

An RTO's View at sustainable battery manufacturing

Prof. Gerhard Sextl/ Dr. Henning Lormann/ Dr. Victor Trapp
Fraunhofer Institute for Silicate Research, ISC

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INSIDE & ON TOP
MATERIAL SOLUTIONS
by Fraunhofer ISC

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Who we are



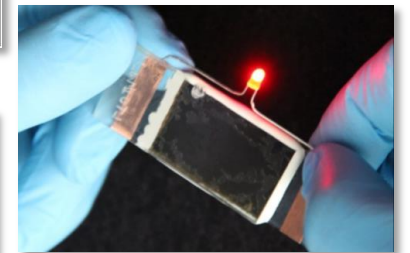
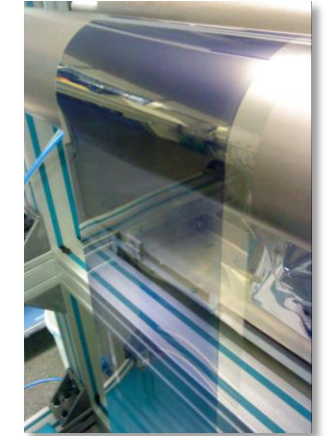
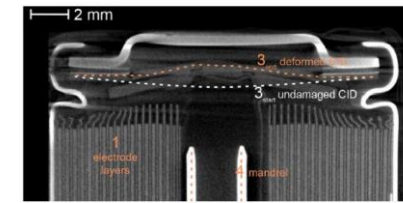
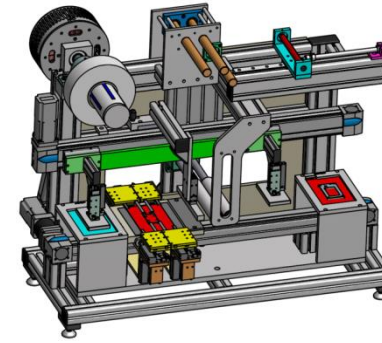
LiB Materials

- upgraded/ novel active materials
- polymer & ceramic electrolytes (Gen4)
- components
- design for recycling



Process development

- solid-state-cell concepts (Gen4)
- semi-automatic electrode & cell manufacturing
- recycling

