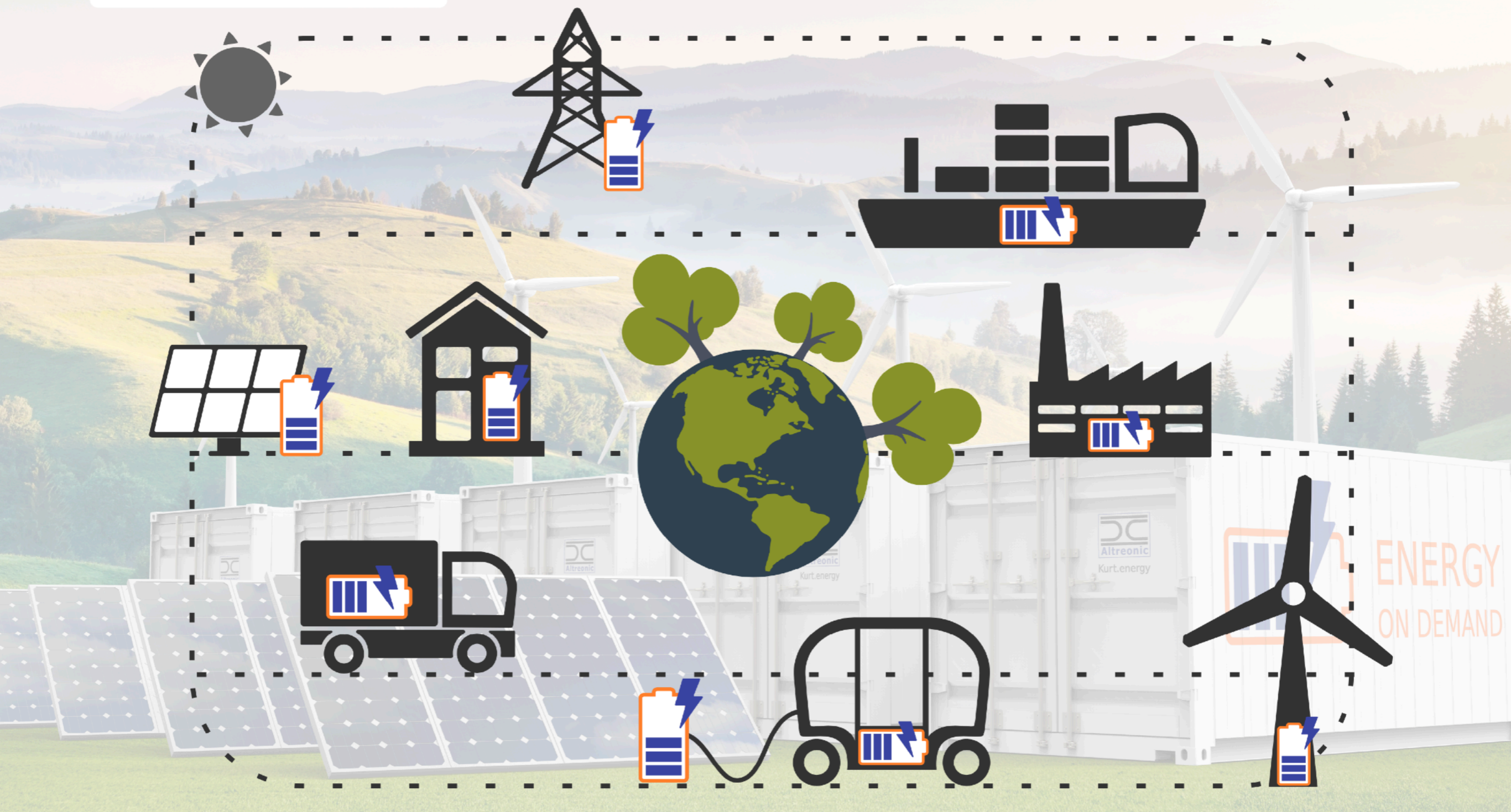




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ENERGY FOR LIFE, BLUE CELL POWER



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The shift to clean energy needs better batteries NOW

