



Presentation for

DOE Hydrogen and Fuel Cell Technical Advisory
Committee

June 15, 2011



***Clean hybrid power
for off-grid applications***

SFC Energy AG & Inc.



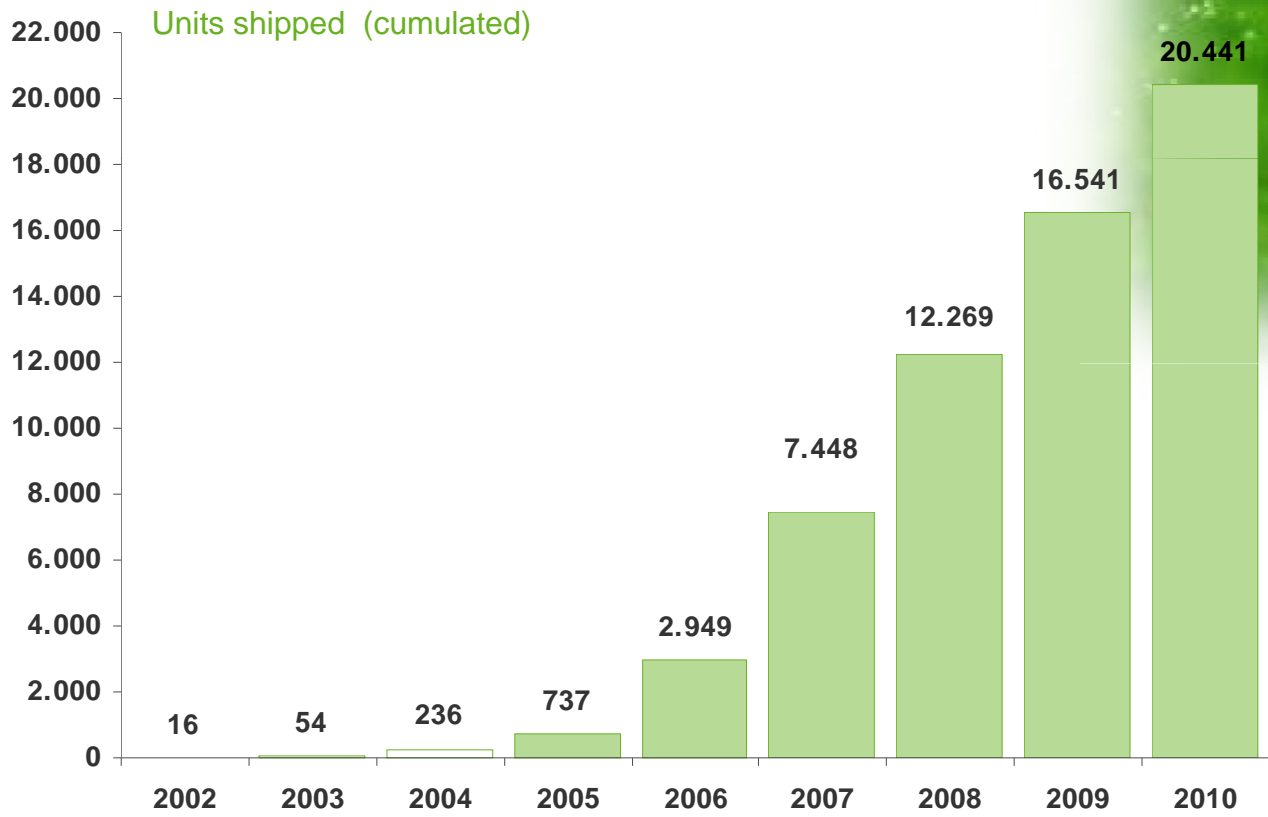
Facts and figures

- 🔌 Founded in 2000
- 🔌 Sole company developing, producing and selling commercially available DMFC products
- 🔌 Locations
 - SFC Energy AG: Brunnthal, Germany
 - SFC Energy Inc: Rockville, MD
- 🔌 100 employees