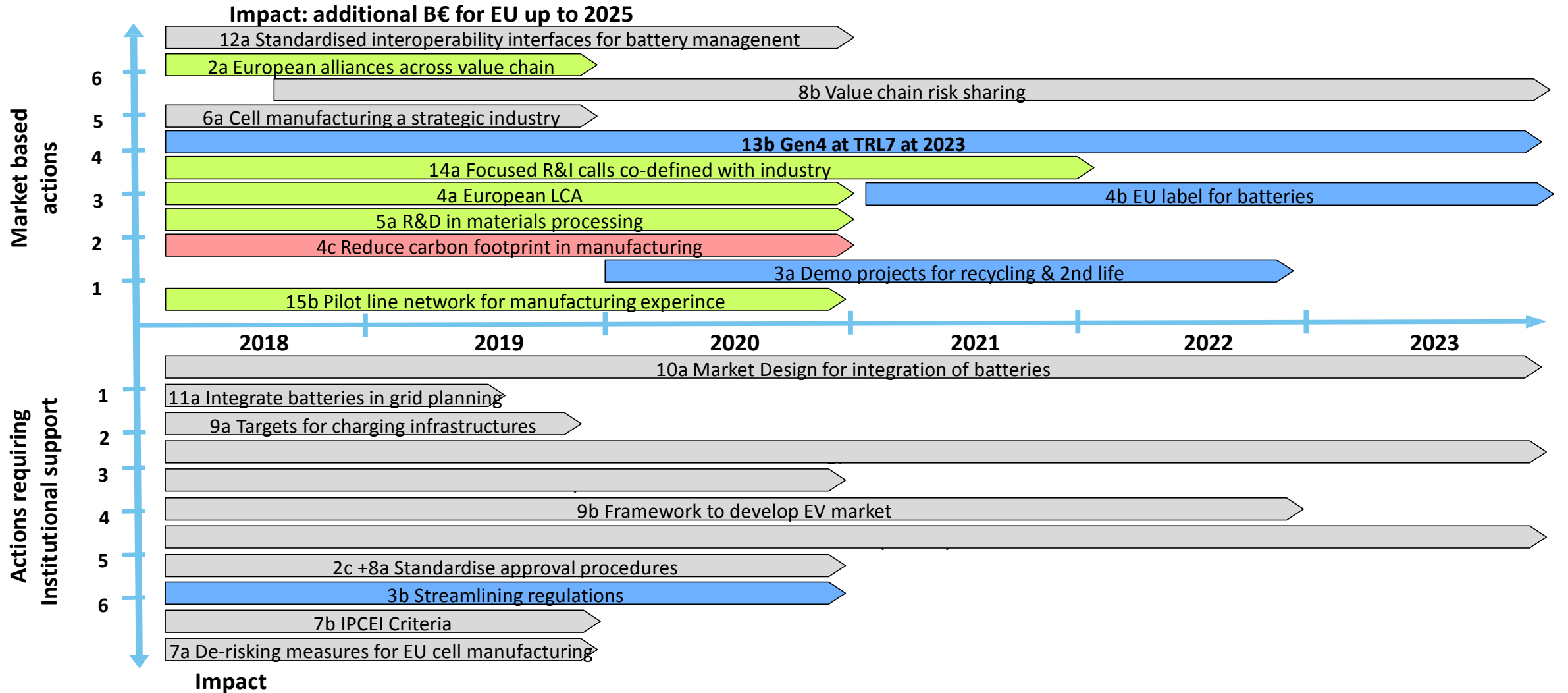


■ > 35 employees, > 4 Mio. € annual budget

■ National and international collaborations with battery manufacturers, chemical companies and OEM

■ Active members in EBA, EMIRI, EIT Raw Materials, SET Plan battery working group