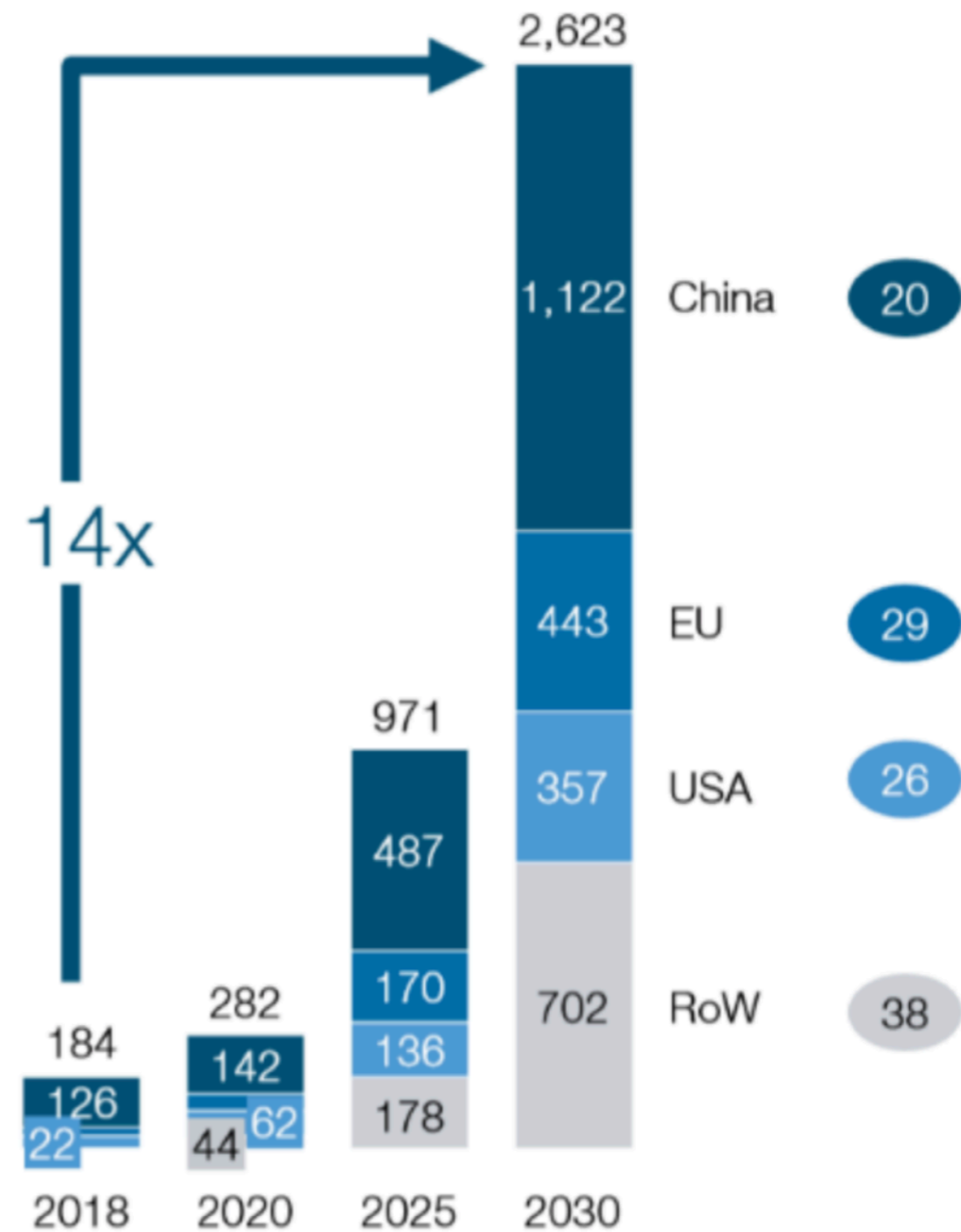
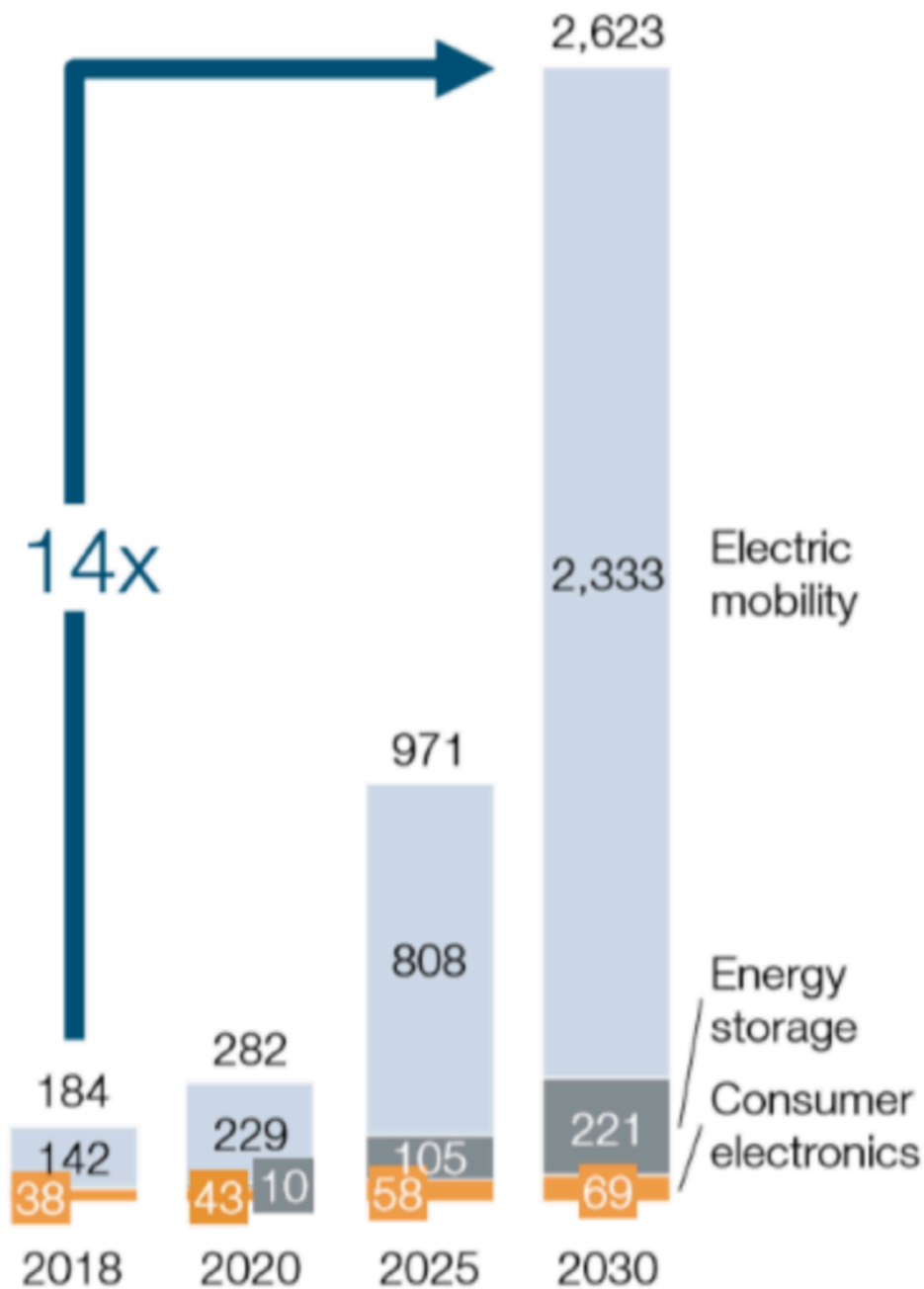
Battery demand (src: Battery 2030, EU)