Market Traction

- As of today, more than 21,000 fuel cell systems shipped
- > 8 million operating hours in end user environments
- Fully functional fuel infrastructure established in core markets



Product Readiness

EFOY-Series



EFOY Pro



Jenny



Power Manager



Liquid Fuel Infrastructure

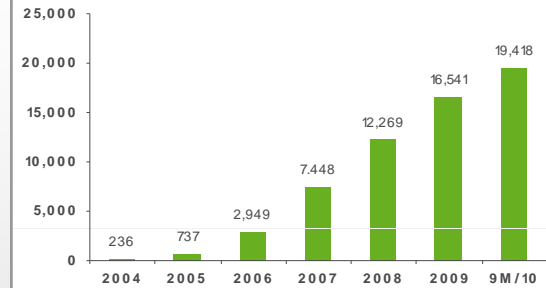
Market Presence



Coverage with SFC points of sale and methanol cartridges outlets (Leisure market)

Substantial Market Traction

Units shipped (cumulated)

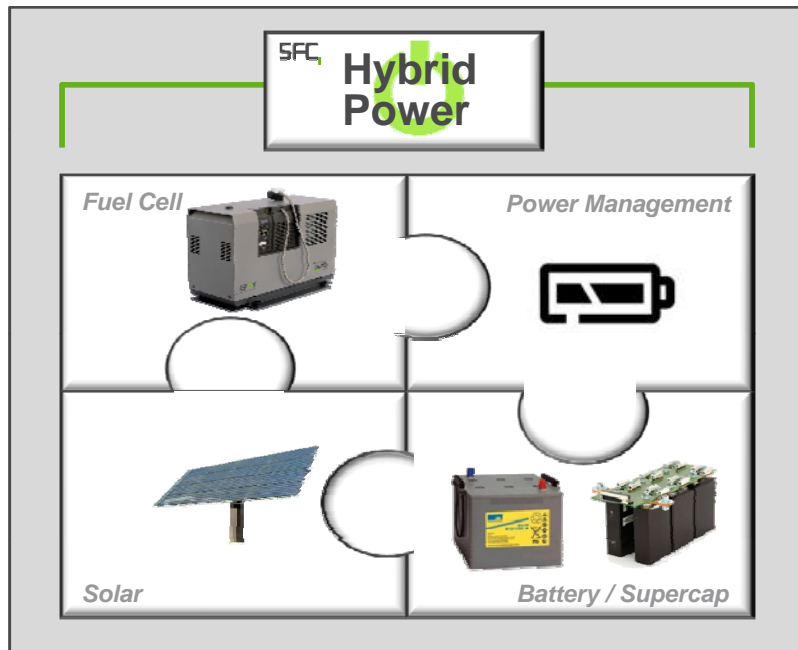


Customers



Sustainable growth of commercial fuel cell business

SFC's Enabling Power Supply Solution







Single Customer Interface

Customer

- ⚡ **Compatibility** with incumbent solutions → **low or no complexity** of integration; ideal **retrofit market opportunities**
- ⚡ EFOY closes “**power gap**” of existing solutions – **augmentation**, not direct competition
- ⚡ **Load sharing** between battery and fuel cell [and solar panel] → **size and cost minimization** for both
- ⚡ **Prior investment costs are not lost** → elimination of psychological purchase barriers

SFC's hybridization concept enables superior product advantages and capturing the full off-grid market potential

Macro-Economic Drivers

-  Electrification and Digitalization
-  Clean Energy
-  Security
-  Reduction of Dependency on Fossil Fuel

Micro-Economic Drivers

-   On Board Power – Increased Demand for Functionality & Comfort
-   Increasing Off-Grid Power Needs
-   Digitalization of Military and Security Forces
-   Increasing Need for Backup Power Supply
-   Increased Demand to Intelligently Use and Manage Power
-   E-Mobility

SFC's product solutions serve multiple mega-trends.

