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SWISSCAPTECH

ELECTRIC CHARGING SYSTEM WITH SUPER CAPACITORS FOR MOBILE CONSUMERS

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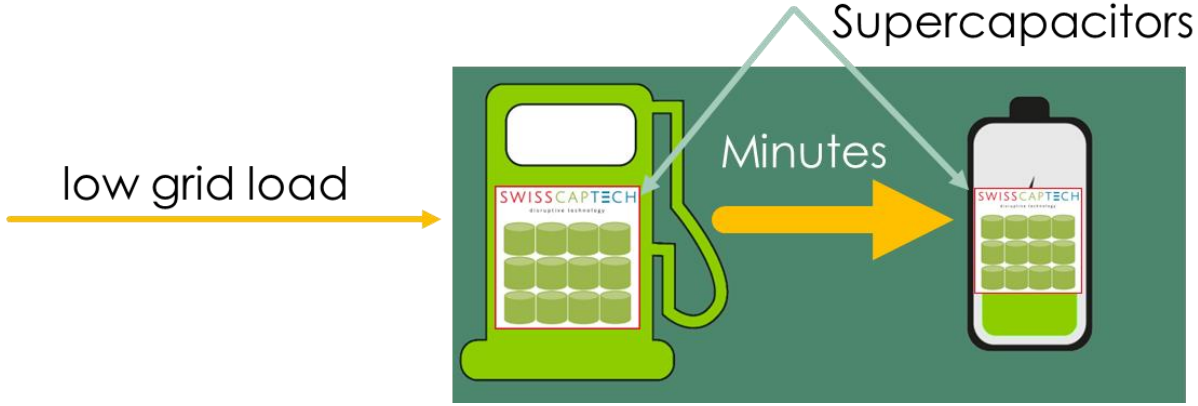
I4CHALLENGE | BASEL AREA
Winner I4Challenge new idea 2020

Problem: Battery technology today

- Based on a **chemical reaction** => inherently slow, time consuming => causing dead time,
- Burden for the environment and the grid,
- No alternative to combustion engines (power density),
- charging from **0% to 100%** takes at least 1 hour.

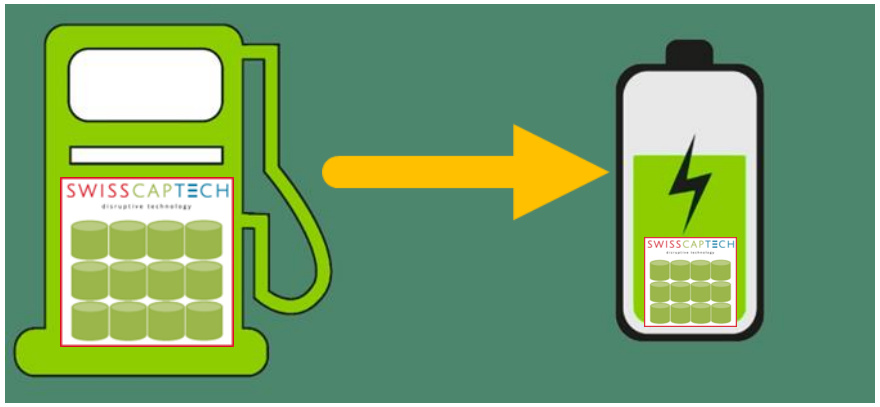
Solution: deploying latest Supercapacitors with SwissCapTech

- based on a **physical process**, thus extremely fast
- very low environmental impact and no strain on the power grid
- alternative to combustion engines => extremely high performance possible
- with SwissCapTech: charging from **0% to 100% in 2-6 minutes**