Global battery demand by application
GWh in 2030, base case

CAGR,
% p.a.

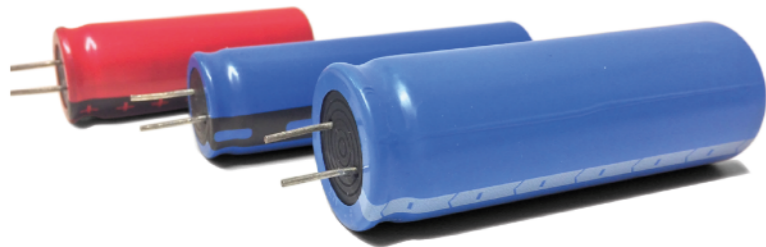
Global battery demand by region
GWh in 2030, base case

CAGR,
% p.a.



Small cells, enabling a high potential

CARBON BASED POWER CAPACITORS

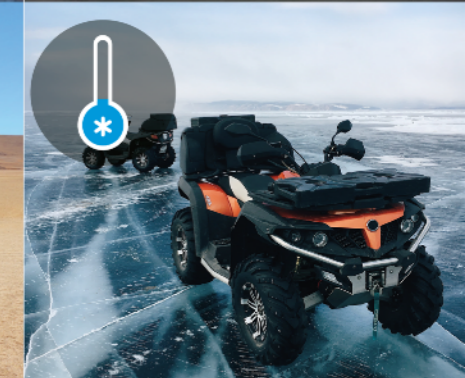


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*Hybrid
vehicles
application*