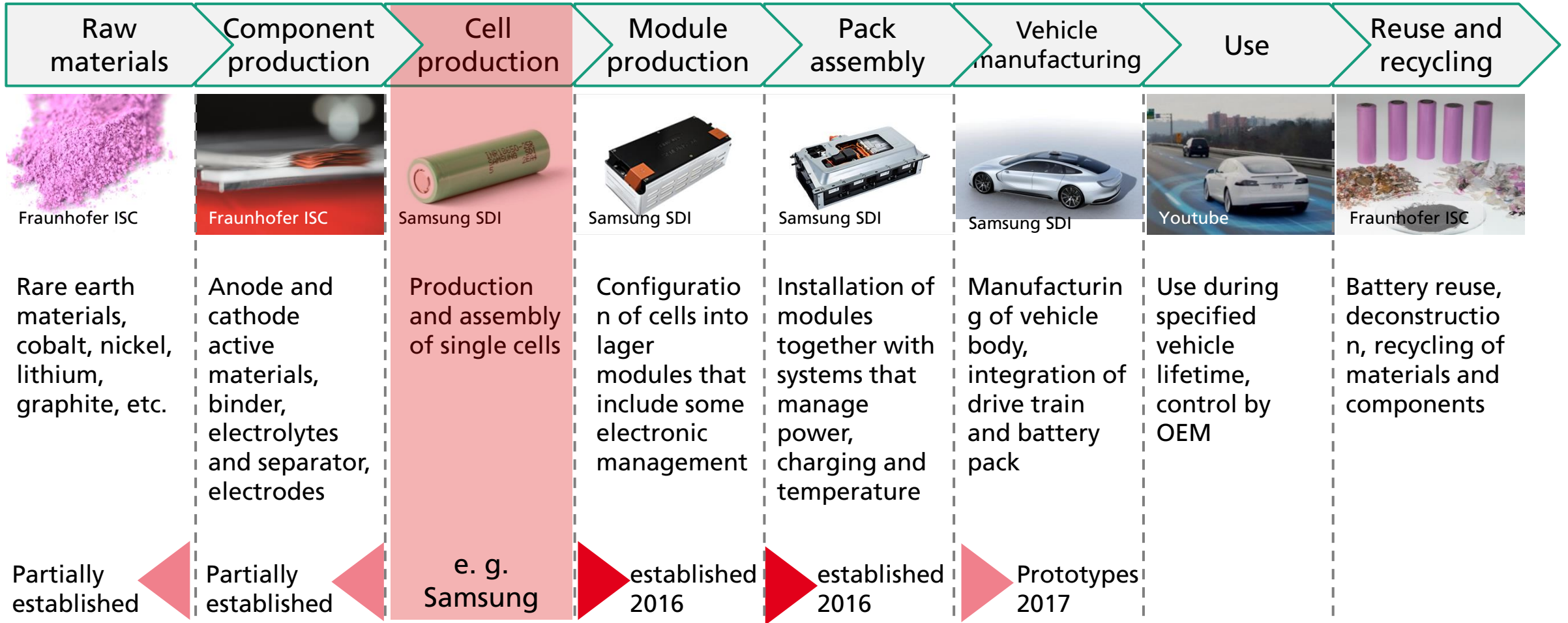
Alignment with EBA scope



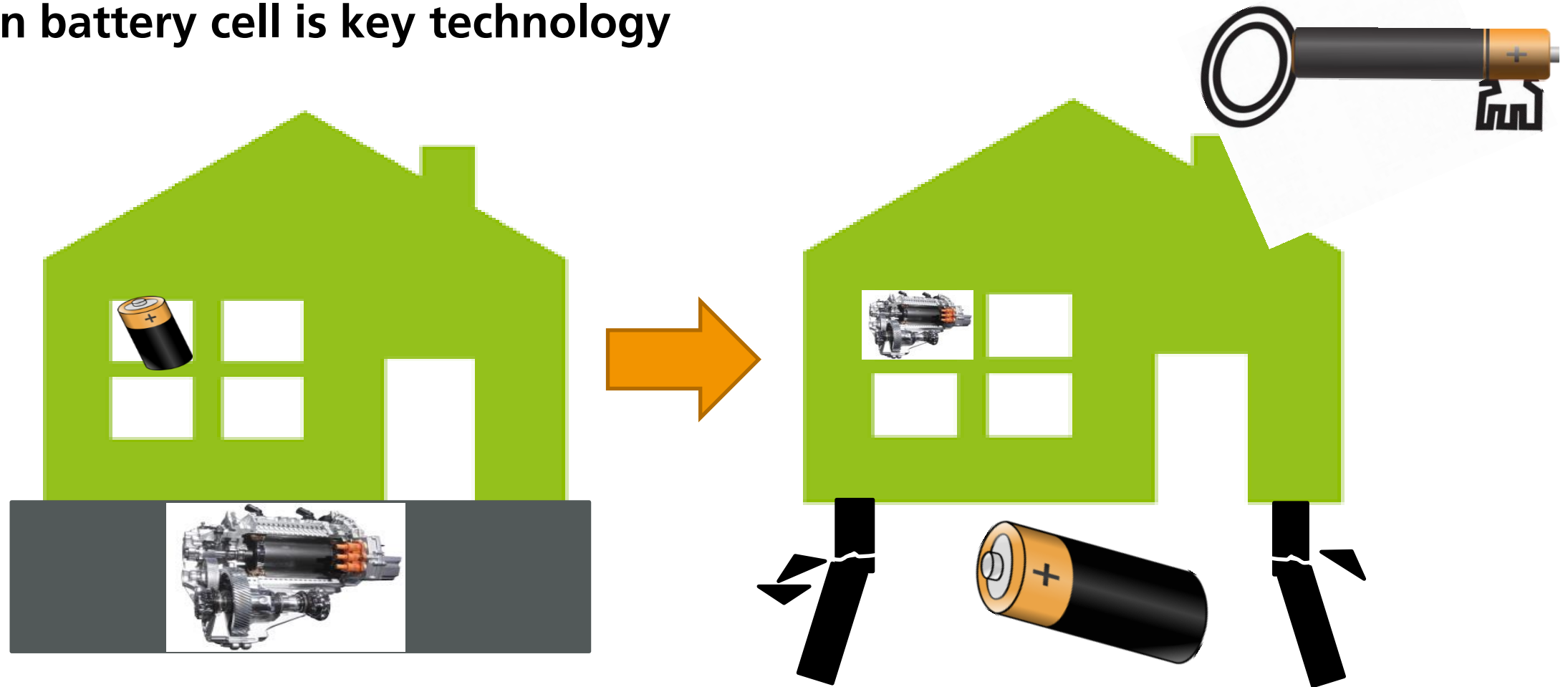
Full vertical integration



<http://www.argentus.com/friday-round-supply-chain-news-october->



Li-Ion battery cell is key technology



- Internal Combustion Engine (ICE) was automotive key technology for a century
- (Li-Ion) Battery Cell is currently „swapping seats“ with ICE

