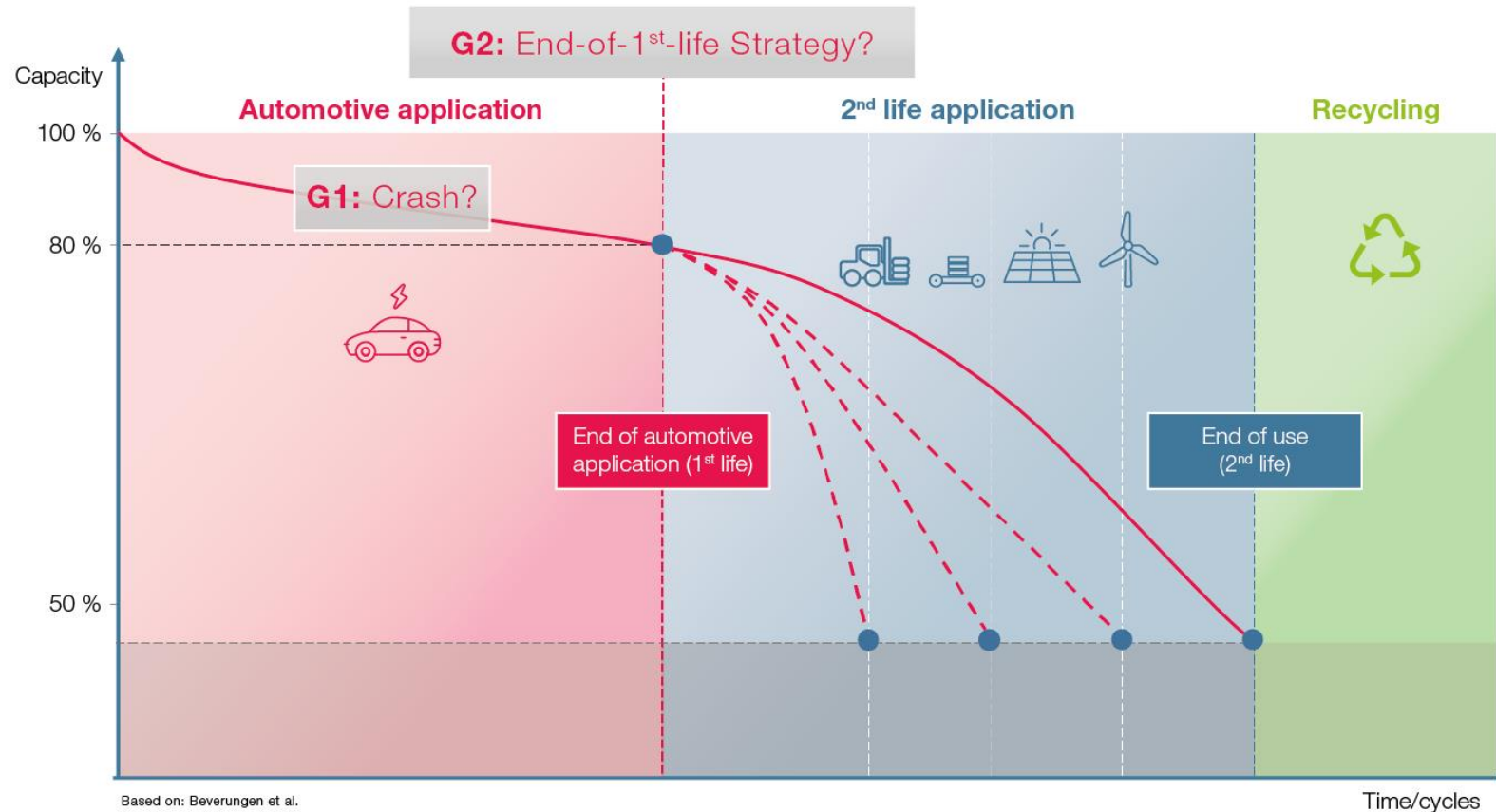
- VALIDATION
- VERIFICATION

**Mechanical Test-
ABUSING**

- QUASISTATIC
- DYNAMIC

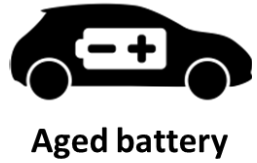
DISASSEMBLING








G1: Assessment of the safety status of automotive LIB in a crash, considering the product history ("First Life")





G2: Qualification of (automotive) LIB for "Second Life"



Parameter 1
Parameter 2
Parameter 3
⋮
Parameter n

Technical

Param 1	
Param 2	
⋮	
Param n	

High demanding load profile	
Medium demanding load profile	
Low demanding load profile	
Recycle	

