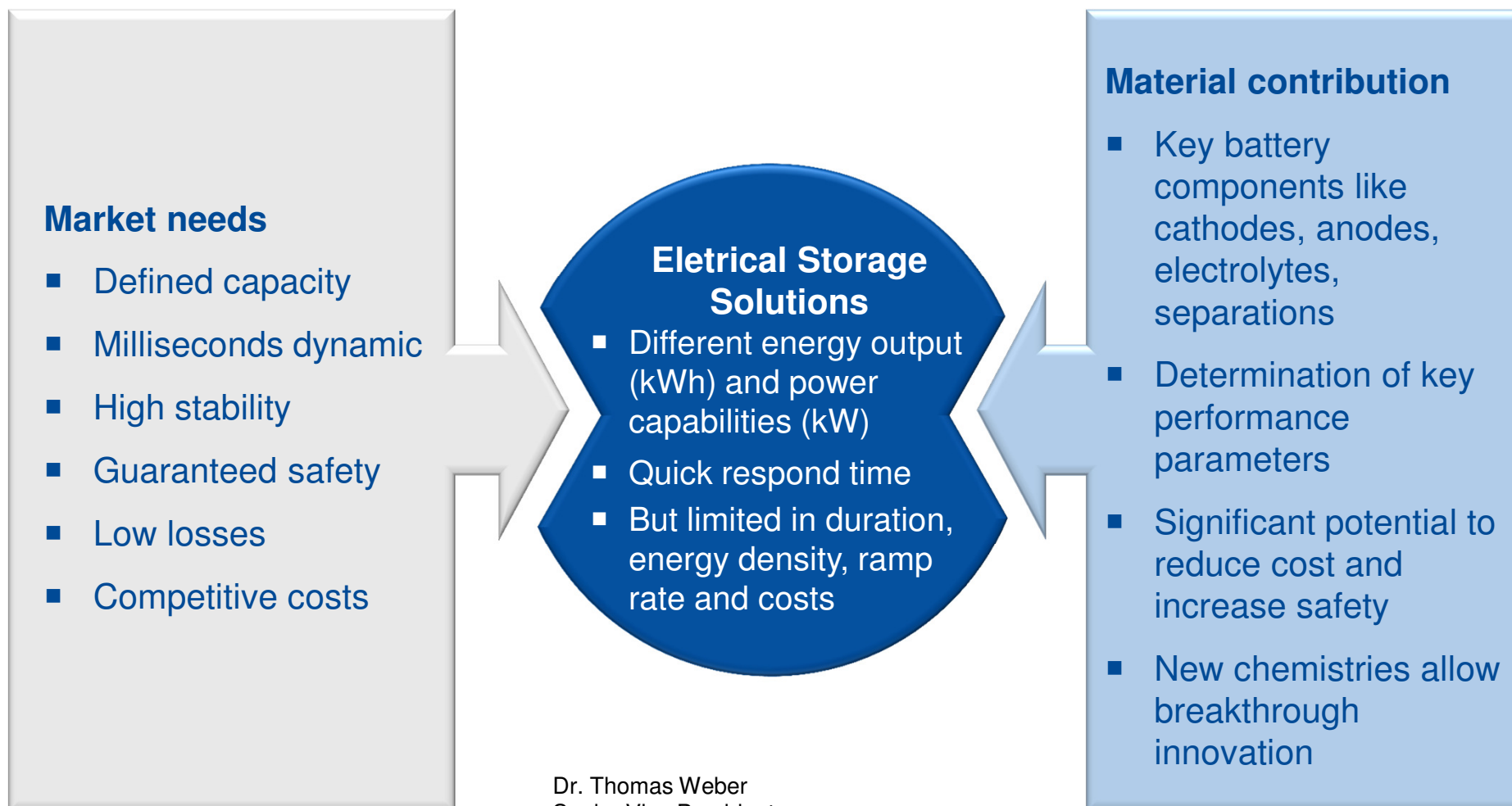
