

HT-PEM system benefits and challenges
...by the worlds most integrated fuel cell company

Carisma 2012
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Head of R&D

Outline

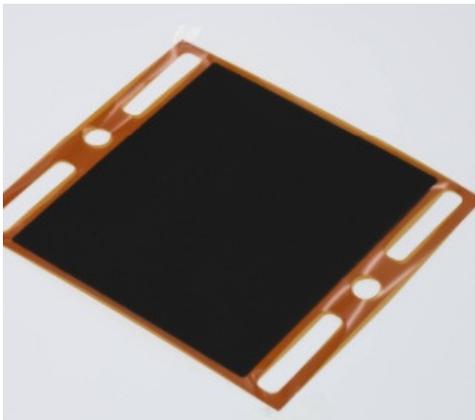


- **The companies elcomax & elcore**
- **The elcore2400-system**
- **System requirments**
- **Summary**

Company Group



elcomax
EFFICIENT FUEL CELL TECHNOLOGIES



**Core Component MEA
Membrane Electrode-Assembly**

elcore

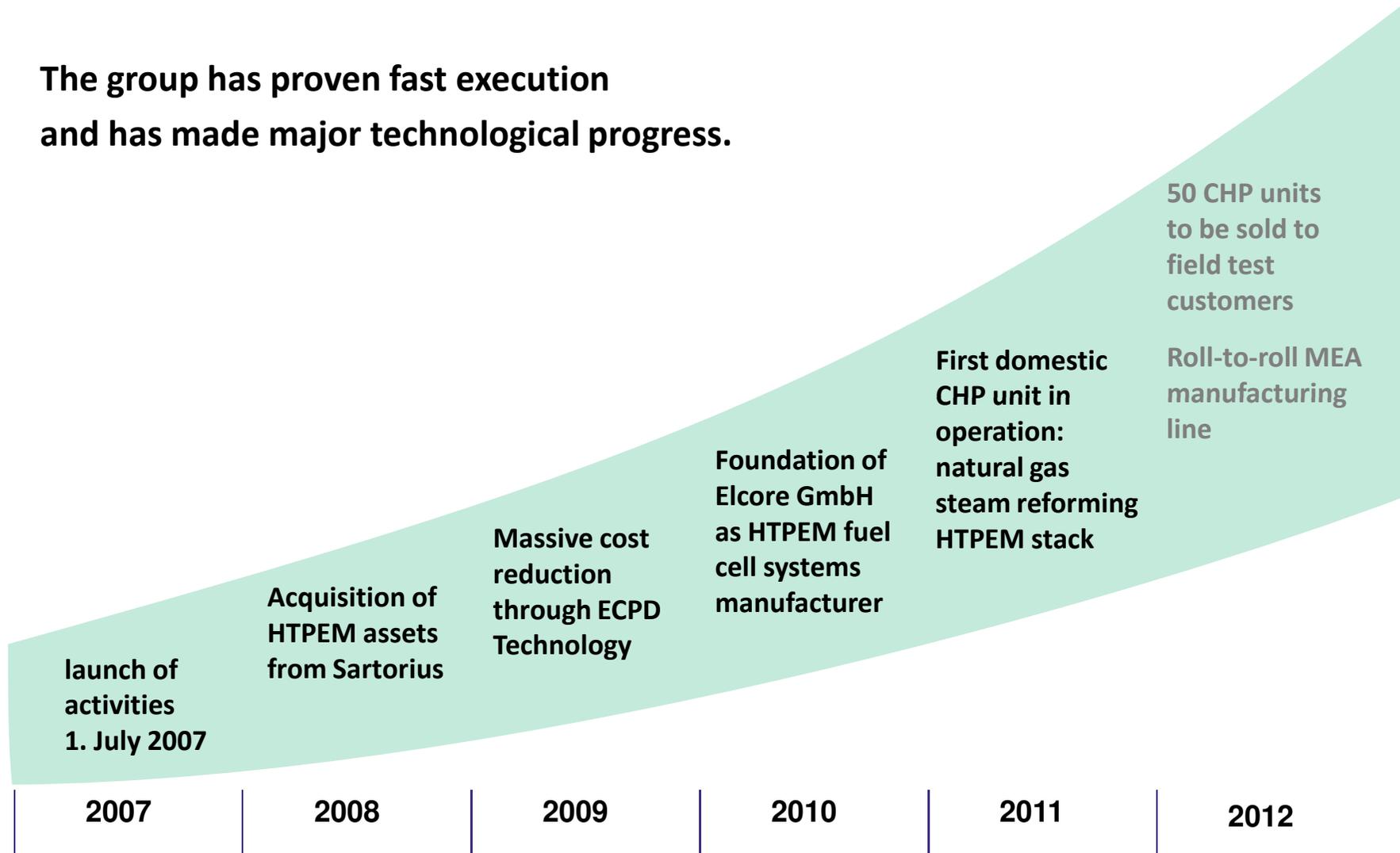


**High efficient Energy Systems
Focus: Combined Heat and Power**

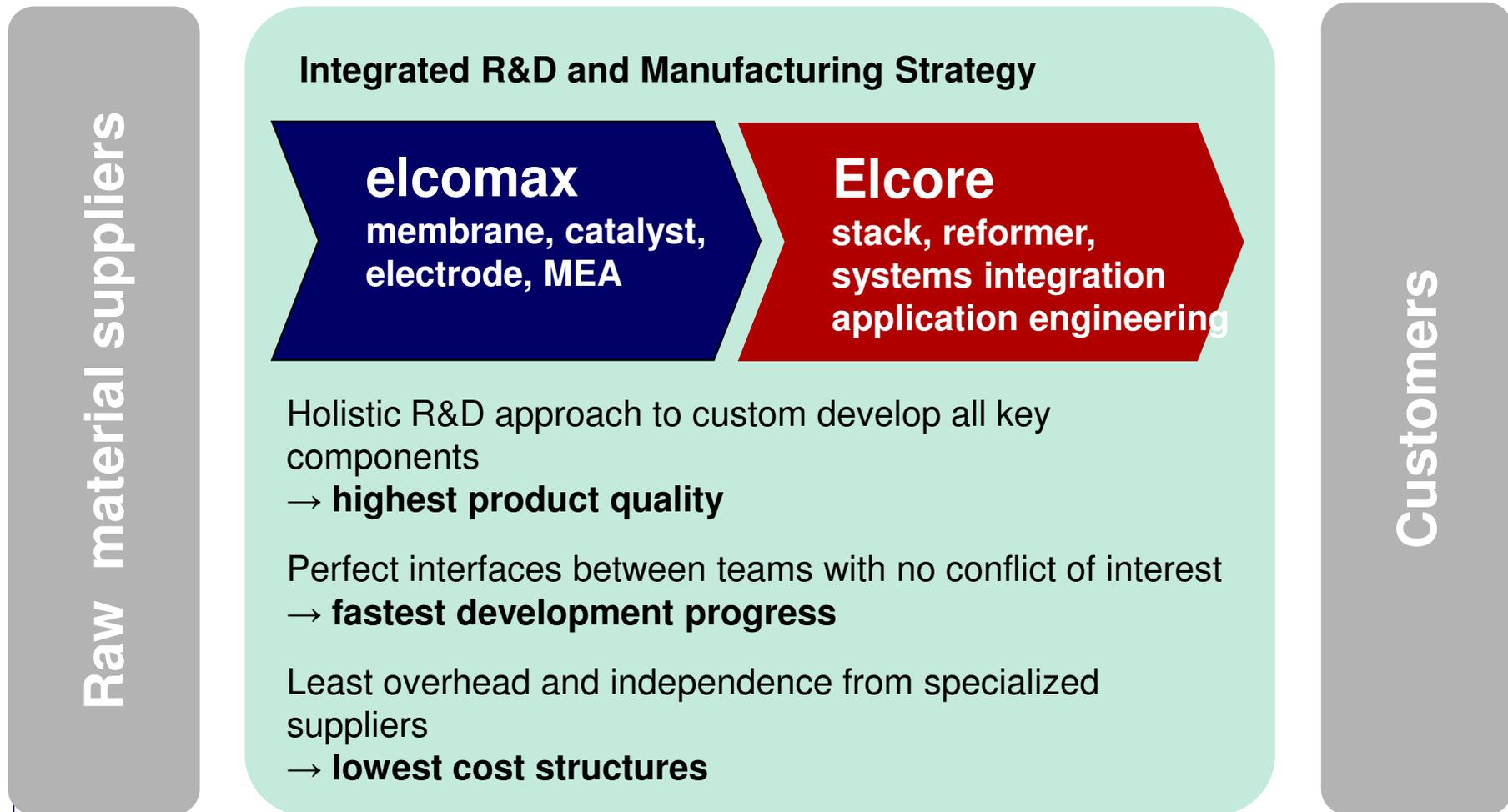
Milestones



The group has proven fast execution and has made major technological progress.