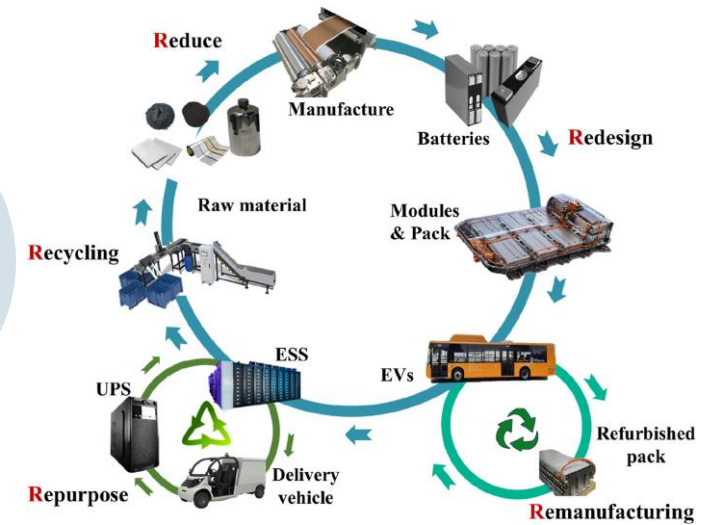


SafeLIB
2nd life

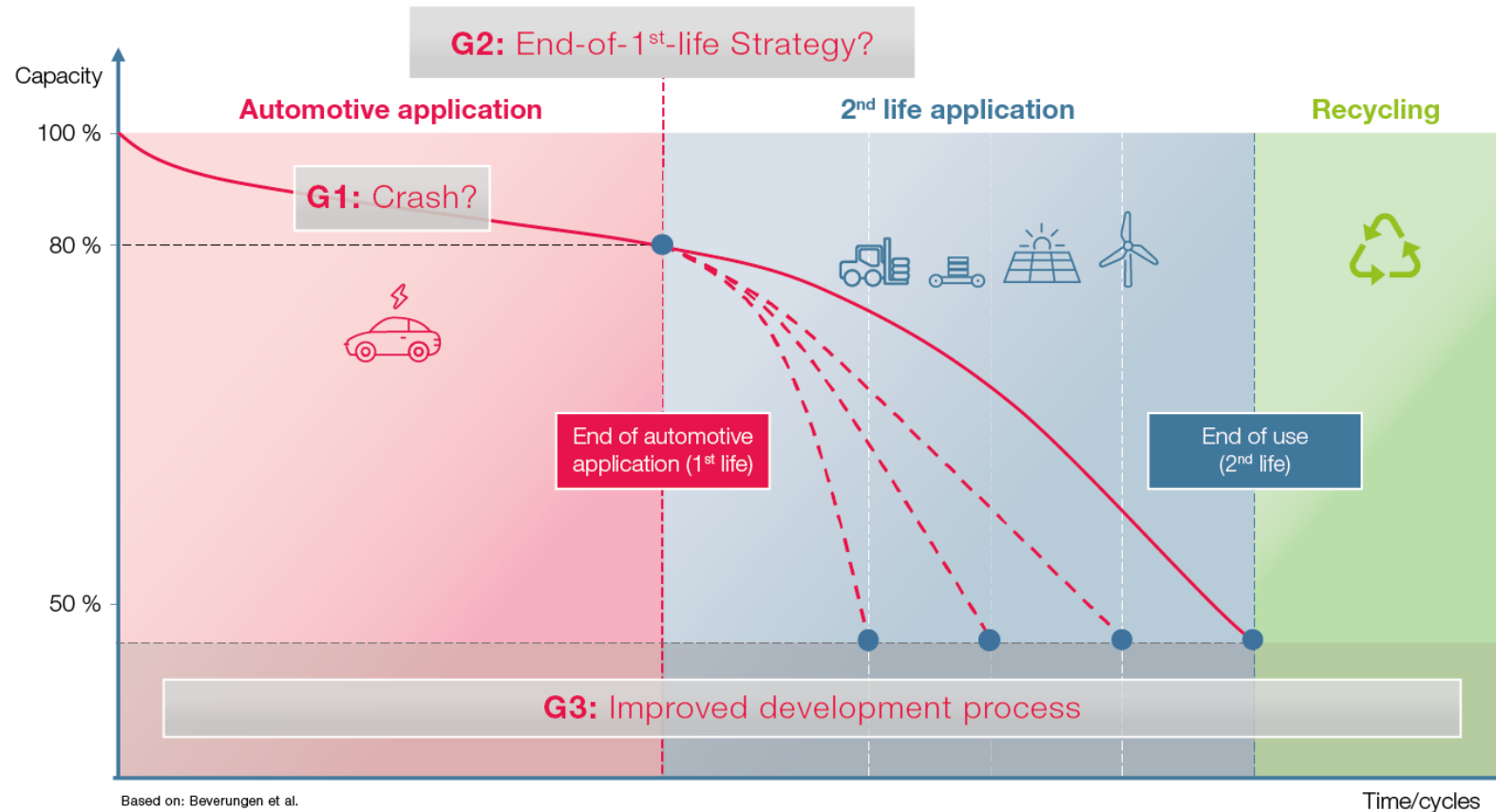
Legal

Business

- § Waste and Environmental law
- § Transportation law
- § Safety regulations
- § Warranty, liability and product requirements
- § Data protection law
- § Insurance law
- § Technical norms and standards