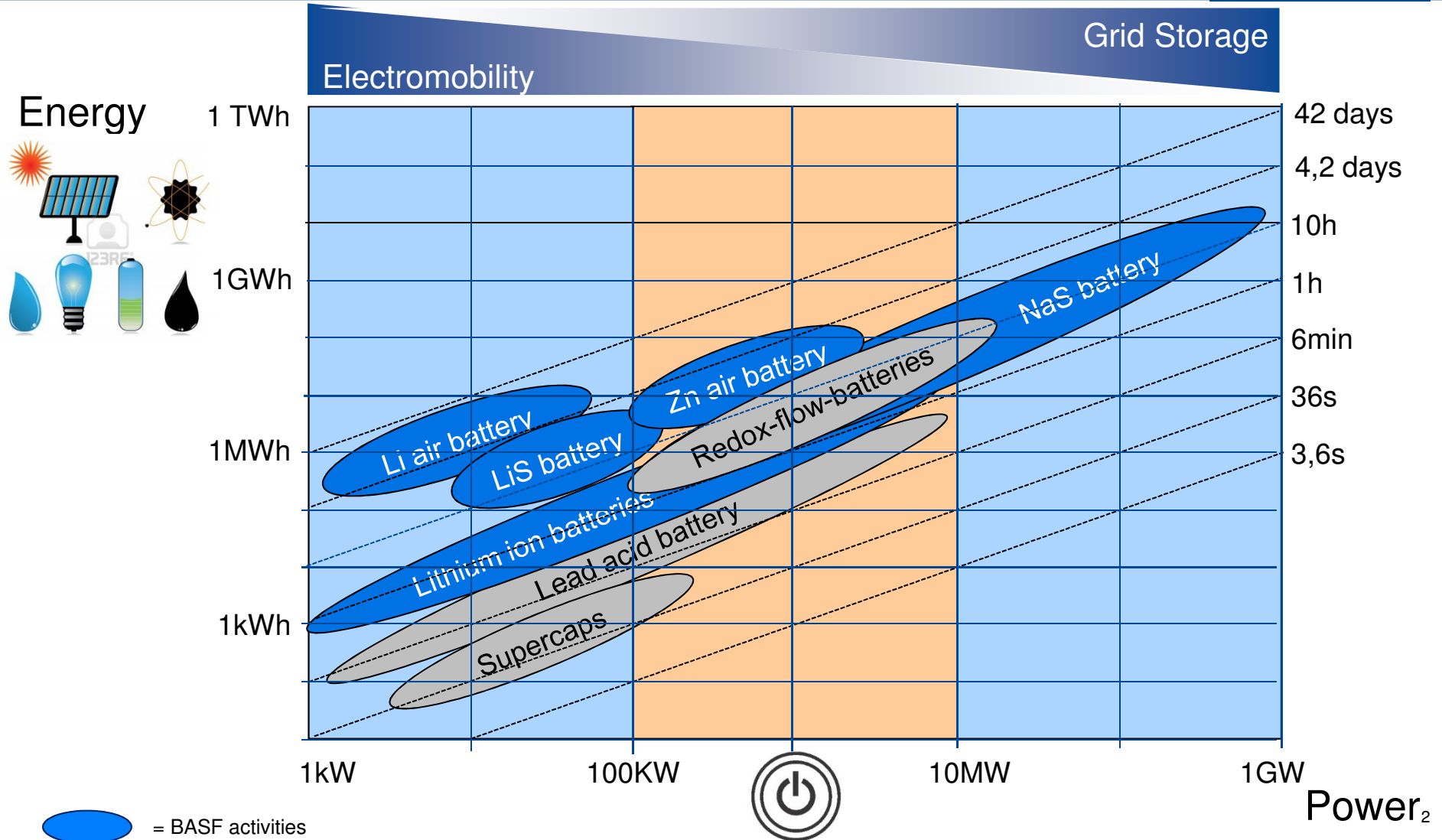