Energy Density Comparison

Different ways to provide 11 kWh electricity

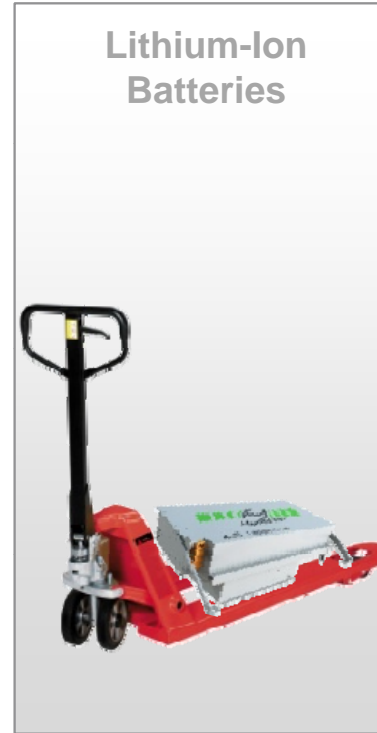
Methanol



Hydrogen



Lithium-Ion Batteries



Lead-Acid Batteries



Weight	17 lbs	180 lbs	235 lbs	600 lbs
Volume	10 l	60 l	60 l	140 l

Methanol combines superior energy density with easy handling and low cost.

SFC Market Segments

Leisure

Comfortonomy for:
Motor Homes, Cabins
and Boats



Remote Industry

**Dependability and
Low Maintenance Cost
for:**
Traffic Technologies,
Security, Environmental
Monitoring



Defense

**Weight Saving and Non-
Detectability for:**
Portable Power



**Reliability and
Non-Detectability
of On-Board Power for:**
Tactical Vehicles



Mobility - APU

**Reliability of On-Board
Power and Reduction of
Fleet Operating Costs
for:**

Special Purpose Vehicles



E-Mobility

**Combined Heat and
Power Source for:**

Increased performance
and user acceptance of
battery vehicles



Rationale

- ❶ SFC fuel cells are unique enabling components – but hardly plug & play solutions so far
⇒ demand for **whole product solutions**
- ❷ Strategic advantages of energy solution provider over component supplier:
 - ⇒ direct customer access
 - ⇒ stronger market position + margin protection
- ❸ Today's market access and market fragmentation limit growth speed
- ❹ First SFC whole-product solutions / systems (e.g. EFOY ProCube, energy network incl. Power Manager) very well received on the market