Overall value chain



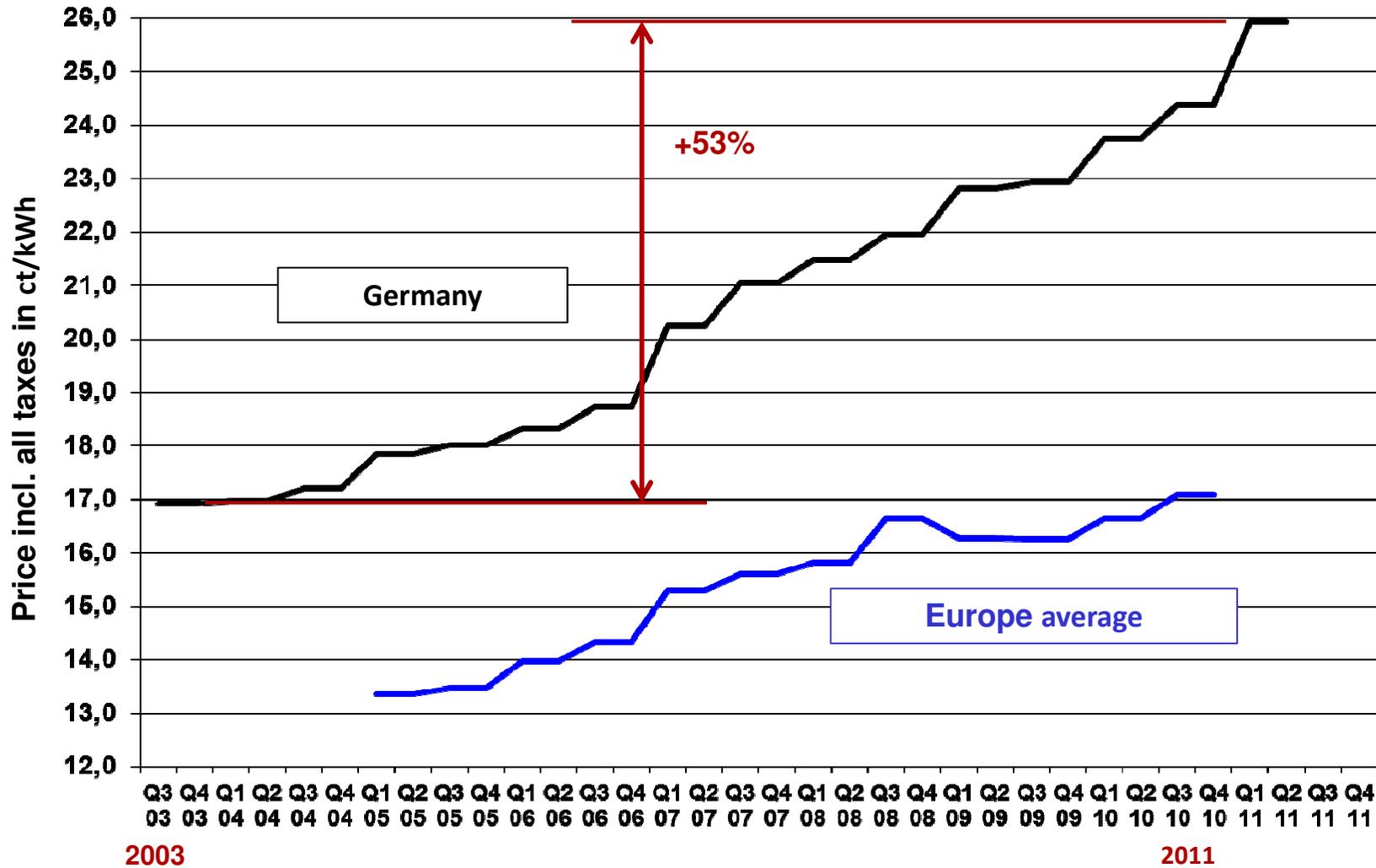
Target Market – Single Homes in Germany

Electricity costs - Comparison

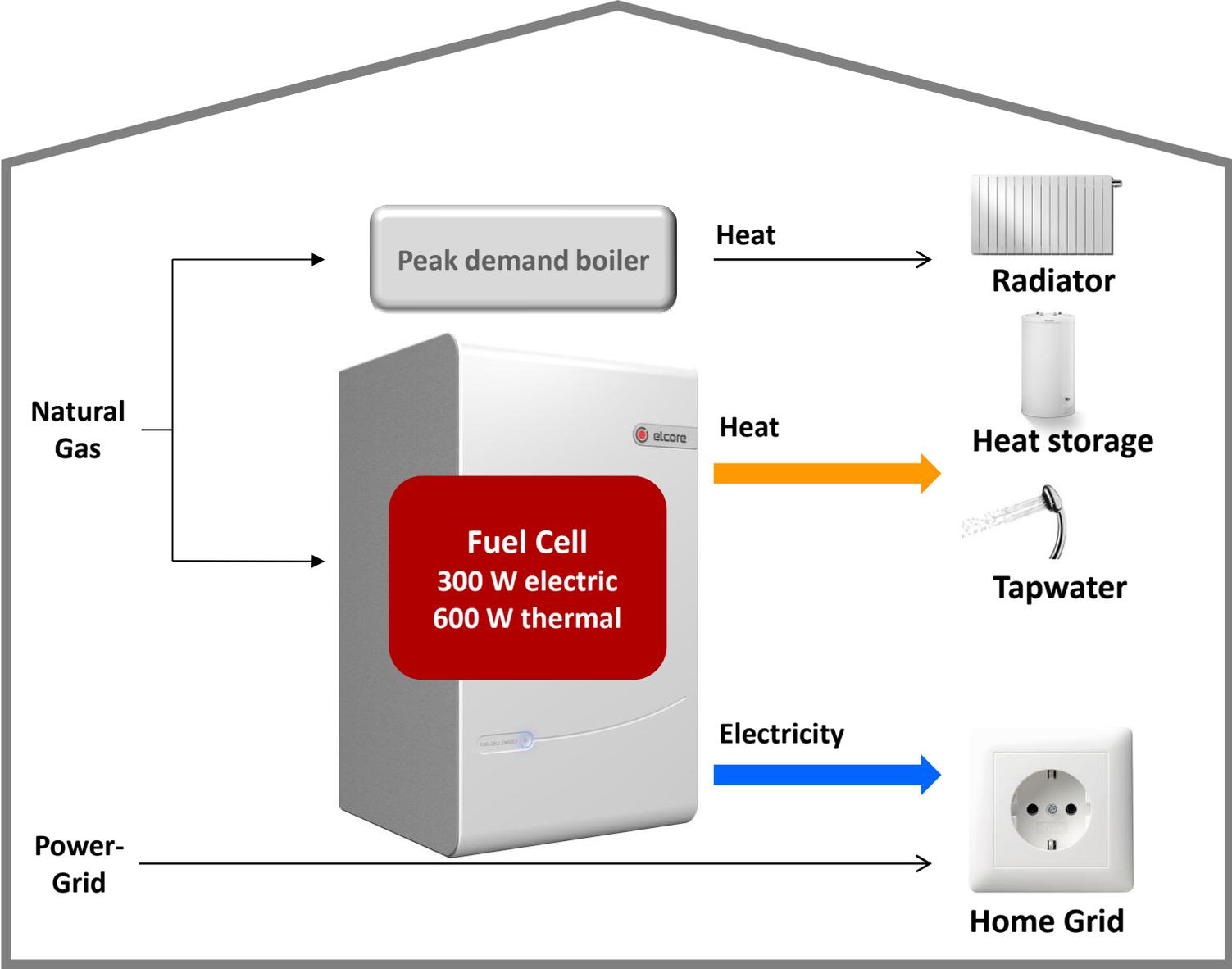


Domestic electricity prices – Germany and Europe

(Source: Eurostat; 2.500 – 5.000 kWh/yr)