Chemistry as key enabler to meet market needs

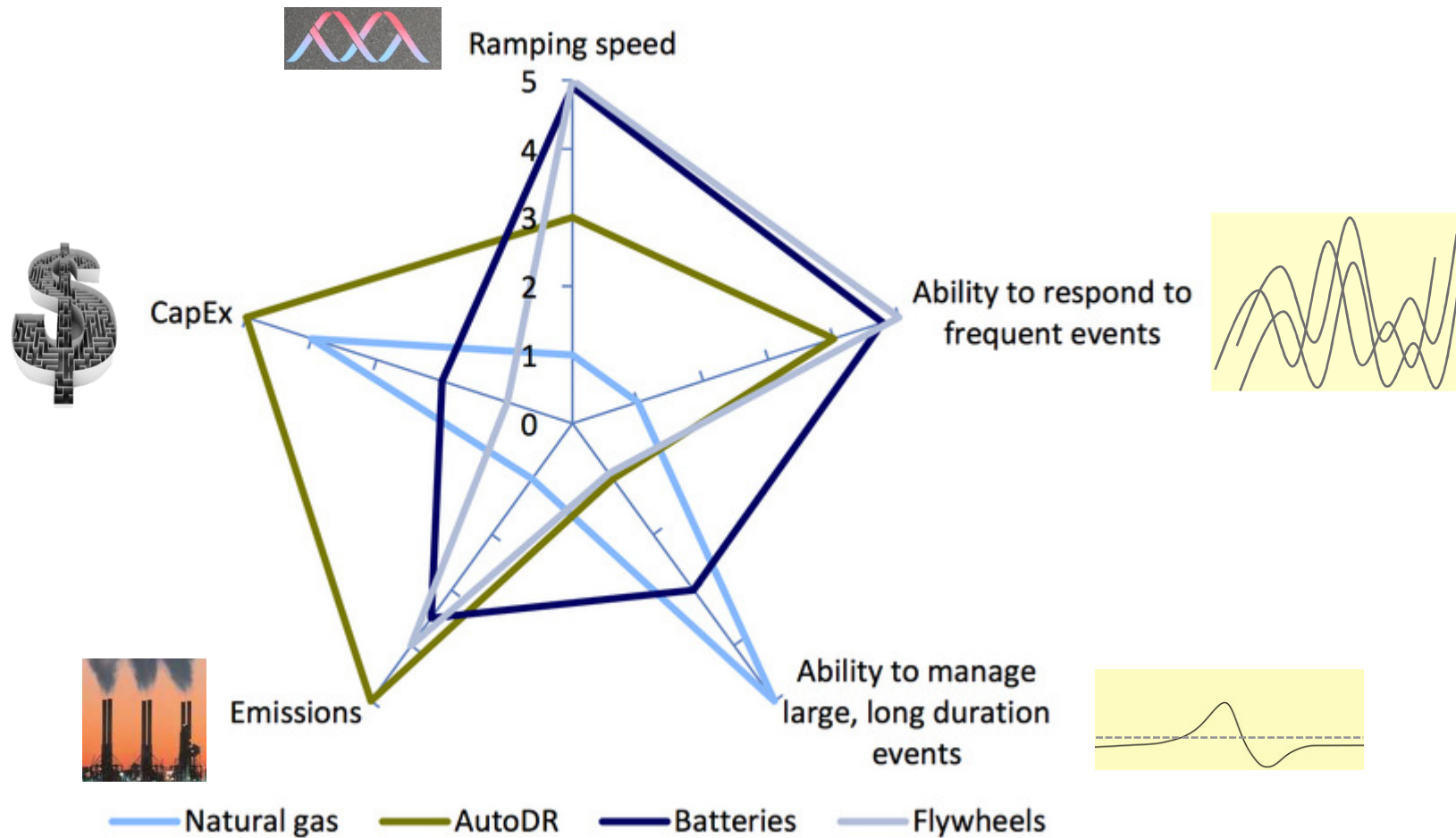


Dr. Thomas Weber
Senior Vice President
Innovation Management and Science Relation