Key technology



- Even though the perceived added value of the battery cell as part of the E-mobility value chain may be little due to fully automated production, the **cell manufacturing must be considered a key technology** for the European society and economy (“bolt for the automotive industry”).
- The automotive industry is one of the **most important industrial sectors** in the EU. In France and Germany alone, almost 1.5 Mio. employees are working for car manufacturers or their suppliers. Within the European Union **every tenth job** (3.4 Mio.) is directly or implicitly linked to the automotive industry^{1,2}



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¹Statista, based on the numbers of 2016;

²THE AUTOMOBILE INDUSTRY POCKETGUIDE8 2015 / 201, ACEA – European Automobile Manufacturers Association

Circular economy

- The development of material closed loops will allow for a technology leap and ensure the **security of supply**. Innovative processing and recycling technologies to be developed, will lead to a sustainable economy not only for valuable elements (Cobalt, Copper) but for all cell components. (Best practice: 100 % recycling rate for lead acid batteries).
- Additionally the concept of closed loops will comfortably position Europe compared to Korea and Japan in the **upcoming price war for raw materials** in Africa, South America and China.
- Definition and implementation of **“Design for Recycling” standards** for future batteries/ cells will give European manufacturers market advantages and embed their products in closed loops



Cobalt miner at Kawama mine, DRC (Congo). Source: Washington Post

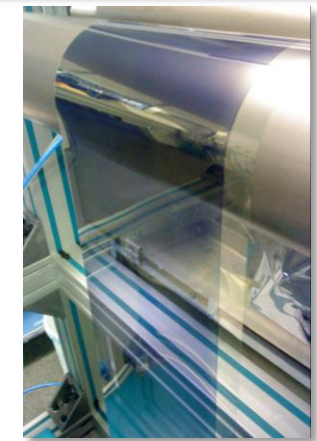
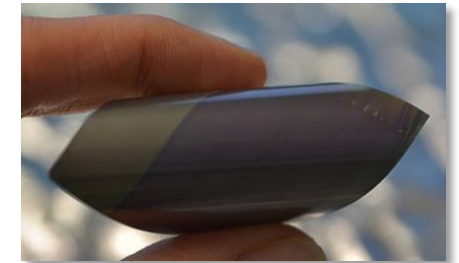
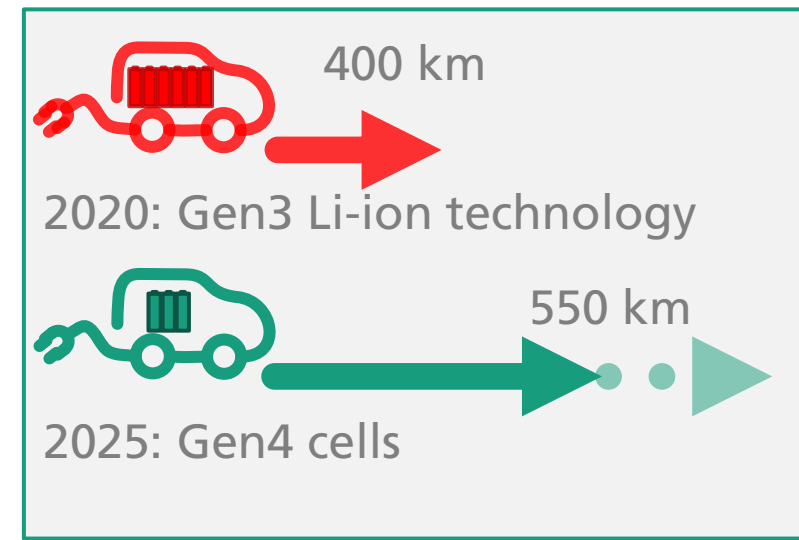
Short term goals

■ Gen3 Li-ion batteries

- Dominating Asian manufacturers establish plants in Europe
- **EBA action 6a: Cell manufacturing a strategic industry**
- Northvolt; SAFT... pushing for manufacturing capabilities in EU