Elcore 2400 – how it works



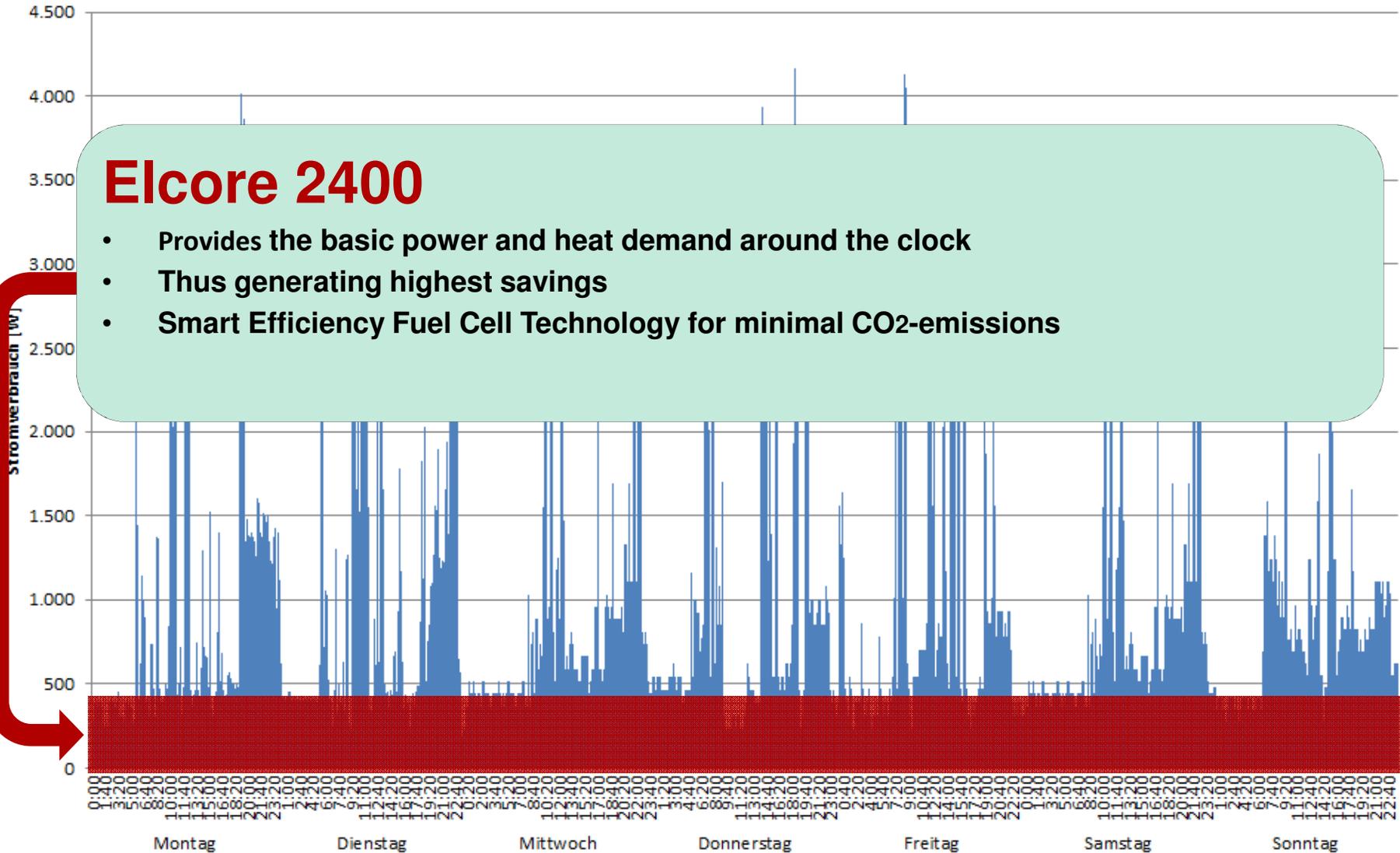
Up to 50% reduced electricity bill for you



Power consumption of a single family home

Elcore 2400

- Provides the basic power and heat demand around the clock
- Thus generating highest savings
- Smart Efficiency Fuel Cell Technology for minimal CO2-emissions

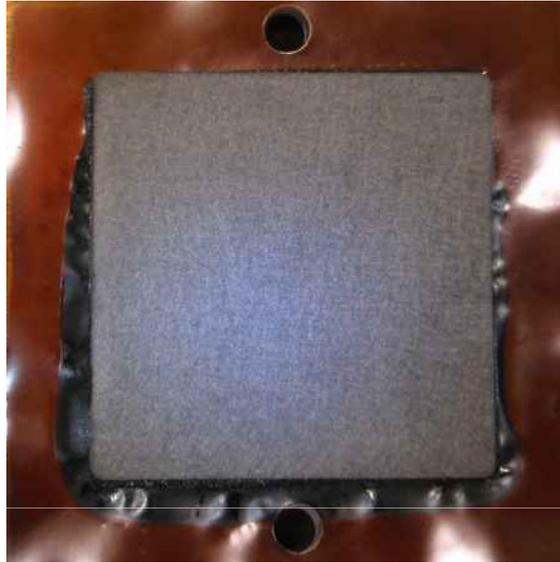


System requirements for pilot products



Requirement	Most critical	Solved by
Maintenance: >32.000h	Lifetime MEA	elcomax
	Stack design, operation conditions	elcore
Gas sealing	Stack	elcore
System cost	MEA cost	elcomax
	Stack & other component costs	elcore
Electrical efficiency	MEA-Performance	elcomax
	Parasitics	elcore