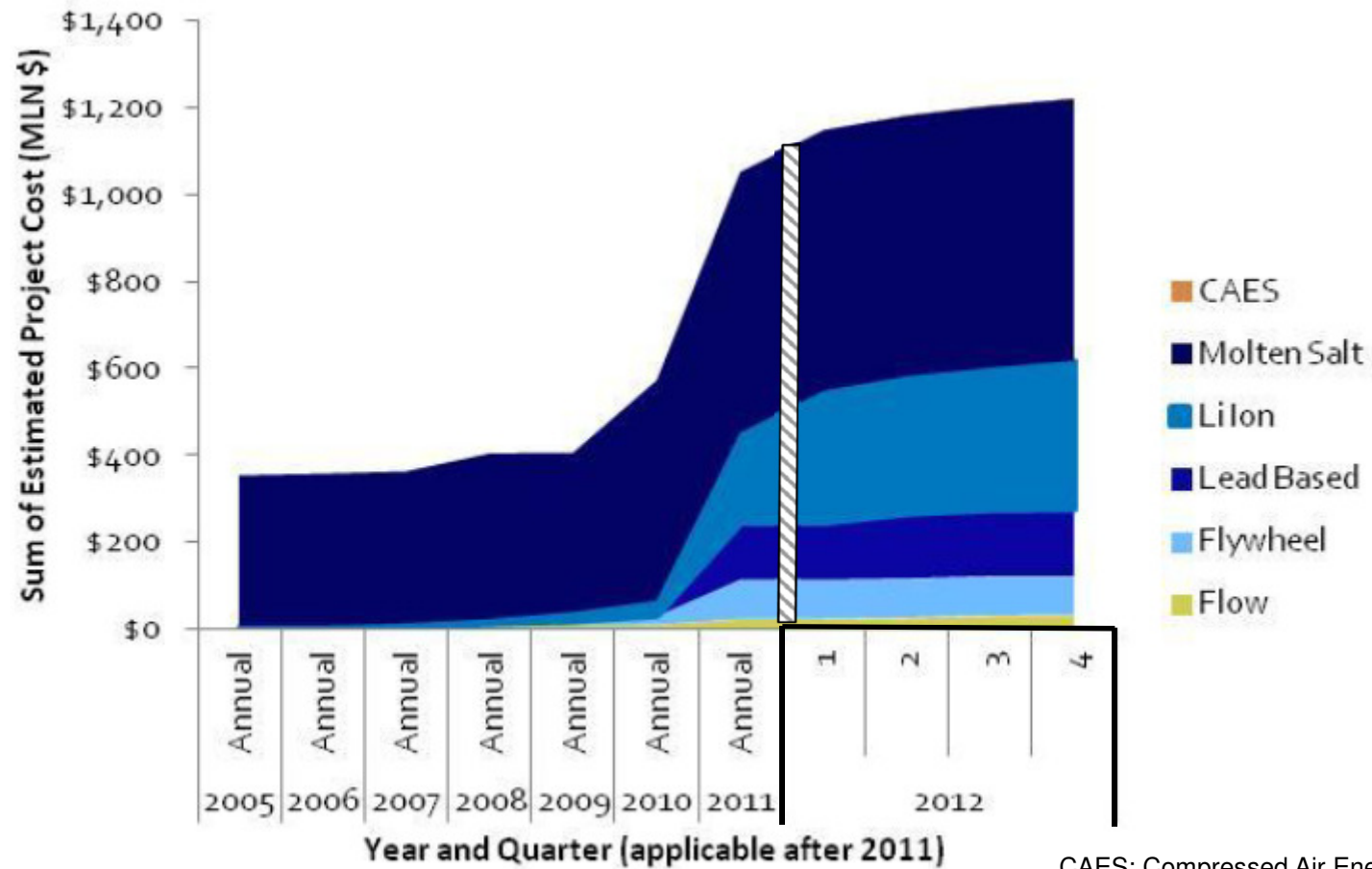
Electrical storage drives solutions in electro mobility and grid storage



In grid storage, electrical storage manage intermittency effectively...