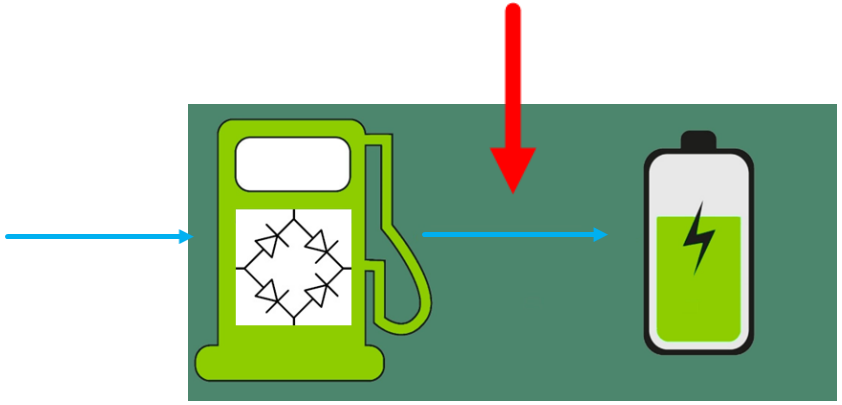
The SwissCapTech solution

A new and disruptive technology
which enables large amounts of electric energy
to be transmitted from a charging station
to a mobile energy storage within a very short time.

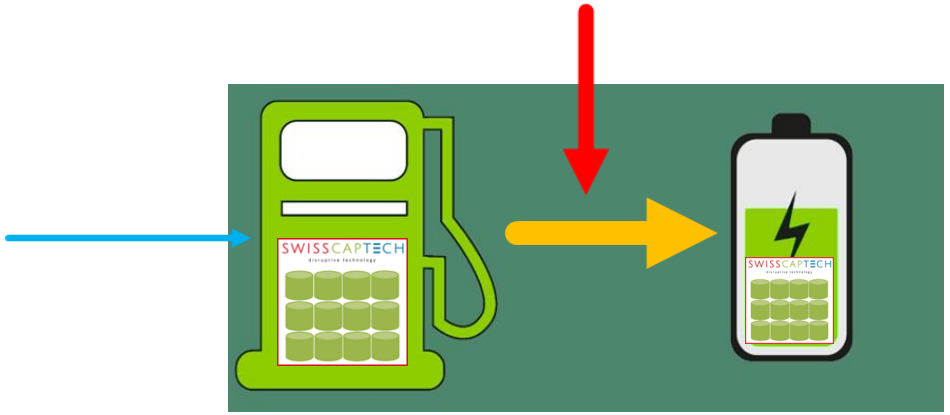


Difference:
Converter vs. Energy Storage

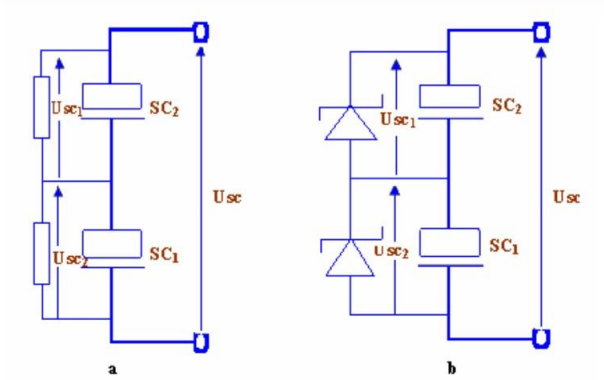
Conventional chargers as fast as the grid permits



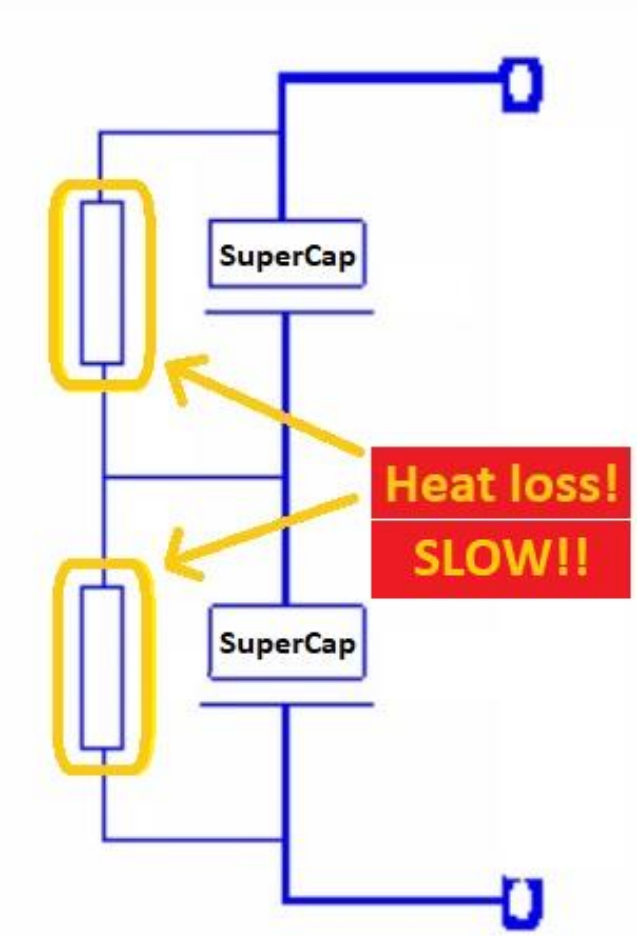
Li-Ion Capacitors
Very fast independent Energy Transmission