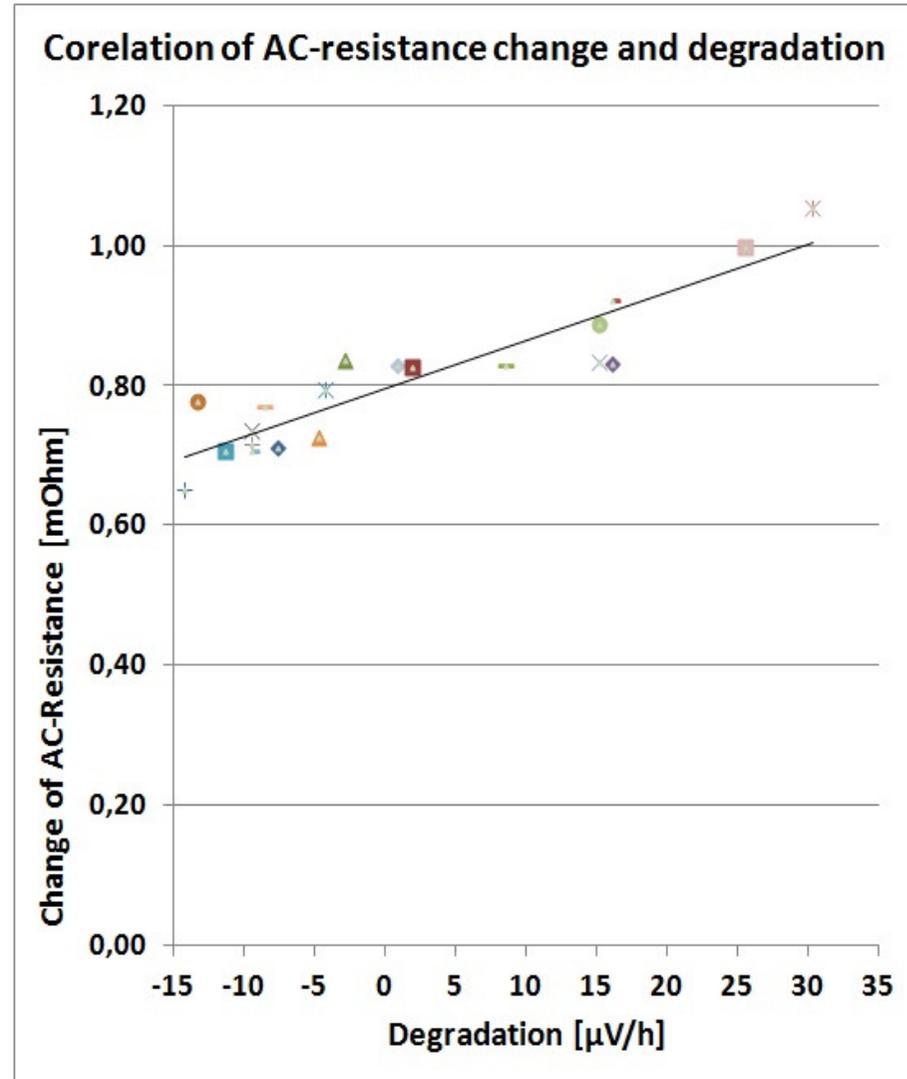
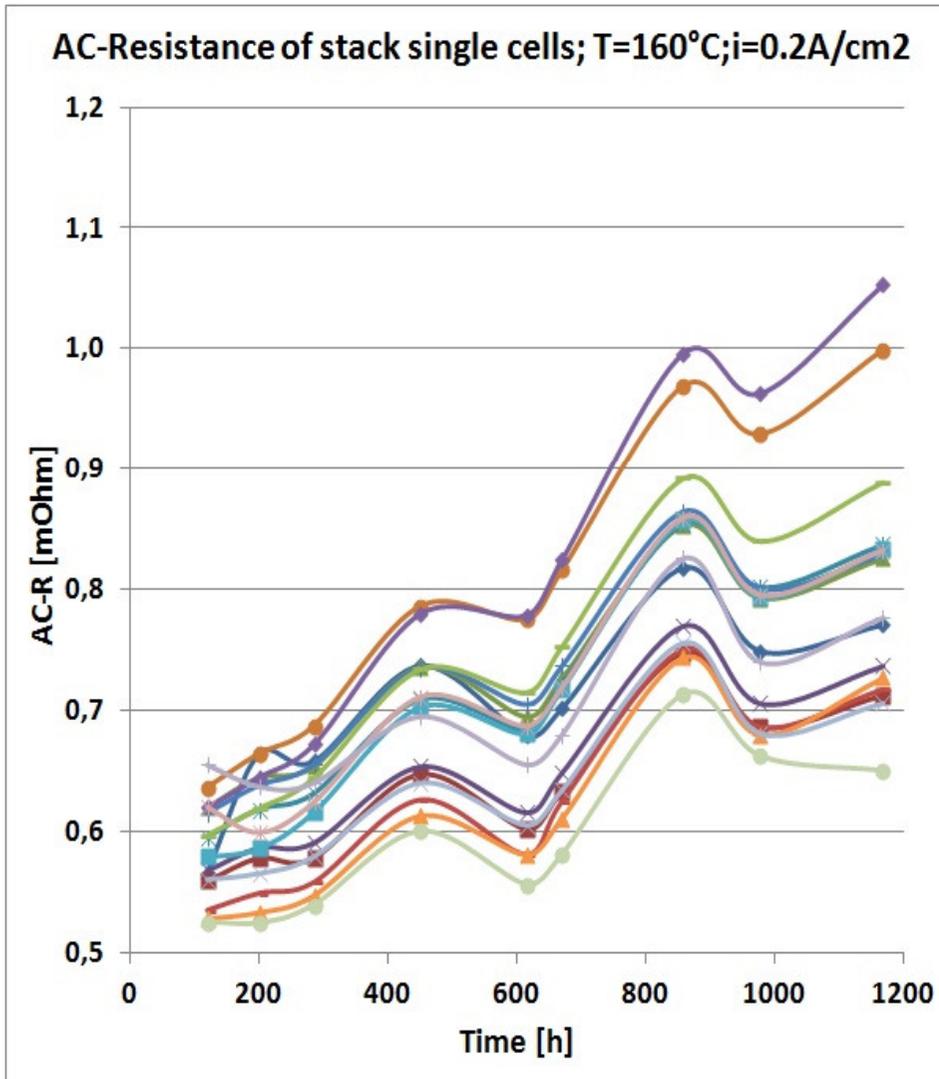
MEA lifetime



