



# Energy Storage System EV Smart Battery Management System



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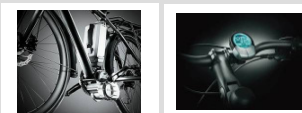
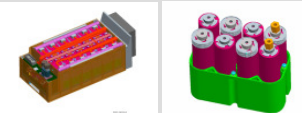
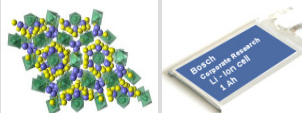
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## Energy Storage System EV

### Lithium Ion Technology at Bosch

<p>Bosch Power Tools</p>		<p>→ Power Tools powered by Lithium Ion cells</p>
<p>Bosch eBikes</p>		<p>→ Closed System (Battery, Charger, Drive Unit) for electric bikes</p>
<p>Bosch/Samsung <b>SB LiMotive</b></p>		<p>→ Energy storage and battery systems for HEV/EV vehicles</p>
<p>Bosch Corporate Research</p>		<p>→ New High Energy Lithium Ion Cells → Safe Lithium Ion cells</p>

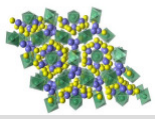



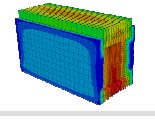

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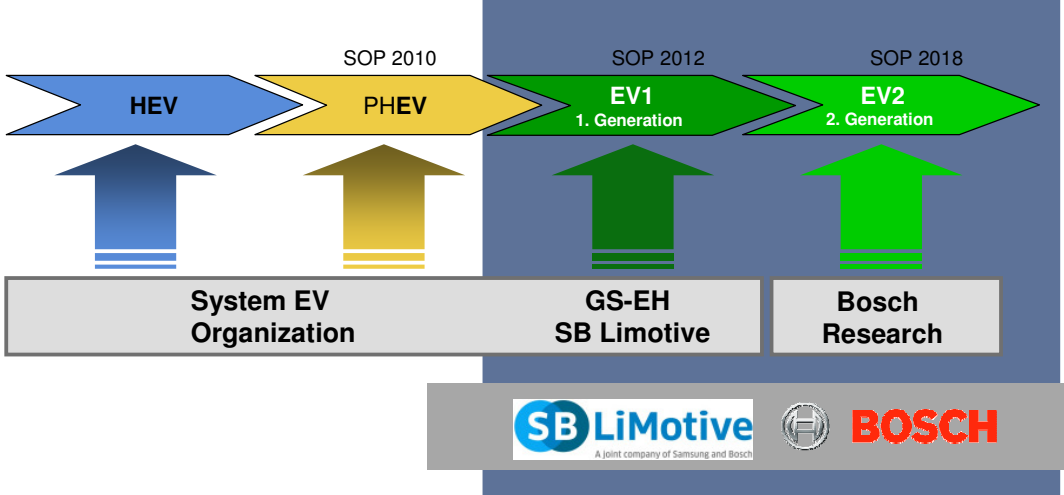
### Lithium Ion Technology at the Bosch Research Department

Material research	 	→ New Materials for High Energy Lithium Ion cells
Lithium Ion Cell manufacturing	 	→ High Energy Cells: LiS & Li-Air → Safe Lithium Ion Cells
System development	 	→ Module Design → Battery Management Algorithms


3
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## Energy Storage System EV


### Development Roadmap E-Mobility



The diagram illustrates the development roadmap for E-Mobility. It shows a progression from HEV (System EV Organization) to PHEV (System EV Organization), then to EV1 1. Generation (GS-EH SB Limotive) with a SOP of 2012, and finally to EV2 2. Generation (Bosch Research) with a SOP of 2018. The logos for SB LiMotive and Bosch are shown at the bottom of the roadmap.