*Extreme
temperature,
lifetime
and power
requirements*



Game changing hybrid carbon based power capacitors

<u>Li-ion</u>	<u>Kurt.energy Hybrid Power/Energy Capacitors</u>
Fire risk	NO fire risk
Complex to use	Very simple and robust
Short time limited power	Sustained high power capability (upto 20x)
Limited temperature range	Works from -40°C to +80°C
Fast charging is problematic	Can charge to 75% in 5 min
Lifetime too short	1 mio km or 30 years and more
Sustainable?	10 to 20X less environmental footprint
Cost efficient	Lowest life cycle cost
Many announcements	In production

**High energy density + high power density + safety + long lifetime
= a game-changing opportunity**

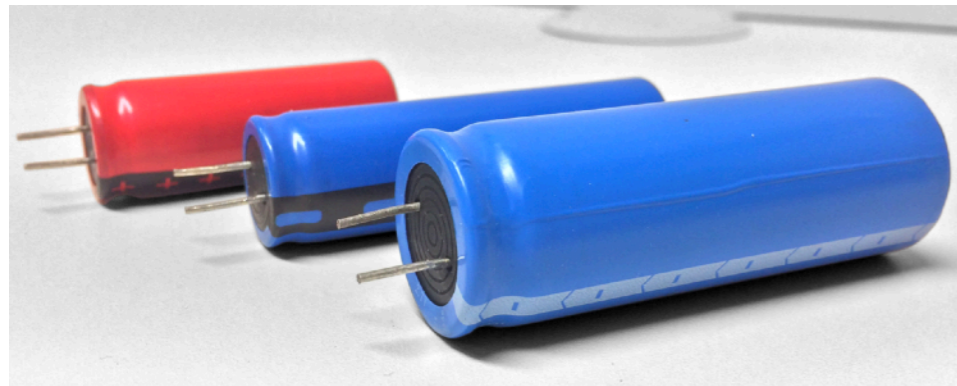


Comparison with batteries and supercaps

	Lithium iron phosphate battery	NMC lithium battery	Lithium titanate battery	Lithium based super capacitor	Kurt.energy Power capacitors	Kurt.energy Energy capacitor
Energy density (Wh/kg)	90 - 150	180 - 250	70 - 95	4 - 6	80 - 100	230-265
Power density (kW/kg)	0.1 - 0.2	0.1 - 0.5	0.5 - 1	5 - 7	1 - 1.5	0.5
Typical charging/ discharging rates	1 C	0.7 - 1 C	1 - 5 C	100 - 200 C	10 - 20 C	1 - 1.25 C
Working temperature (°C)	-10 ~ 55	-20 ~ 45	-40 ~ 60	-40 ~ 65	-20 / -40 ~ +70 / 80	-40 ~ +80
Cycle life (times)	2000	2000	5000	> 500000	> 20000 to 50000	> 10000
Safety	acceptable	not good	good	excellent	excellent	excellent
Complexity	Medium	High	Medium	Low	Low	Low
	BMS needed	BMS needed + thermal mgt	BMS	passive cooling	no BMS, passive cooling	no BMS, passive cooling