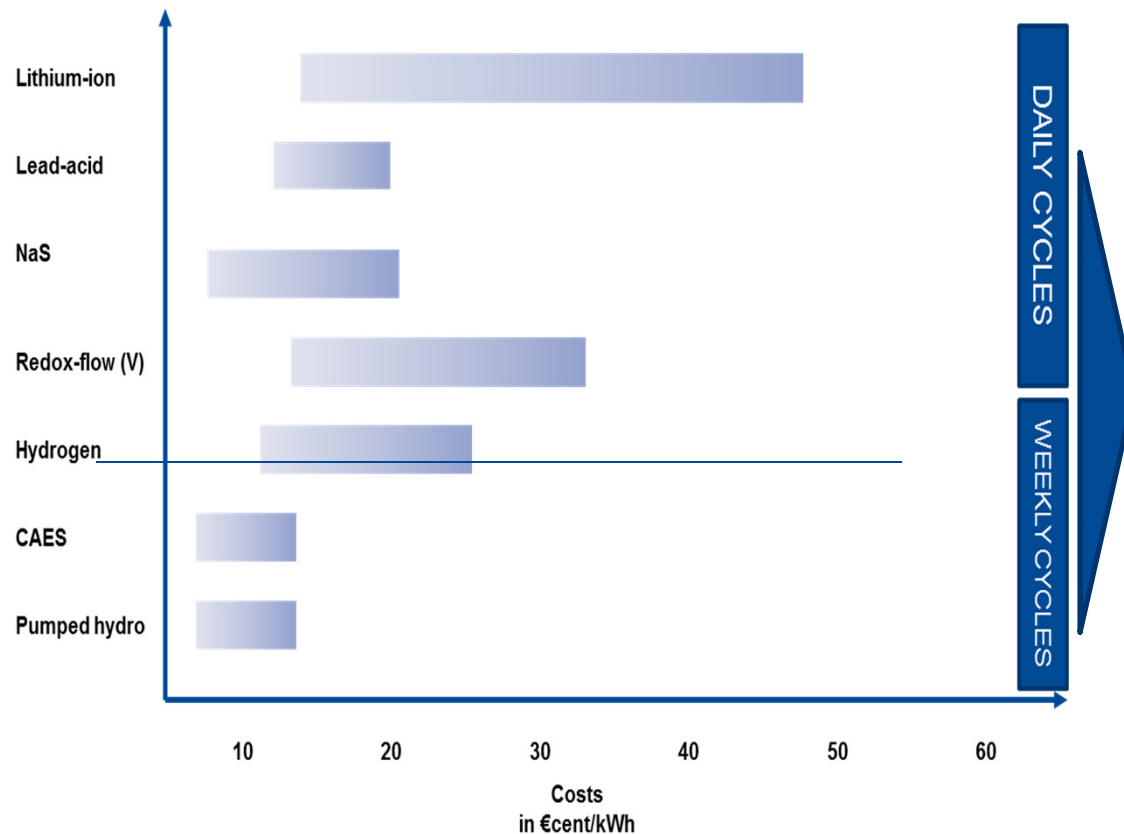
... and represent > 80% of global grid storage project cost



Source: Lux Research

CAES: Compressed Air Energy Storage
Molten Salt: NaS, NaNiCl (Zebra)