4
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## Energy Storage System EV




A joint company of Samsung and Bosch


**Basis Materials**




**Cells**




**Battery System**




**Automotive Integration**





**Aftermarket**



**Recycling**








Innovation for higher performance (specific energy & power)

Prismatic cell design for highest safety & lifetime

Focus on high quality plus cost-efficient & innovative system solutions

World-wide spare part support by Bosch Aftermarket


Recycling w/ support of partners



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## Energy Storage System EV




A joint company of Samsung and Bosch

→ **SB LiMotive offers flexible business models**


Products




**Cells**



**Modules**

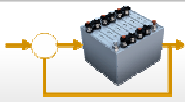


**BMS**

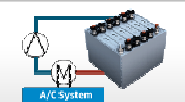


**Pack**

→ **In connection with hardware also development services, e. g.**





**BMS Software**



**Cooling System**

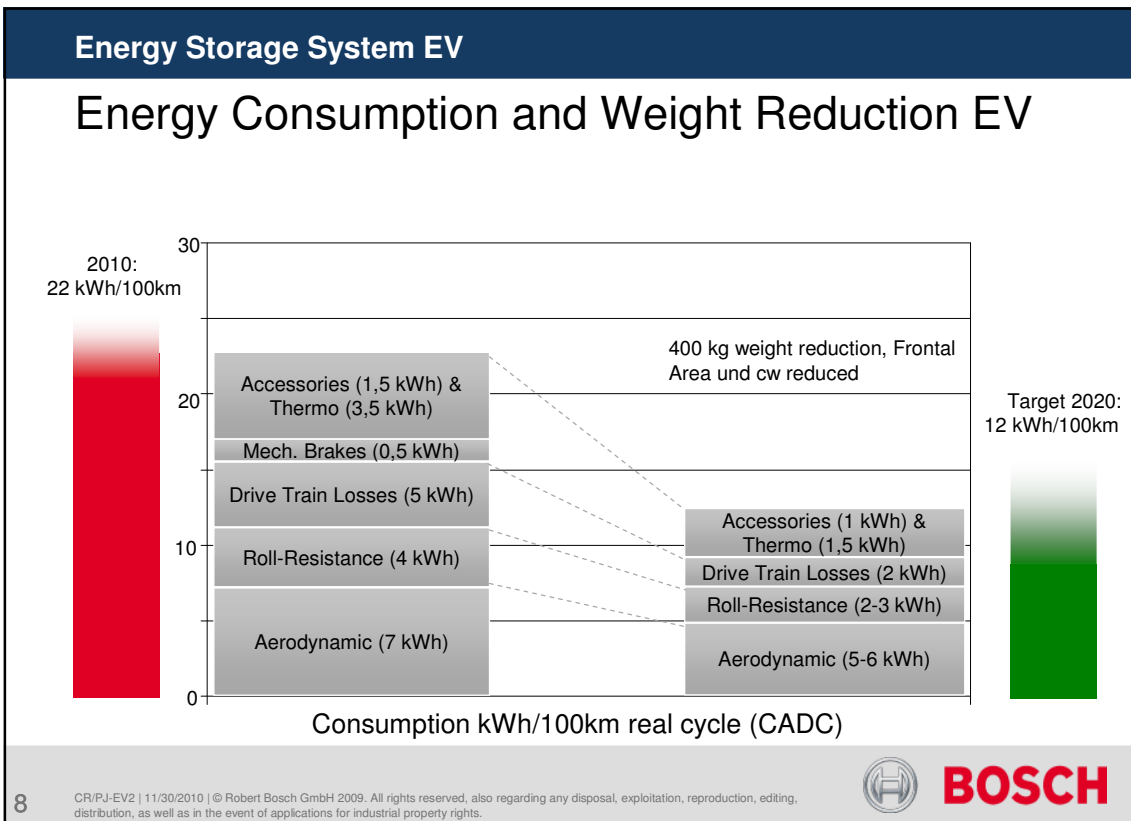
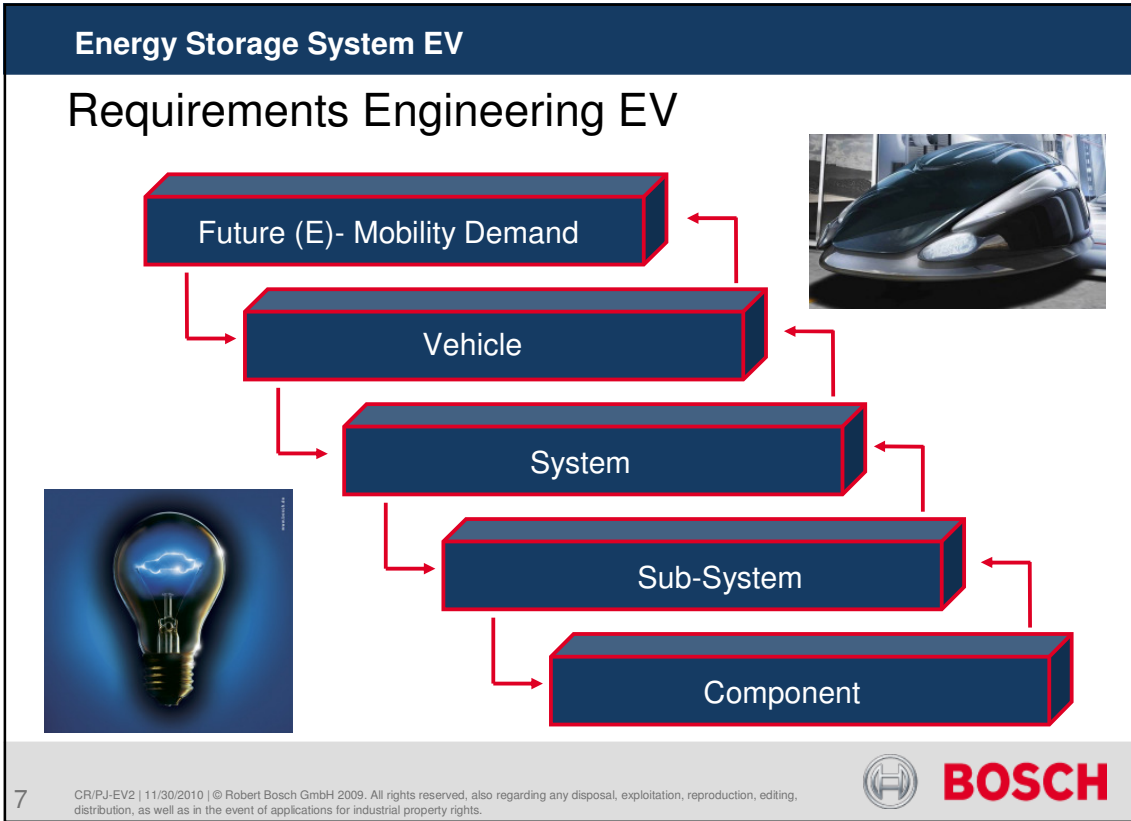
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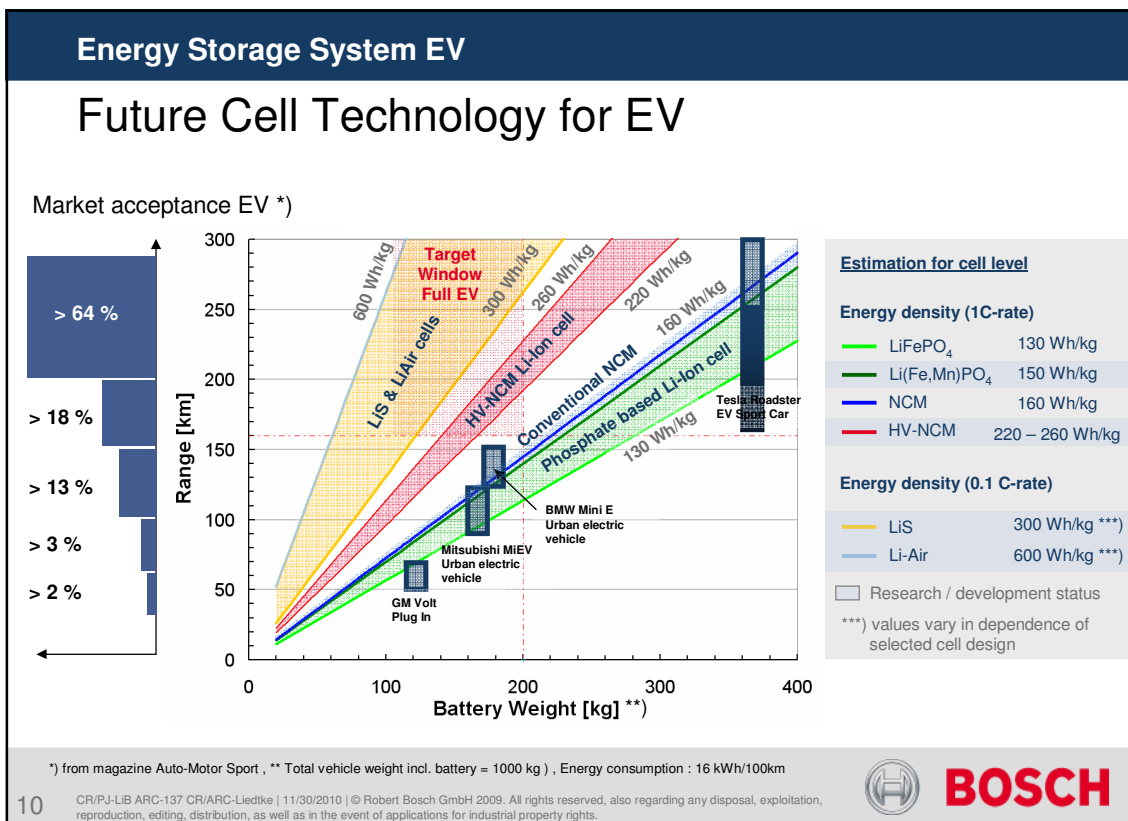
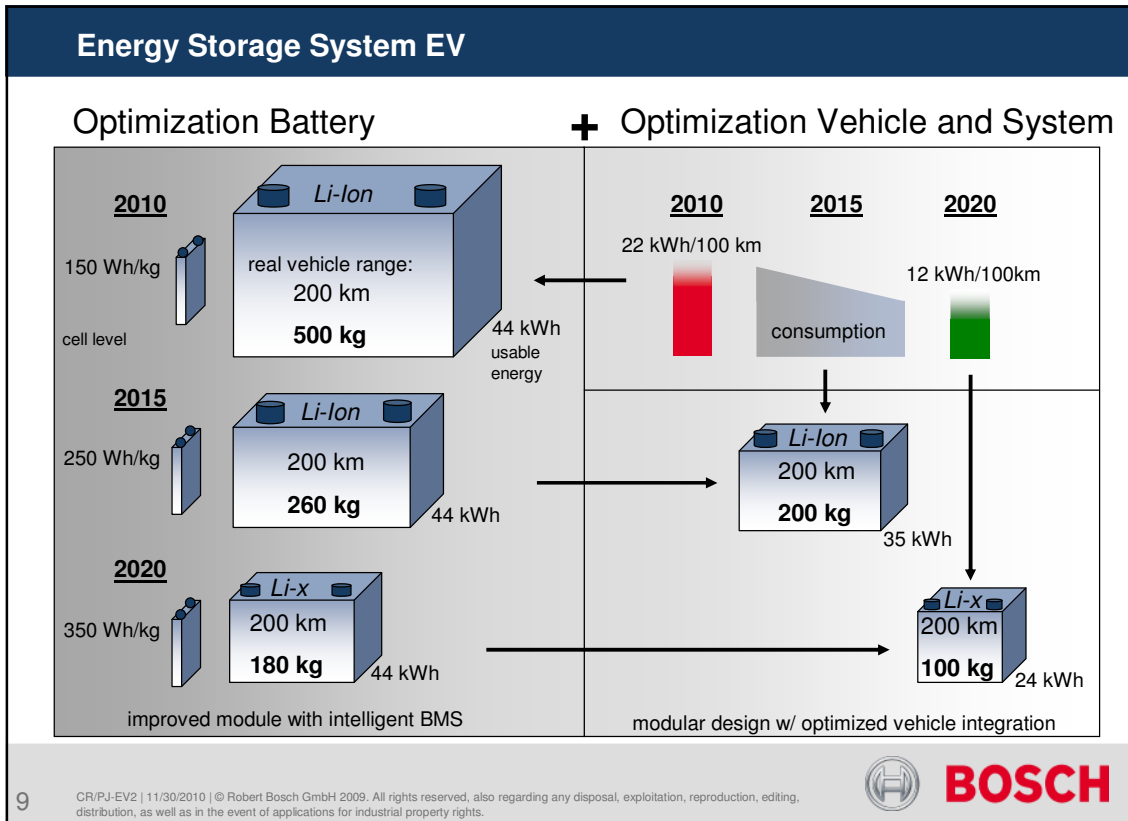