Regular balancing Systems

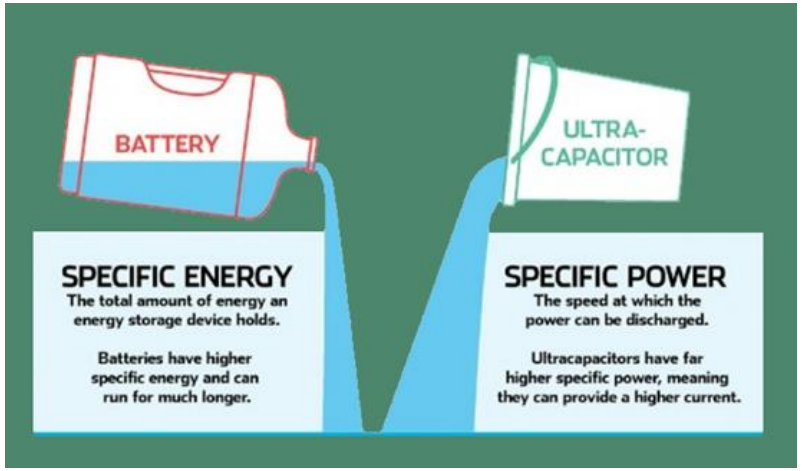


Cell balancing circuits a) resistor, b) Zener diodes,
c) switched-resistor, d) DC/DC converter



SuperCaps charge SuperCaps

- Supercapacitors store energy through a physical process
- Chemical batteries store energy through a chemical process
- Supercapacitors can transfer energy at high charging rates



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SuperCap as Core Element

- Supercapacitors charge Supercapacitors
- Always in the optimal range
- Balancing without losses