Achieving cost benchmark crucial for market success



Approaches for innovation towards cost reduction

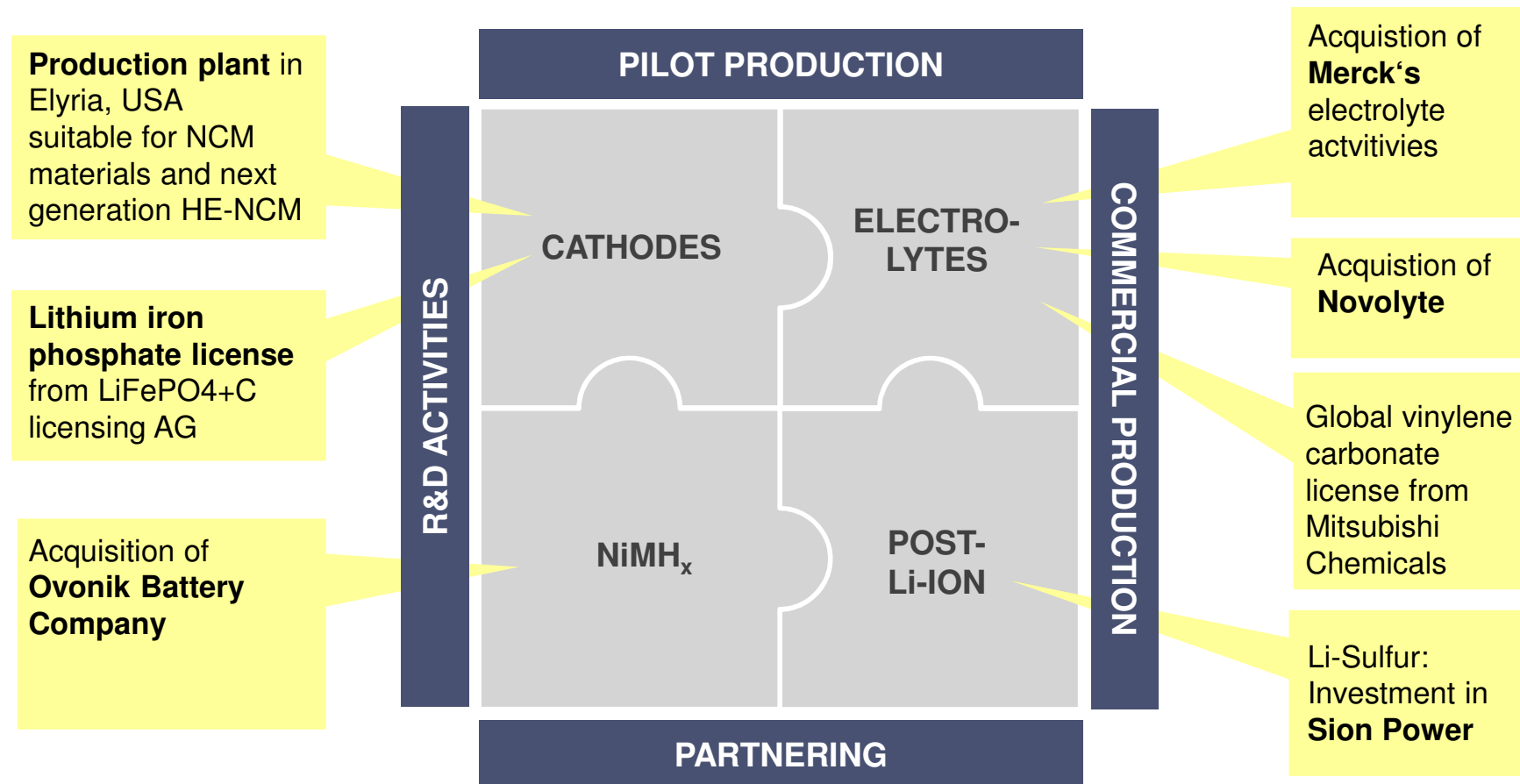
- Mass production / automated manufacturing, e. g. Li-Ion
- Reduced material cost / higher energy density, e. g. High Energy Li-Ion
- Scaling system size, e. g. Redox-Flow
- Breakthrough innovation and technical development, e. g. NaS large scale, Zn-Air
- ...

Assumptions: 1 GW, 8 GWh, electricity costs: 4 €cent/kWh, interest rate capital costs: 8%
Source: RTWH Aachen, BCG, VDE, Lux Research, internal

 = Cost range (left: future potential; right: today)

BASF committed to battery material solutions for electromobility ...

Goals: Better performance, improved safety and lower costs



... and leverage expertise in electro-chemistry and large scale operations

Goals: Energy storage to ensure stable energy supply

- ➔ Advances in electrical storage technologies required to ensure stable energy supply
- ➔ Electrochemical storage in large scale batteries based on cost-competitive raw materials like Na and S seen as potential future solutions for large scale electricity storage
- ➔ Electrochemical power storage stations are chemical depots
- ➔ Electricity storage is industrial electrochemistry



Already today BASF takes care of tomorrow's battery solutions

- ➔ Jointly addressing fundamental questions related to new materials, functional components and systems for electro mobility and energy storage
- ➔ International competence network with outstanding experts from academic research
- ➔ Joint lab BELLA together with Karlsruhe Institute of Technology