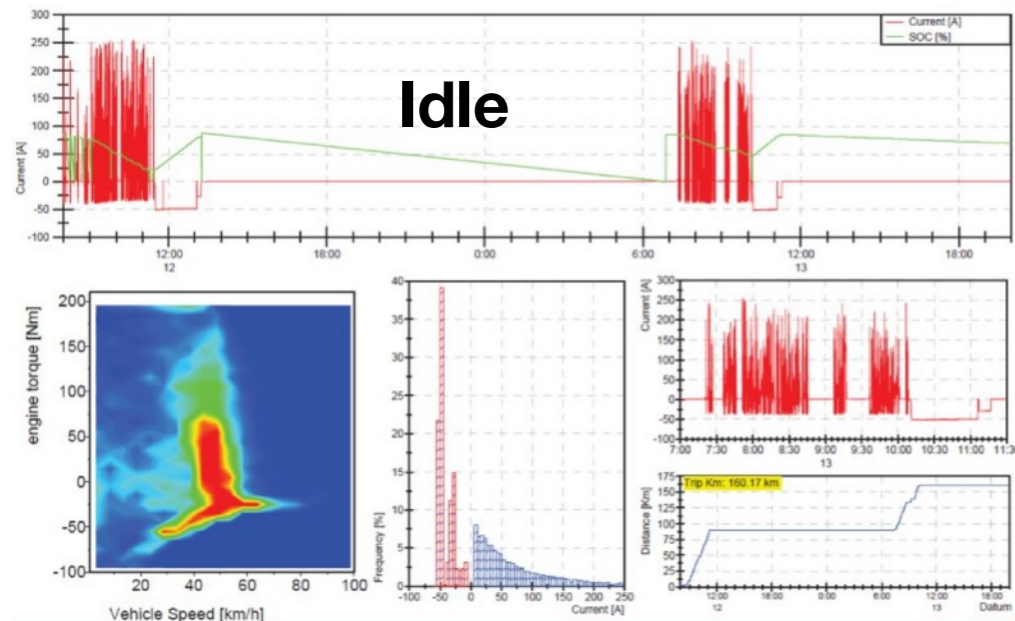
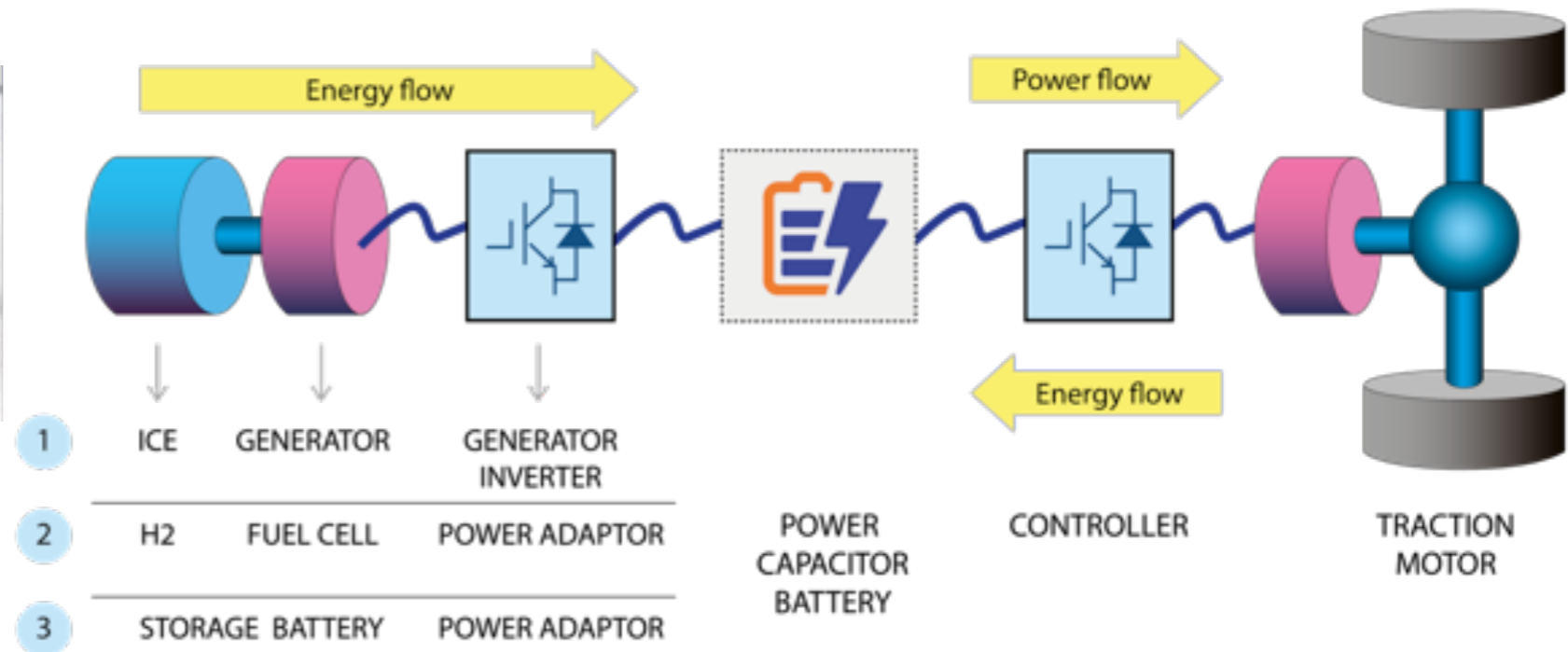


Carbon based hybrid capacitor = energy + power



charging
+
regen
braking

Pull-up



Unbeatable benefits in hybrid propulsion:

- Safe (H2 fuel cells!)
- Power (up to 20x instant power)
- Simple: no BMS, no active cooling
- Works from -40 to +80°C
- Lifetime: 1 mio km or up to 30 years

Power needs happen in bursts: the killer for Li-ion



Seal of Excellence from EU Commission

Evaluation by external experts:

- Business development plan
- Local battery assembly line

Partner in large H2020 project to bring to market novel approach to modular and autonomous urban class e-vehicles

*Certificate delivered by the European Commission,
as the institution managing Horizon 2020,
the EU Framework Programme for Research and Innovation 2014-2020*