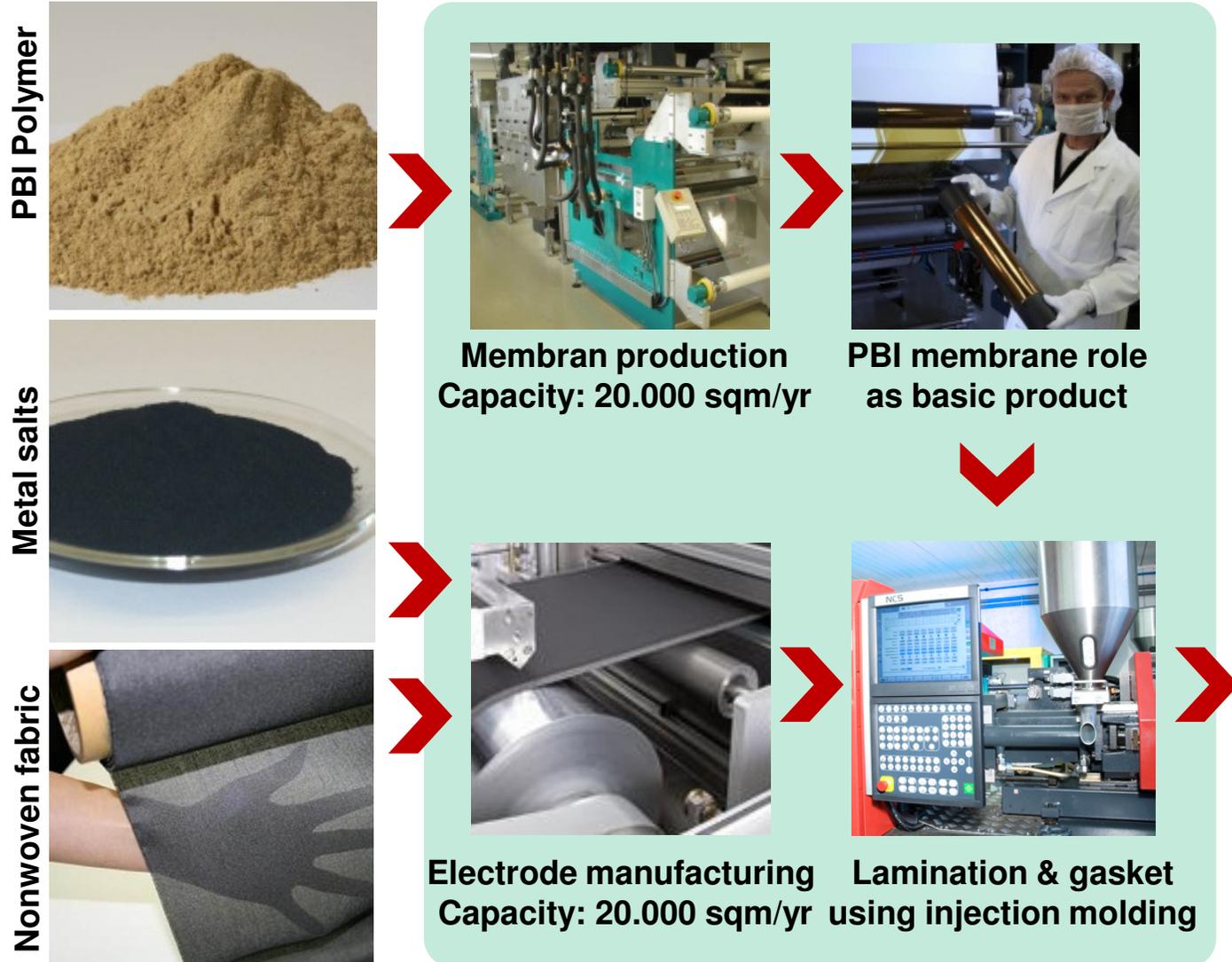
- **Good control over H₃PO₄-content**
- **H₃PO₄-loss into frame critical**
- **Mechanical stability critical**

- **Significant improvement of lifetime**
- **Degradation rate of 10 μ V/h achieved**
- **H₃PO₄ loss still important (BPP)**