EFOY Energy Rack

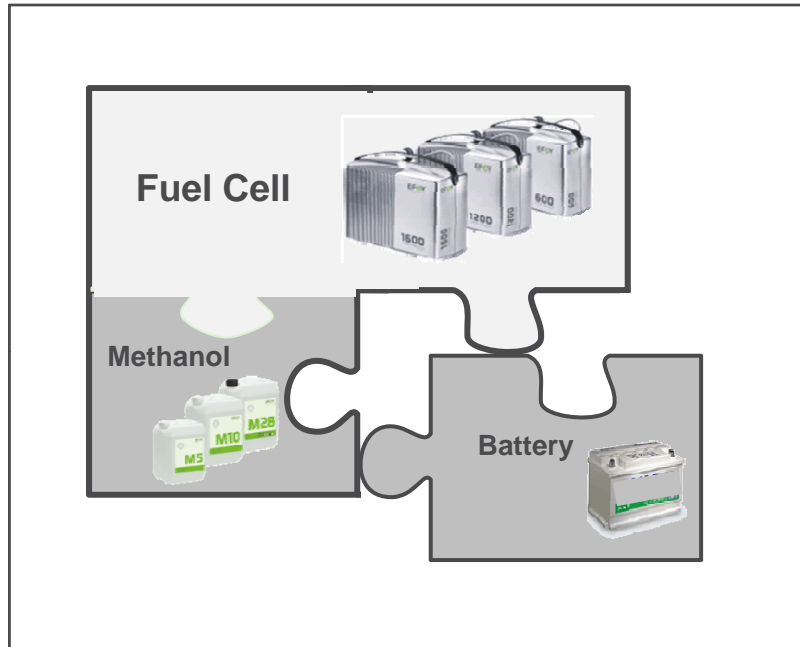


EFOY ProCube

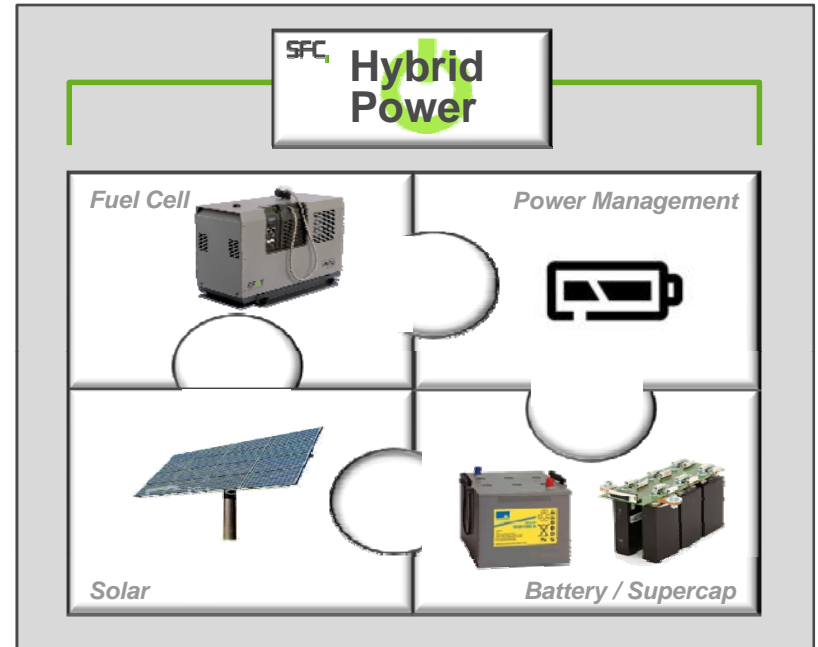


SFC Power Manager 3G

Hybrid Product Concept



Broadening of Business Model

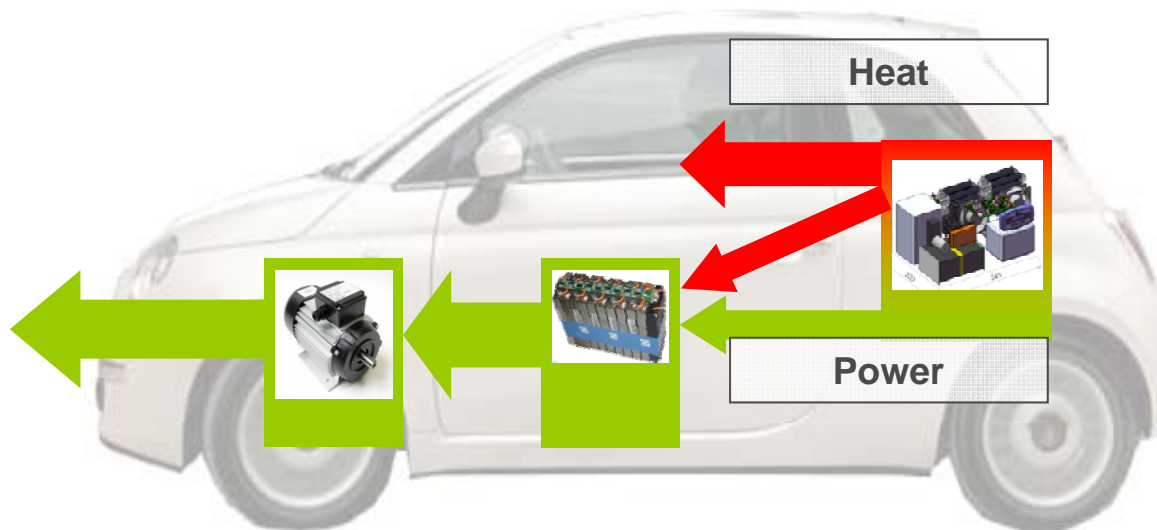


Create leading solution provider for clean hybrid off-grid power.