The project proposal
101009152, HybridPower
Business Development and Automated Pilot Assembly Line
for game changing Carbon –based Hybrid Powercapacitors
submitted under the Horizon 2020's SME Instrument (grant only and blended finance)
call H2020-EIC-SMEInst-2018-2020 (H2020-EIC-SMEInst-2018-2020-4) of 19 May 2020
in the area of H2020-EIC-SMEInst-2020-4

H2020-EIC Accelerator pilot –SME Instrument - Green Deal

by
ALTREONIC NV
GEMEENTESTRAAT 61A BUS 1
3210 LINDEN
Belgium

following evaluation by an international panel of independent experts

**WAS SCORED AS A HIGH-QUALITY PROJECT PROPOSAL
IN A HIGHLY COMPETITIVE EVALUATION PROCESS***

This proposal is recommended for funding by other sources, since Horizon 2020 resources
available for this specific Call were already allocated following a competitive ranking.

* This means passing all stringent Horizon 2020 assessment thresholds for the 3 award criteria
(excellence, impact, quality and efficiency of implementation) required to receive funding from the EU budget Horizon 2020.

Elisa Ferreira,
Commissioner for
Cohesion and Reforms

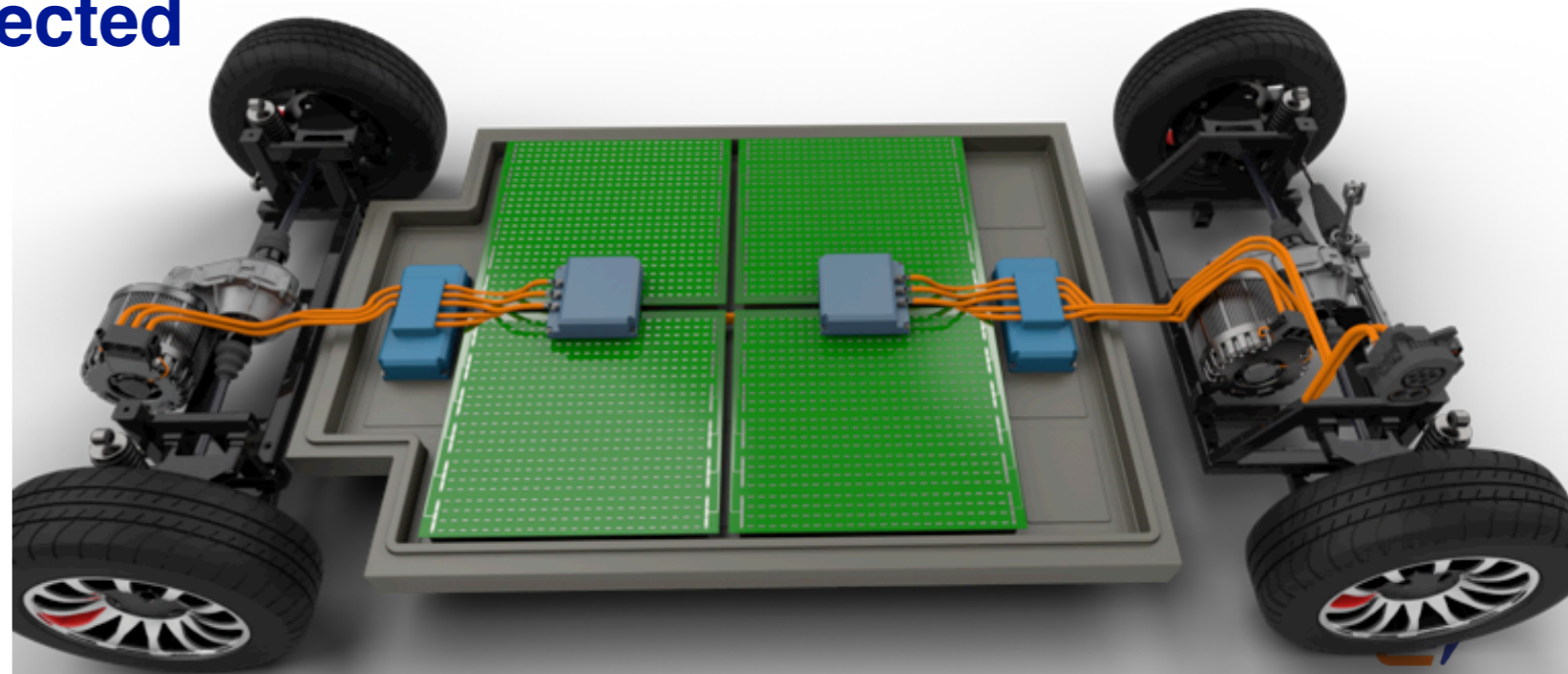
Mariya Gabriel,
Commissioner for Innovation, Research,
Culture, Education and Youth

Brussels, 29/06/2020



The million mile battery

- **Battery Day event (Sept 2020) by Tesla pre-announces a million mile battery (from CATL)**
- **We have it already!**
- **Competition participation with IFEVS (IT):**
 - 600 km range
 - Charging in 5 minutes (from another power capacitor pack!)
 - Lifetime: 30 years expected
 - + safe, robust, ...