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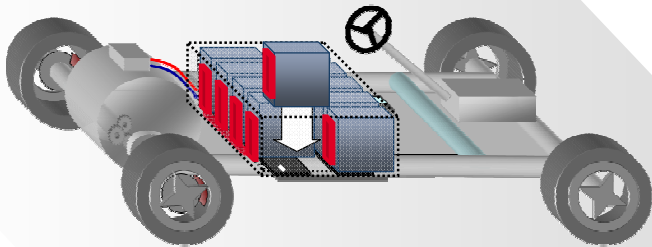




### Energy Storage System EV


## Battery Management System (BMS)

is part of the battery system intended to ensure safe and optimal battery operation, as well as provides information for the other components of the BEV.




Temperature Prediction and Management	Identification of Safety Events	Battery Cell Balancing
Power and rest energy prediction	<b>BMS FUNCTIONS</b>	
Main Contactor Control	Single Cell Sensing	Isolation Failure Detection
		Battery Diagnosis
		Current and Voltage Limitation

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### Energy Storage System EV



**Weight**

High specific energy

Light battery components

**BMS**

Active balancing

Low internal resistance

**Efficiency**

**Costs**


Low pack costs

Long lifetime

**Safety**


BMS safety functions

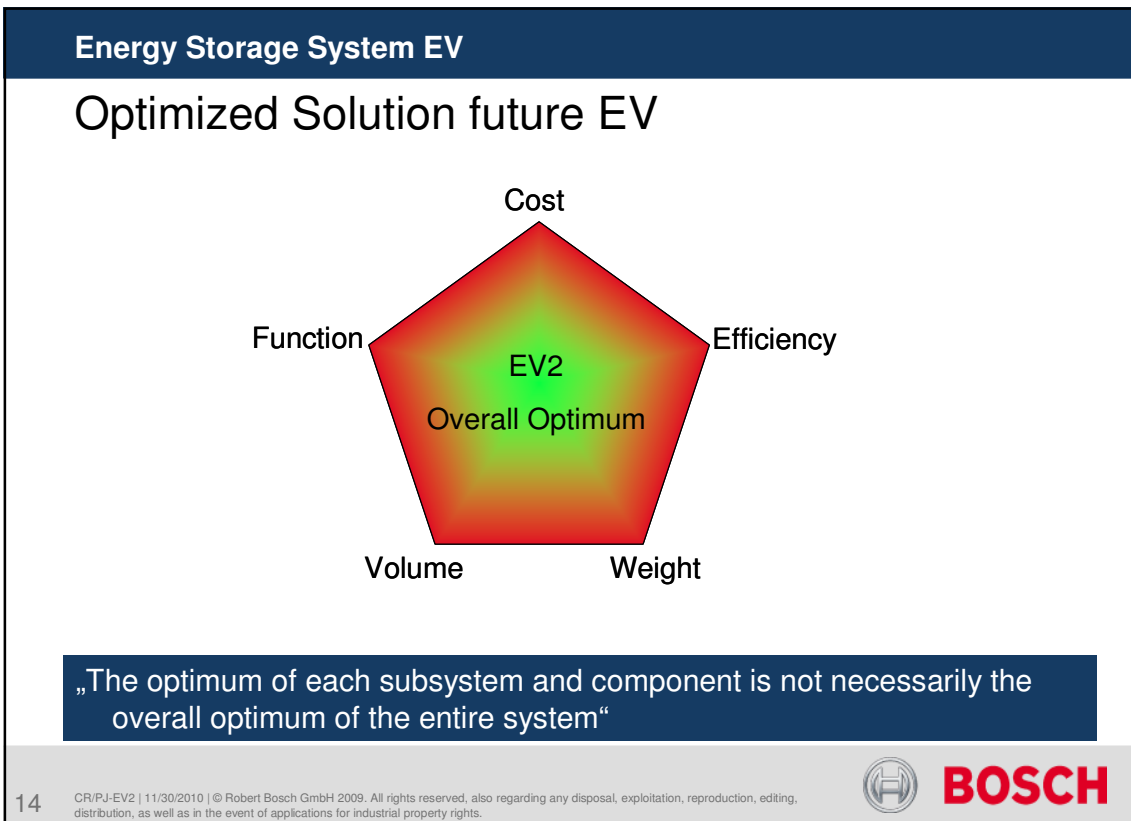
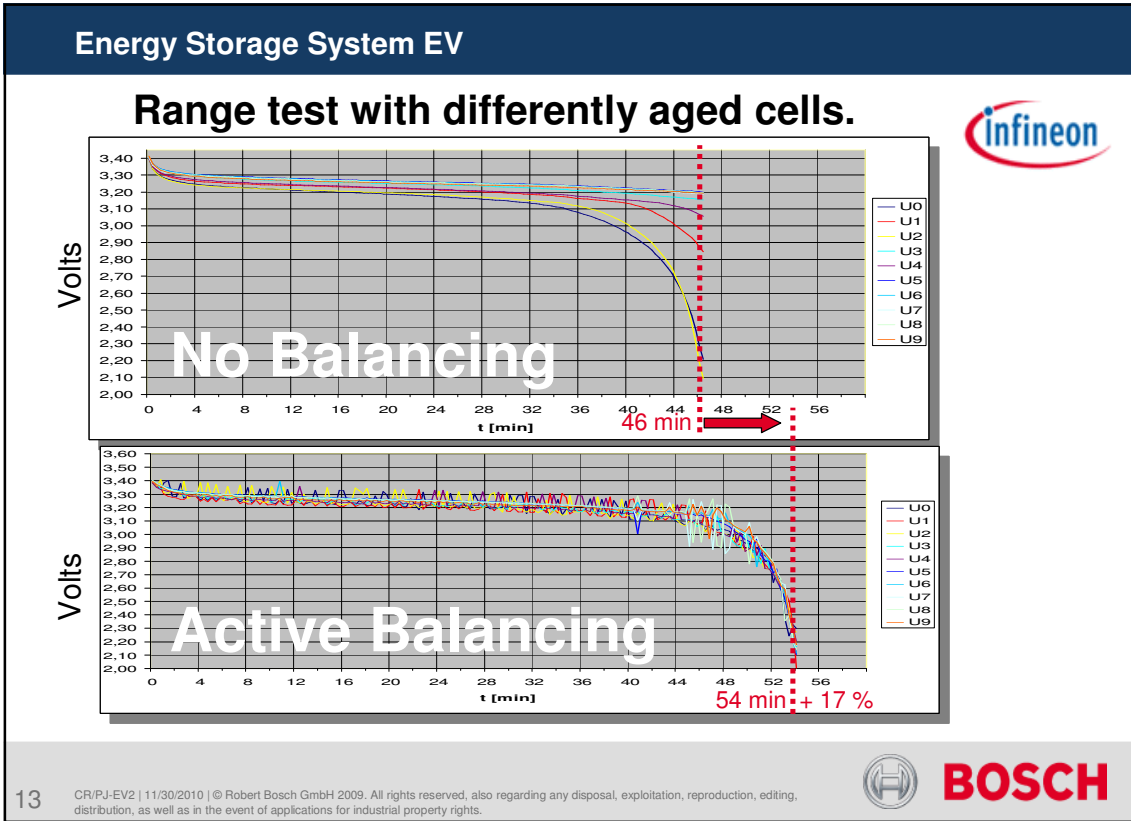
Cell and design specific safety