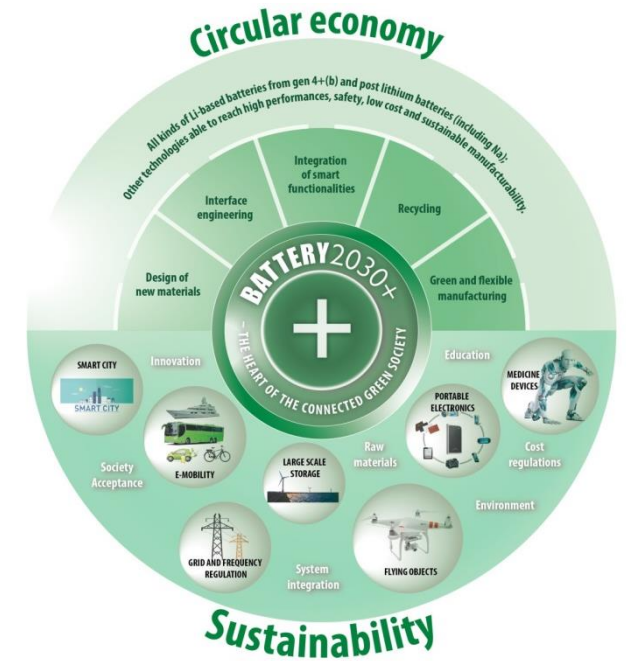
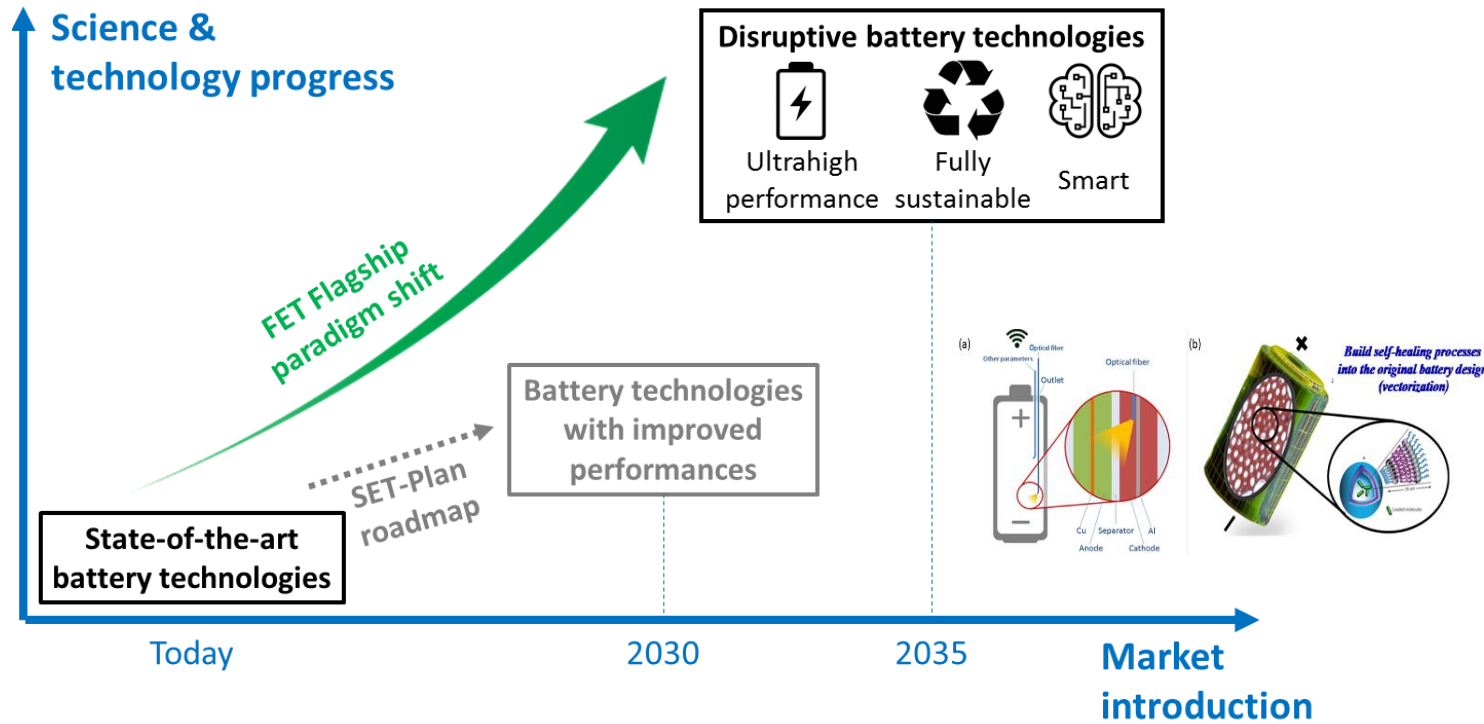
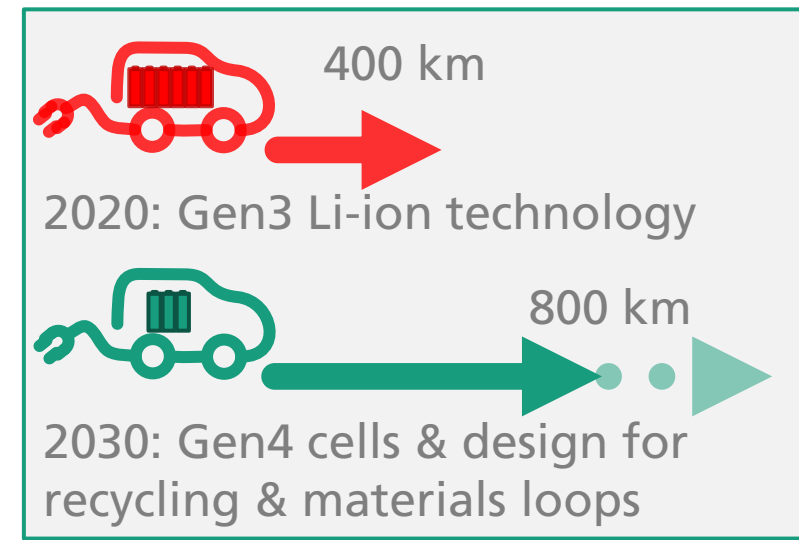
■ Gen4 Li-ion batteries