Market for batteries: Applications



Space



Heavy mining vehicles



Hybrid trucks



E-bike battery



Old-timer electrification



Energy storage



Grid stabilization



Street lighting



Car batteries



AGVs & forklifts



Hybrid vehicles



Trains



Welding equipment



Hand-held power tools



Home energy system



Power mills

Kurt.energy has customers and prospects:

- In all parts of the world
- In most application domains
 - Small handheld power tools
 - Heavy hybrid vehicles
 - large energy farms
 - ...



Kurt.energy division of Altreonic

Questions?

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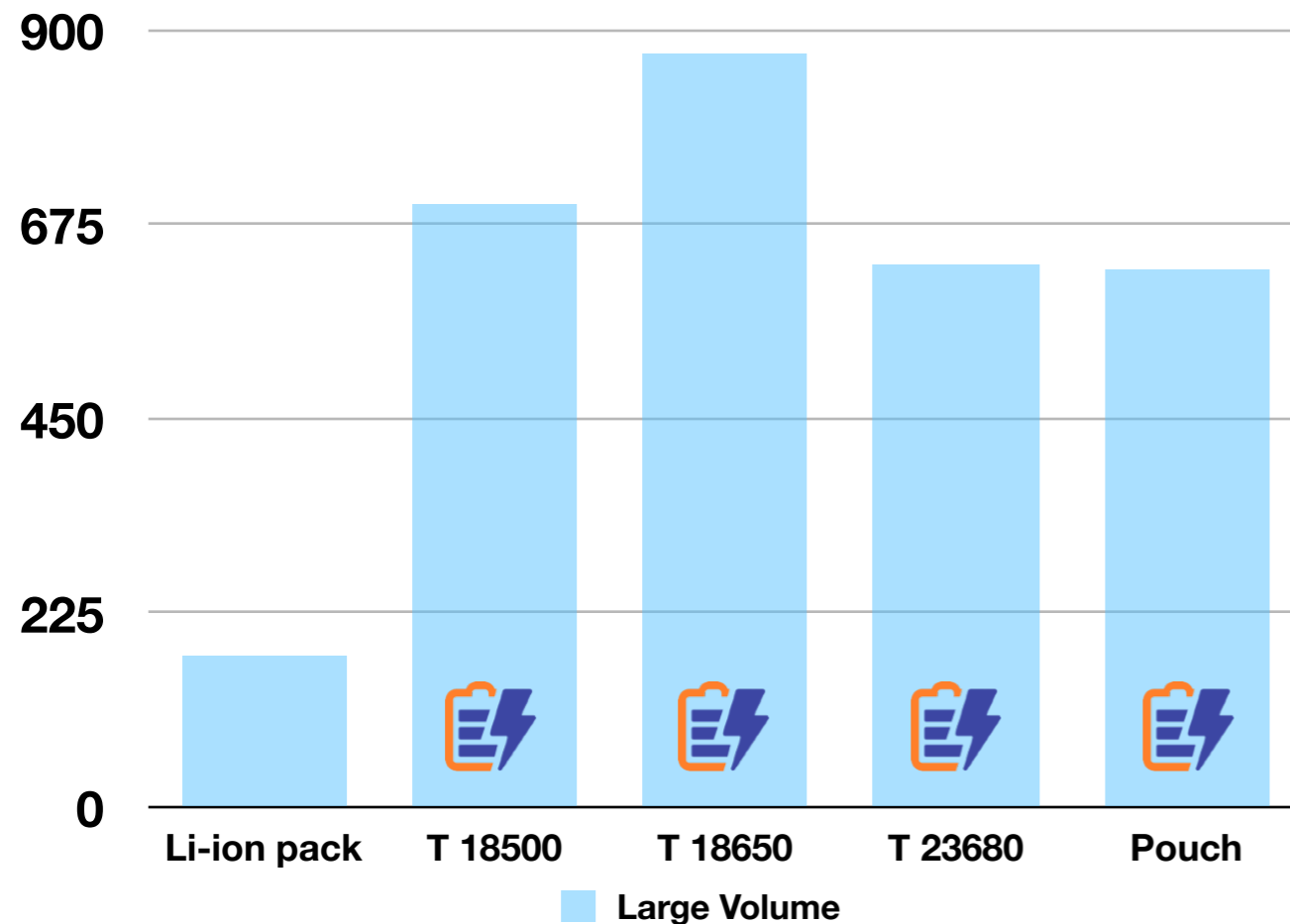
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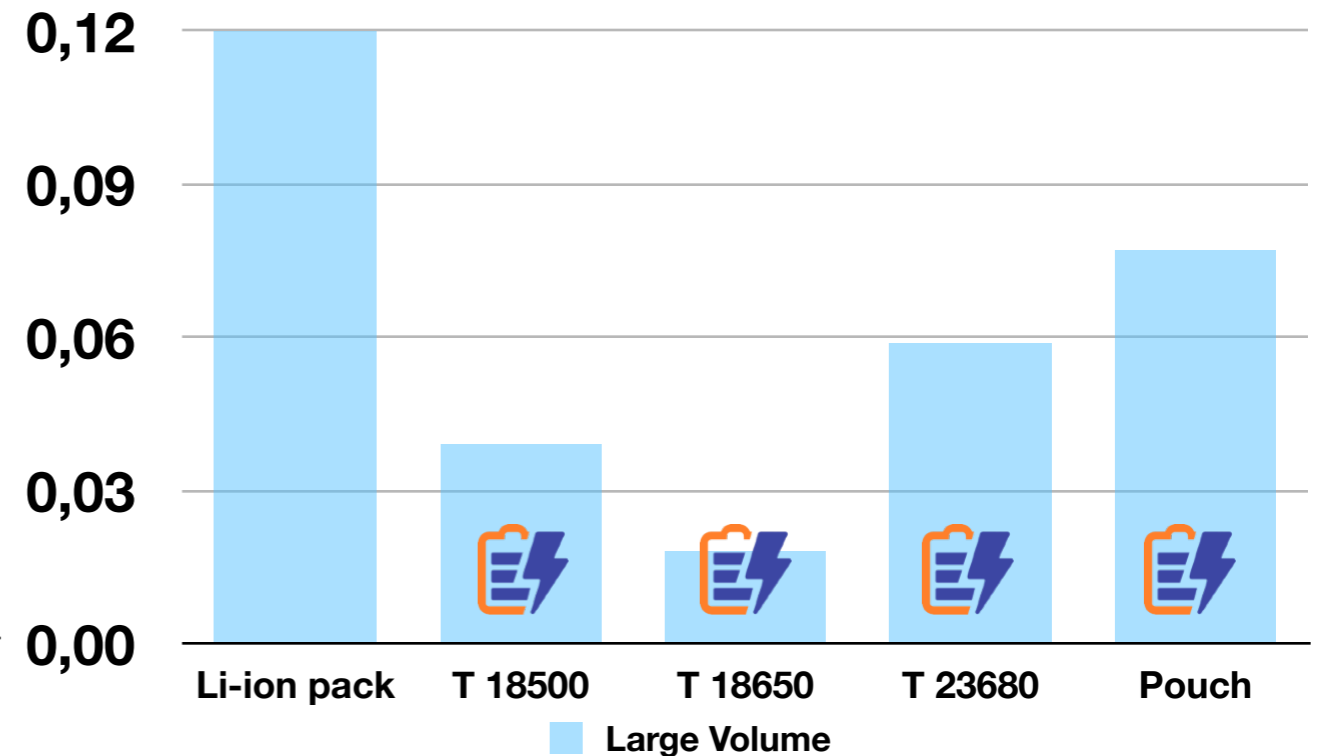


Selling price is generally expressed per kWh

Selling price per kWh (2018)



Calculated price per kWh per cycle



Cycle = charge/discharge

Kurt.energy selling price objective - in own production \approx €400 / kWh

Customer advantage:

10 years lifecycle warranty, maintenance cost very low

Often smaller power cap battery will deliver 3X more power

=> lower lifecycle cost wins: we can expect 30 years lifetime

2x less Li + 10 x lifetime = carbon footprint 20x less than Li-ion



Shorter term needs

- European quality battery boxes.

- Electrical engineering, certification
- Pilot line automated assembly

- Increased marketing/sales:

- International business development team
- One show/event per month

- Implementing the scale-up:

- Legal advice
- Selection of assembly/production site
- Attracting the required investment

Above was topic of SME-II proposal:

- Seal of Excellence obtained