E-Mobility without limitations

Combined Heat and Power (CHP) Concept

- On-board generation of power and heat makes electric vehicles fit for everyday use - even in winter
- Increased range and fully automatic off-grid recharging upon demand improve customer acceptance
- SFC presents concept together with the renowned automotive engineering partner “ESG Elektroniksystem- und Logistik-GmbH”



Innovative CHP (Combined Heat and Power) Concept for Electric Vehicles with SFC Fuel Cells



Range extender and on-board charger:

Light electric vehicles - based on commercially available EFOY fuel cell products – achieved important milestones re. range, grid independence, regulatory approvals

2008: first DMFC hybrid vehicles hit the road

Fuel cells as APU for special-purpose vehicles

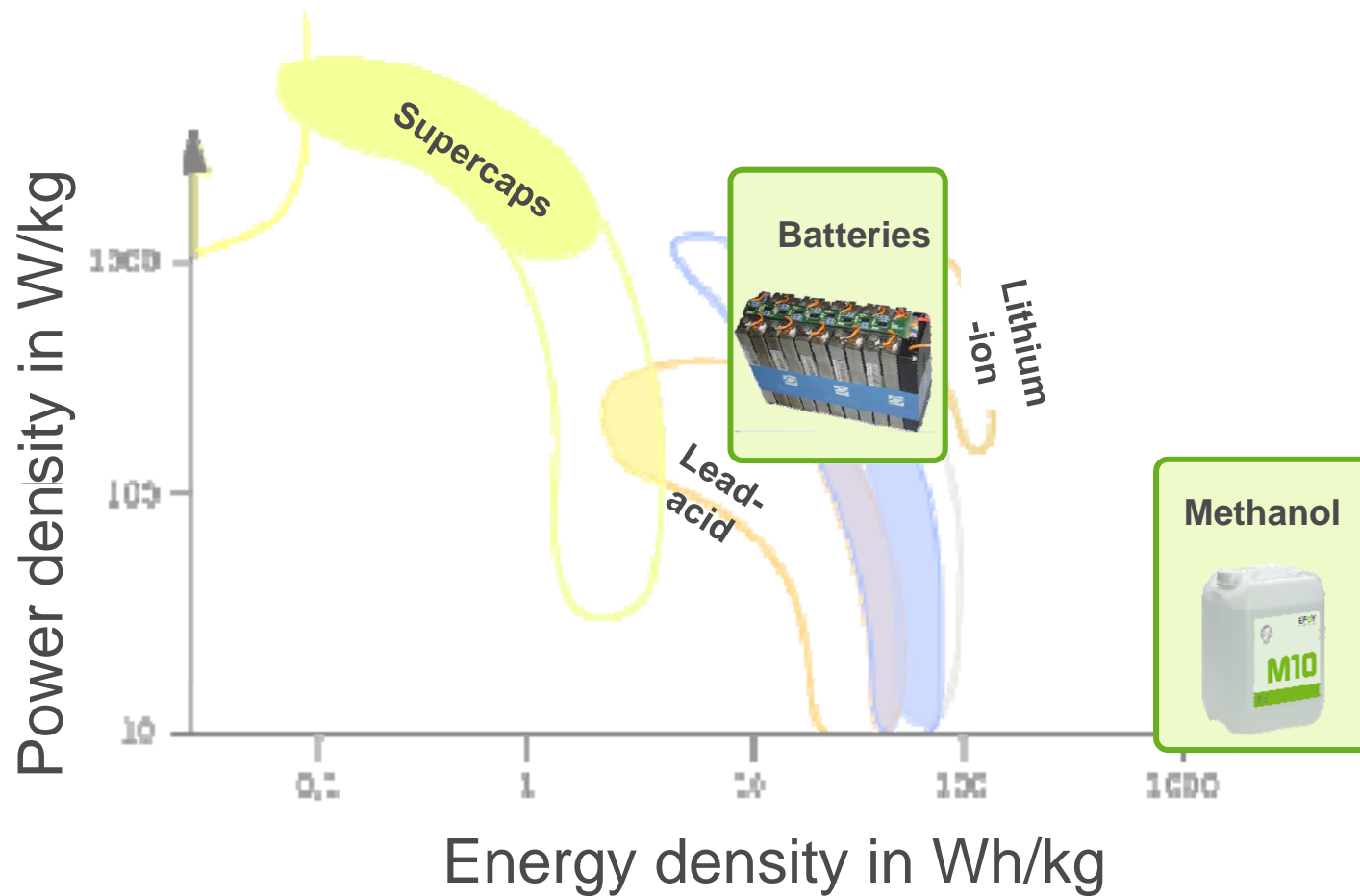


**OEM
customers:**



- Silent, powerful, efficient on-board power source → increased functionality
- Already over 400 vehicles "powered by SFC" in daily use by authorities
- Massive savings in operating cost for fleet managers
- Powerful logistics network for fuel cartridges – more than 1,500 points-of-sale in EU

2009: first volume orders by VW and Mercedes - APU for special-purpose vehicles



Hybrid approach combines superior energy density with required power density

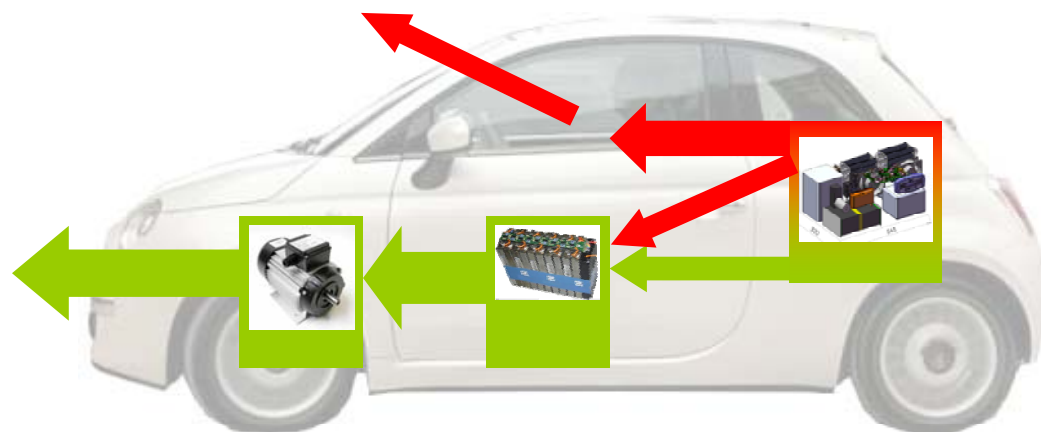
The Battery Power Gap (1) - Capacity Limitations

- Theoretical capacity assumes cycling from 100 % SOC to 0 % SOC
- Neither 100 % SOC nor zero % SOC are achievable in reality
- Cell balancing eats up significant fraction of capacity