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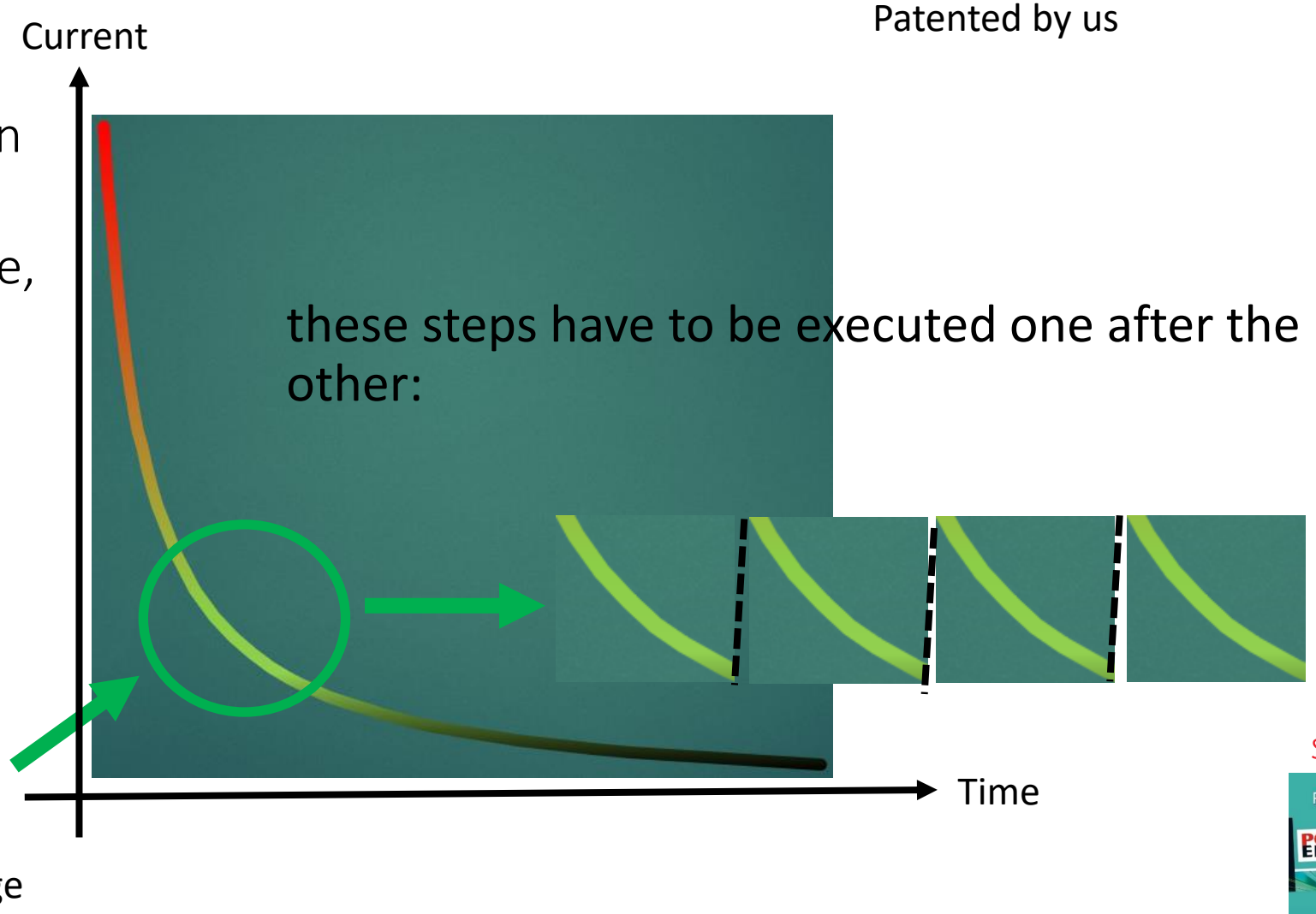
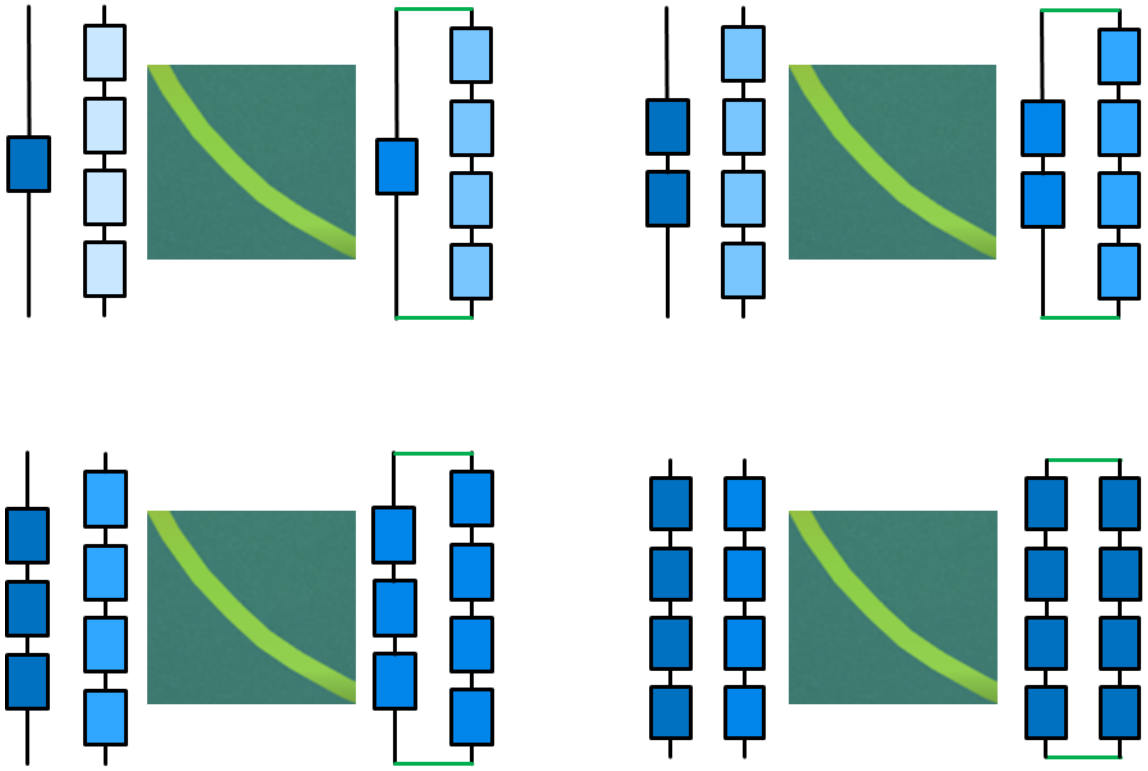
Always in the optimal range