- Various technological advantages: safe, energy density, long cycle life
- Fair chance for EU to become leading manufacturer with novel technologies
- Toyota plans commercial cells by 2025; Japanese PPP LIBTEC: 550km by 2025
- Fraunhofer ISC wants to establish multi-national alliance with RTOs and companies to implement **EBA action 13b: Gen4 at TRL7 at 2023**



Long term goals

- FET-Flagship BATTERY 2030+
- Trans-European flagship-projects for the development of smart and sustainable (Gen4) batteries



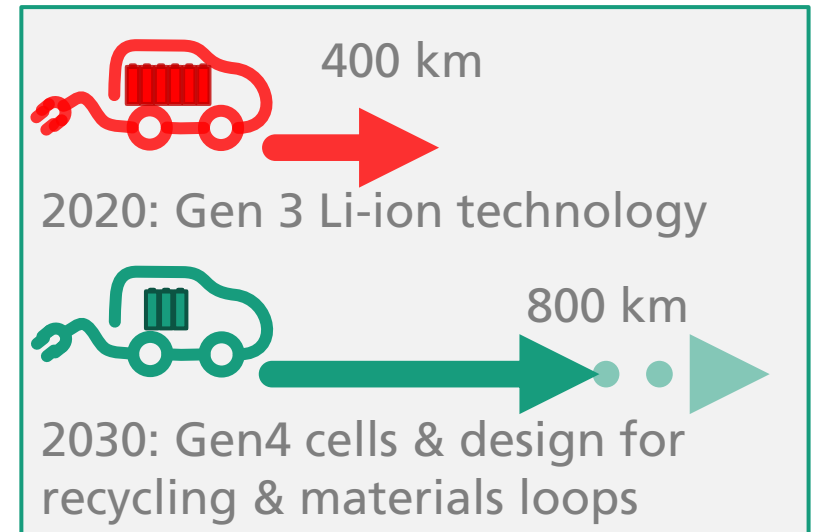
Conclusions

Battery Cell = Key Technology



- **Full vertical integration must be achieved** to prevent erosion of the automotive manufacturing value chain
- **Cell manufacturing** must be considered a **key technology** (“bolt for the automotive industry”)
- **Circular economy** in EU battery production, recycling and 2nd life will ensure security of supply
- **Gen4 cells** are a fair chance to lead the market but need to be upscaled until 2025
- Implement **European “Design for Recycling”** standards

Full vertical integration



THANK YOU VERY MUCH FOR YOUR ATTENTION!

Dr. Victor Trapp
Head of Marketing & Sales

Fraunhofer Institute for Silicate Research ISC
Neunerplatz 2 | 97082 Würzburg | Germany
Phone +49 931 4100 370
victor.trapp@isc.fraunhofer.de
www.isc.fraunhofer.de