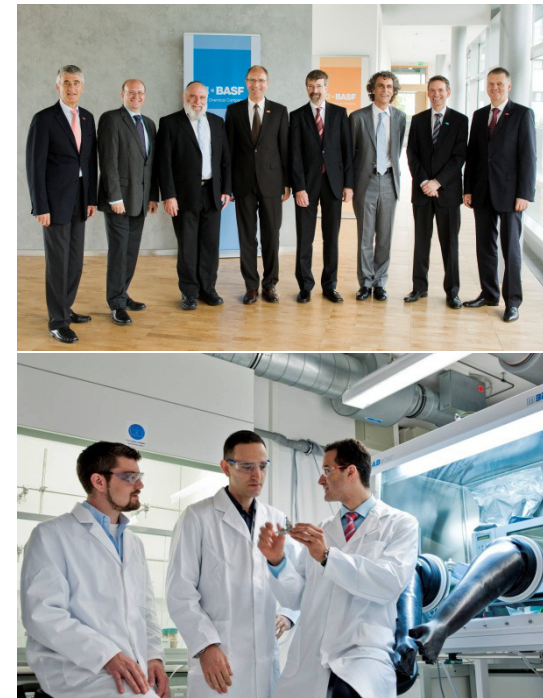
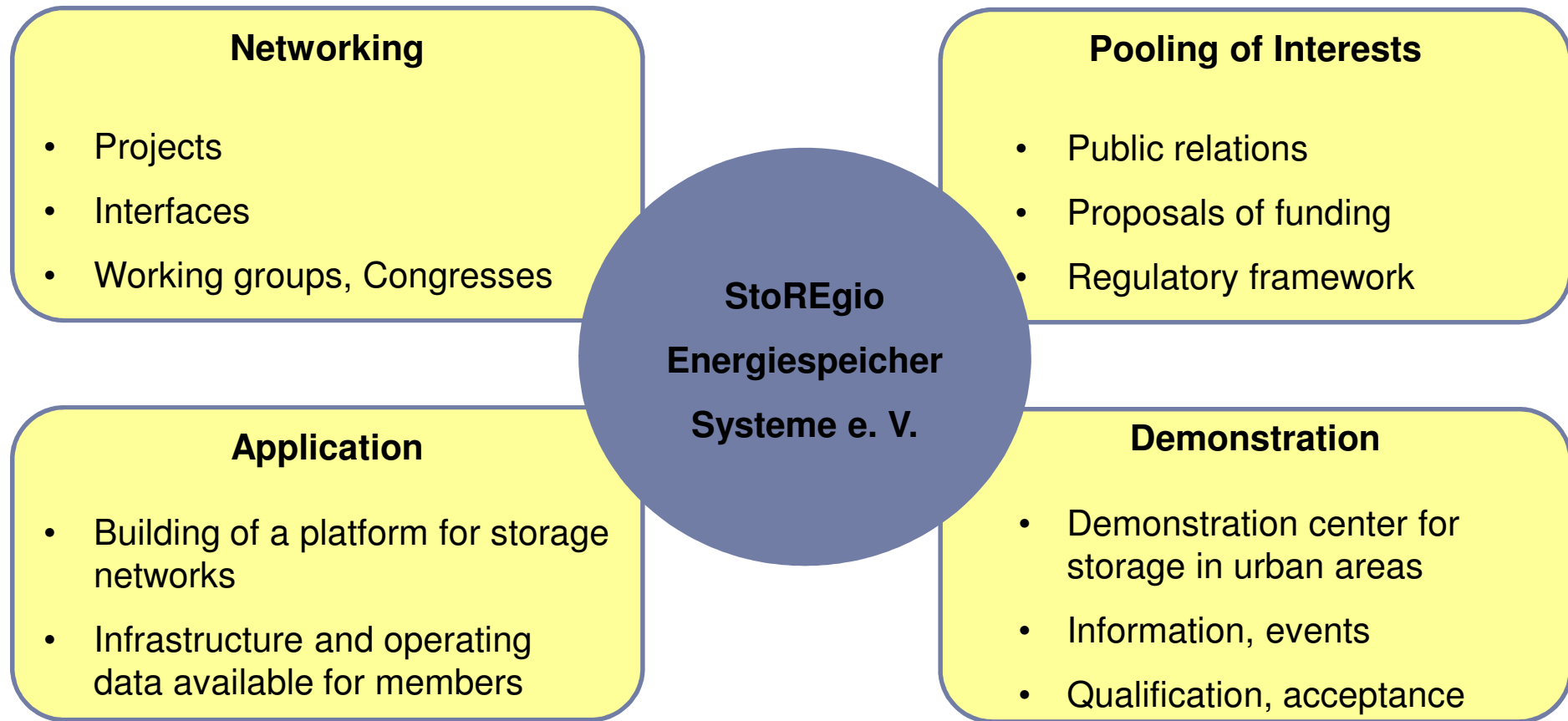