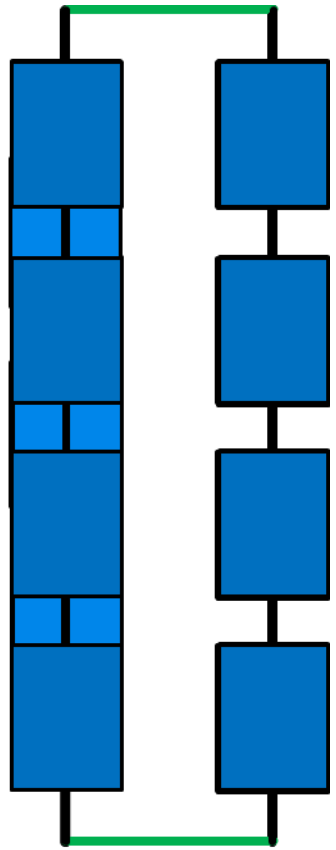
Patented by us

To run always in the optimal operating range,



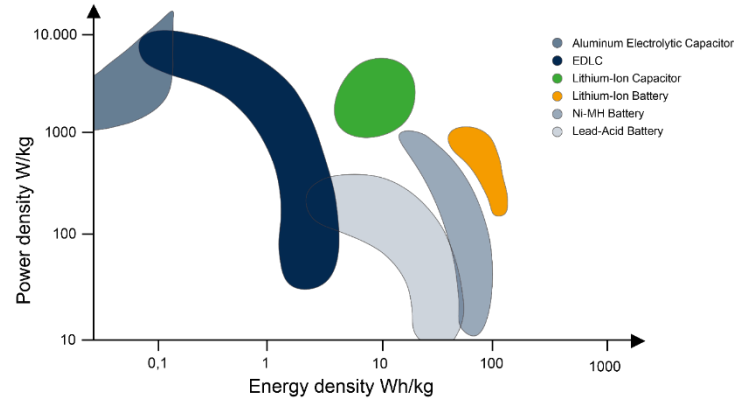
Combination of the Li-Ion Capacitors

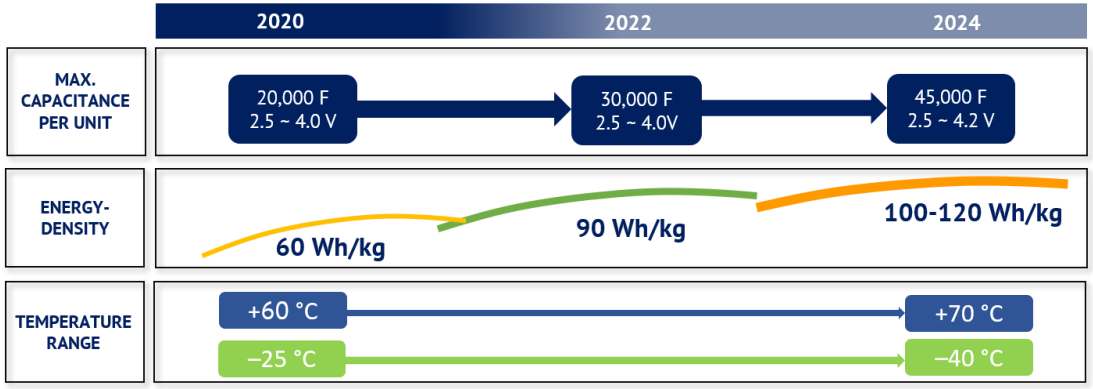




Batteries vs. Li-Ion Caps

	ENERGY-C (EDLC)	ENERGY-C (LIC)	LIB
ANODE	Activated carbon	Activated carbon	$LiCoO_2$ / $LiMnO_4$
CATHODE	Activated carbon	Graphite/Li-ion doped	Graphite/Li-ion doped
ELECTRIC STORAGE PRINCIPLE	Ion-adsorption	Anode: Ion-adsorption Cathode: Ion-adsorption and charge transfer	Reversible redox reaction
TEMPERATURE RANGE	–40 ~ 85 °C	–25 ~ 70 °C	–25 ~ 45 °C
MAX. RATED VOLTAGE	2.3 ~ 3 V	3.8 ~ 4.2 V	3.7 ~ 4.2 V
MAX. CHARGE RATE	approx. 1,000 C	approx. 100 C	0.5 ~ 1 C (normal)
SIZE/WEIGHT	low	low	high
CHARGE-/DISCHARGE-CYCLES	More than 500,000	50,000 ~ 500,000	1000
SELF DISCHARGE	>30 % after 2,000 h	<5 % after 2,500 h	<5 % after 2,500 h
SAFETY	safe	safe	depending on structure and material
ENERGY DENSITY	(5 ~ 7 Wh/kg)	(40 ~ 90 Wh/kg)	(~250 Wh/kg)





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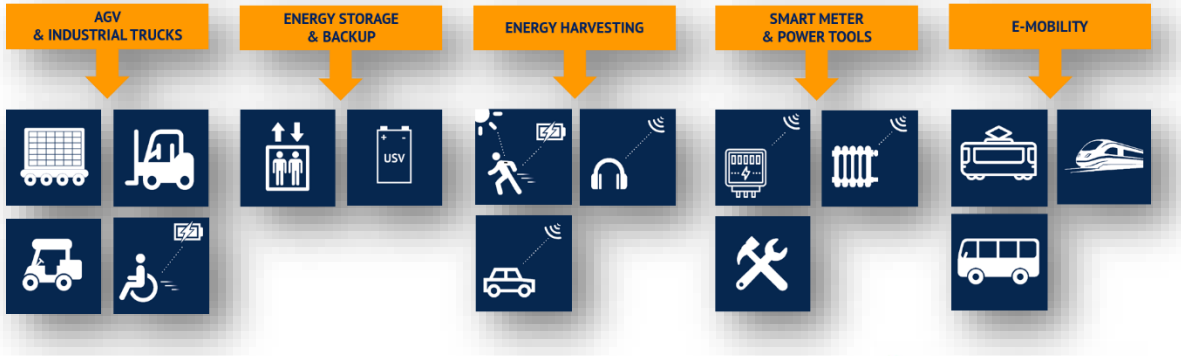
Benefits of SwissCapTech solution

- The charging station as a buffer:
  - *Investments in the grid can be avoided,*
  - *SwissCapTech-System combine mobile- and charging application*

- Minimal waiting time = “dead time killer“,
  - *Transport systems.*
  - *Construction Sites*
  - *Electric Tools*
  - *Etc.*



- Mobile power consumers can be used almost all the time:
  - *No planning of charging times, no replacement batteries, no battery swapping.*

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Why the Swisscaptech Solution?

- A proven and tested technique that works
- Support to create an application together
- Collaboration delivers results faster and more useful applications quickly
- The capacity of our energy network can hardly follow the growth of applications
- There are similar challenges all over Europe

Technology – IP Swisscaptech

- **Step-by-step charging to protect the charging electronics and the charging cables**
  - Patent 1: Method and system for charging mobile ultracaps (P26563CH00)
- **Balancing / switching the cells from parallel to serial**
  - Patent 2: Method and system for maximum capacity utilization (P26617CH00)
- **Very fast charging process**
  - Patent 3 : Quick charging process and unit (P26834CH00)

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Thanks for your attention.

Are there any Questions?