Importance of Acid-handling

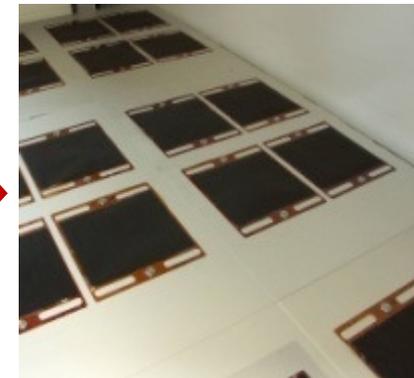


MEA cost & reproducibility



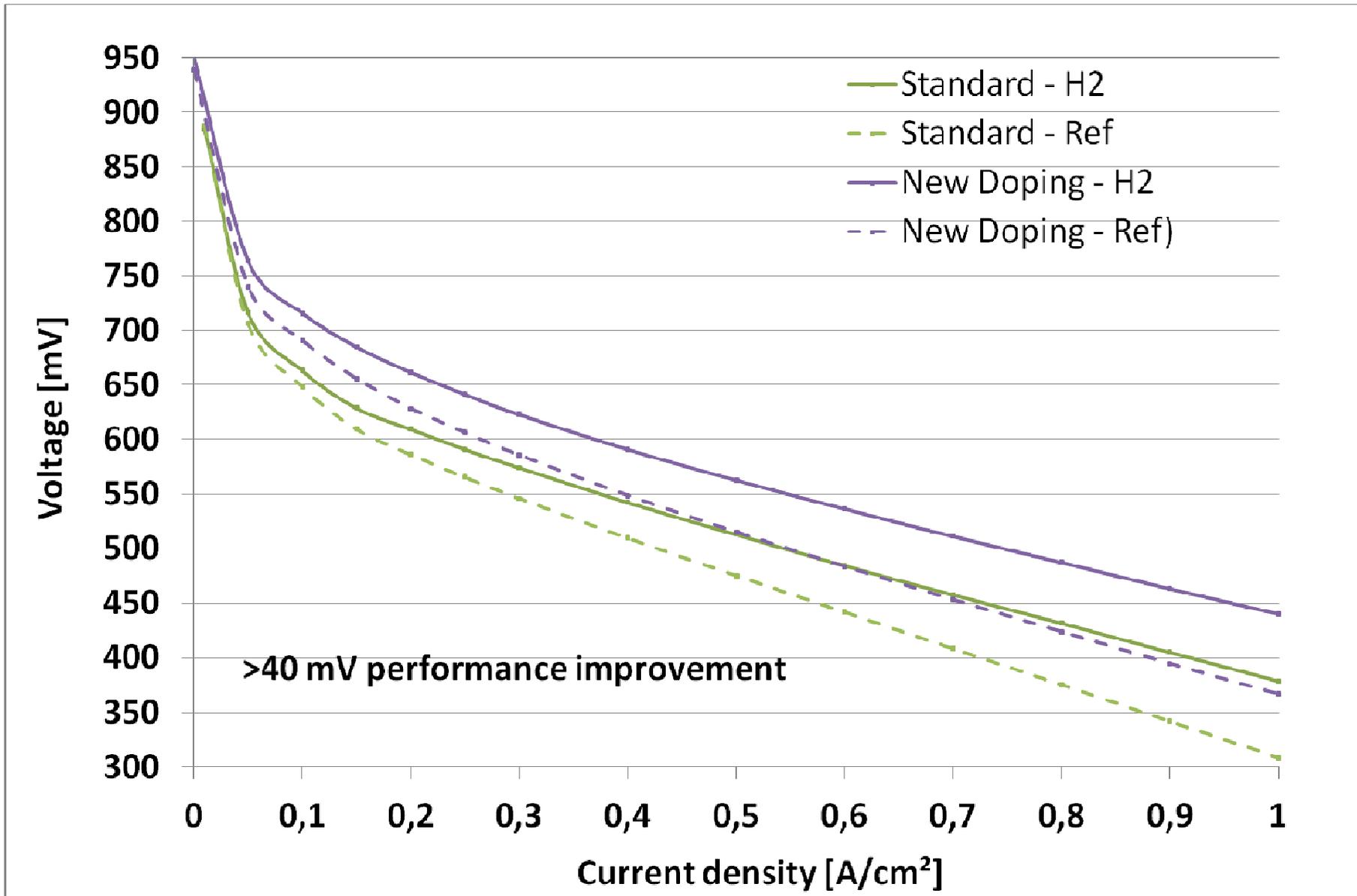
The company group possesses the entire value added chain von raw materials to complete systems