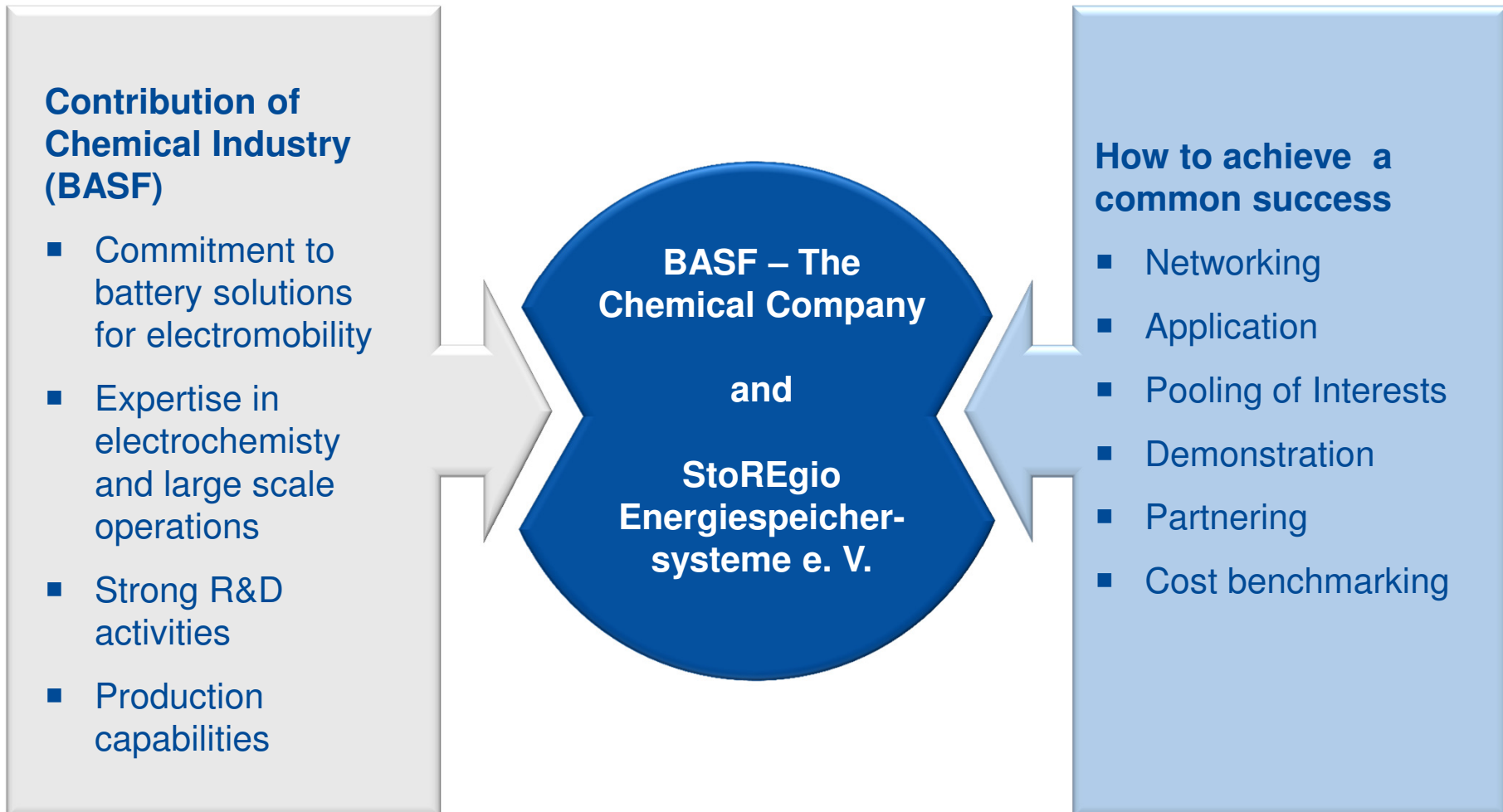
Foto: KIT

Total investment of three-digit million EUR in R&D and production of battery materials from 2011 - 2016

All in all, joining forces along value chain crucial for success of electrical storage and a prerequisite to speed up



Summary: A common success?!





The Chemical Company