→ Theoretical battery capacity is never available in practice

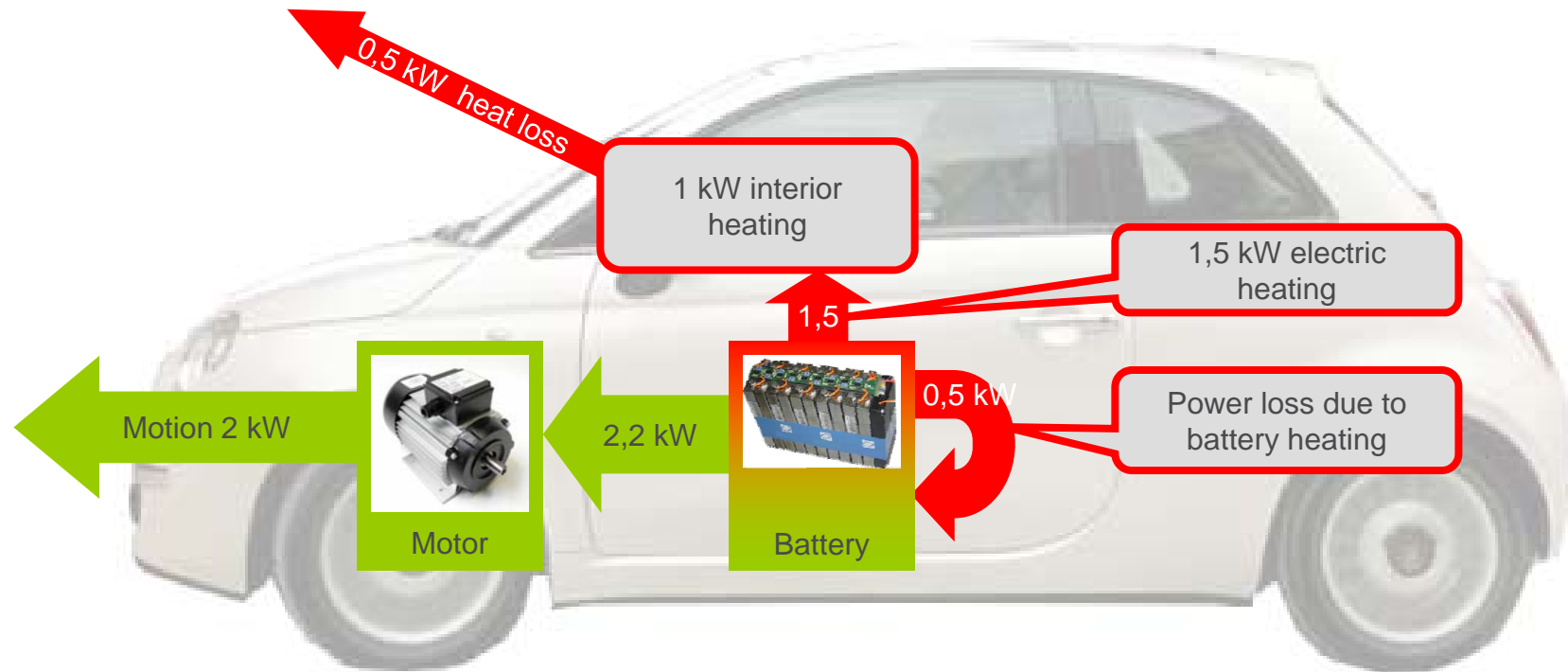
The Battery Power Gap (2) - Thermal Issues

- ❶ Battery capacity + ability to accept charge are strong functions of temperature
 - ❶ Lithium-plating effect prohibits charging below freezing
- ❶ Battery capacity is too precious to be wasted for heating purposes
- ❶ Winter conditions: High energy demand meets poor battery capacity



→ A source of heat is required on board

Example: compact car, urban driving at -10 °C, battery only



Winter driving: Power consumption out of the battery doubles due to heating requirements
At the same time, battery capacity goes down dramatically

Battery vehicles: winter conditions lead to an unresolved power gap

SFC Awards (2002-2010)



Promobil Beste Marken (2010)



Technology Innovation Award (2009)



Cleantech Award (2009)



Promobil Beste Marken (2009)



MMM Award (2009)



Wearable Power Prize (2008)



Deloitte's Fast 50 List (2008)



Frost & Sullivan's Market Leadership Award (2008)



Industriepreis Energie (2008)



Promobil Beste Marken (2008)



Technology Pioneer (2005)



Top 100 Innovators Red Herring (2004, 2002)



SailOvation Award (2004)



DAME Innovation Award (2004)



Inspire Technology Award (2004)



IF Design Award (2004)



F-Cell Award (2004)



German Founders' Prize (2003)



Business Leader Energy (2002)



Best High-Tech Company in Energy Field (2002)

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