Key component: HTPEM MEA



Capacity: >1 MW/yr

Improving MEA performance



Stack design



(Nearly) no free space
space

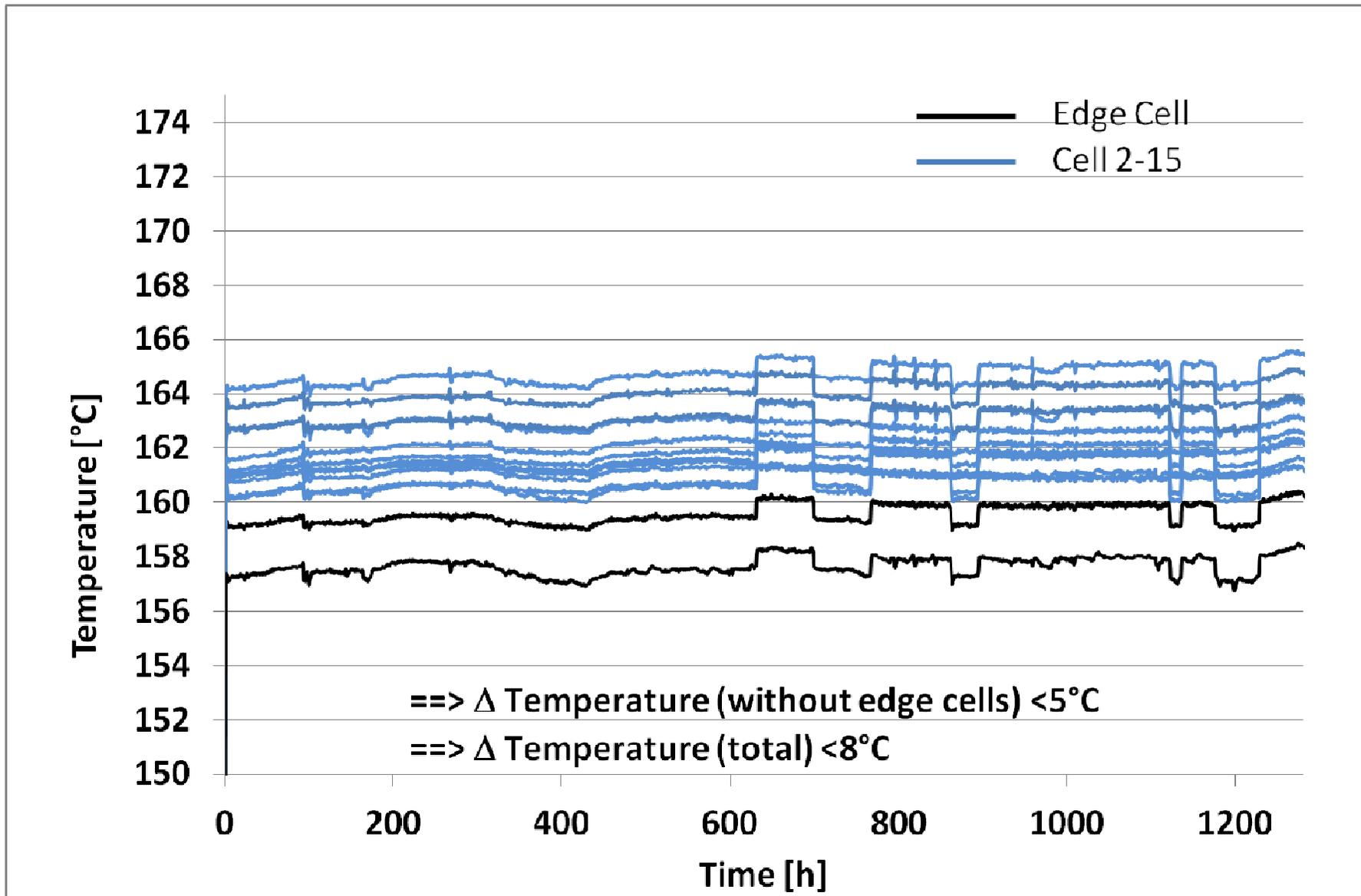
External
manifolding



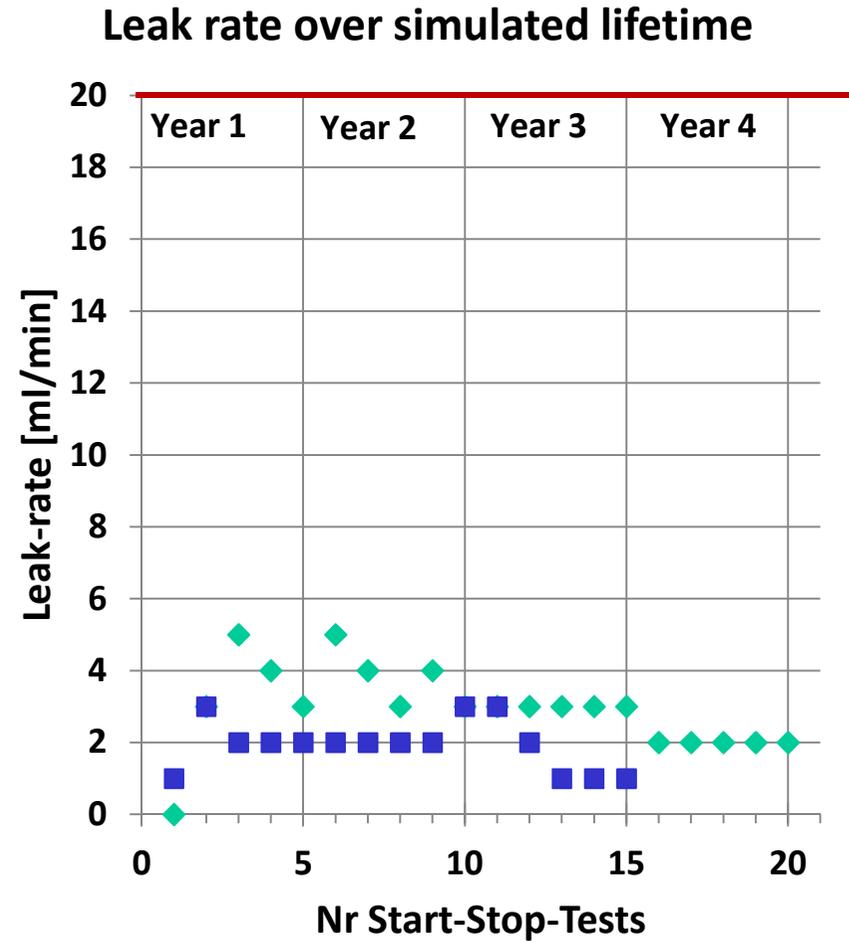
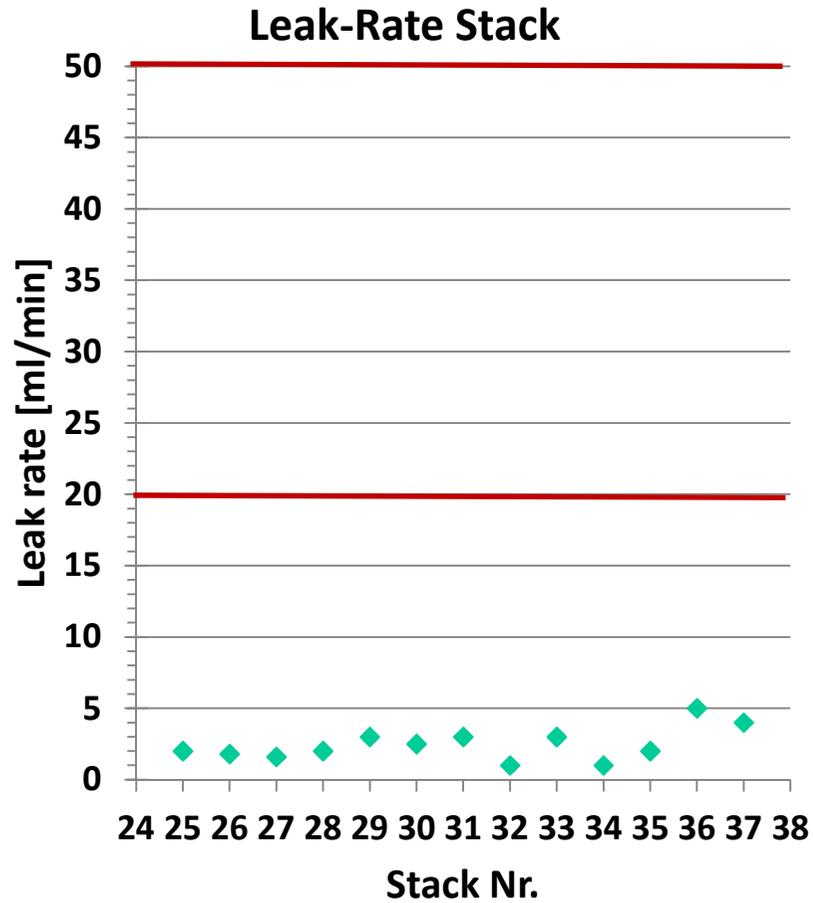
Cost-effective parts

Oil cooling in
separate plates

Temperature distribution



Sealing



- Excellent leak rate far below requirements
- Both BOL and over simulated lifetime

Summary



- All system components developed
- Real reformate testing essential
- HT-PEM technology ready for pilot products

- BPP, sealings and MEAs need further optimization in lifetime and cost for series products



Thanks for your attention

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