Source: Hua et al. (2020)

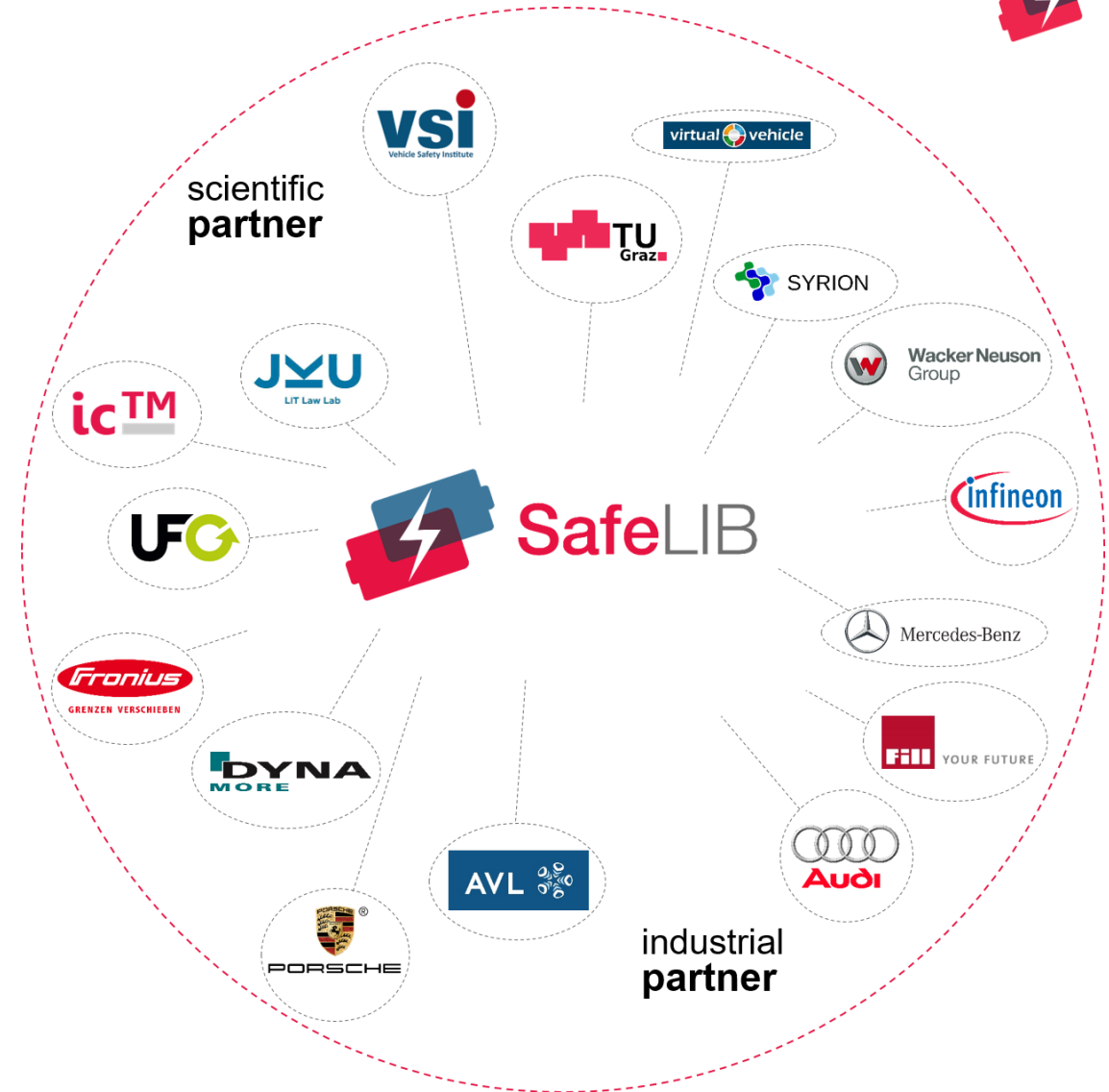


G1: Assessment of the safety status of automotive LIB in a crash, considering the product history ("First Life")

G2: Qualification of (automotive) LIB for "Second Life"

G3: Improved battery design in the development process for the entire product life ("First and Second Life")

- **Leader of consortium:**
Vehicle Safety Institute –
Graz University of Technology
- **Consortium:**
 - 4 scientific partner
 - 9 industrial partner
(5 from Austria and 4 from Germany)
- **Duration:** 04/2021 – 03/2025
- **Total budget:** 6 Mio Euro



www.tugraz.at/projekte/safelib

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Competence Centers for
Excellent Technologies