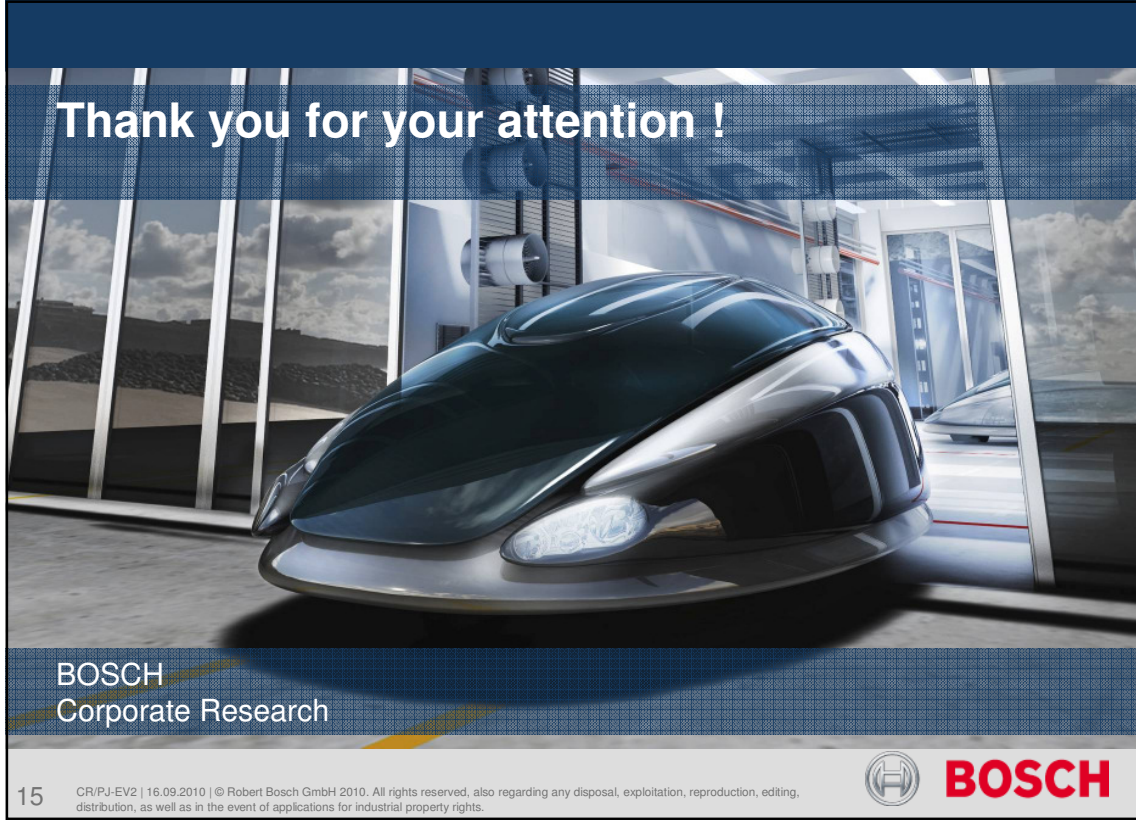


Energy storage system - requirements pyramid

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**Thank you for your attention !**

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15

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