

f-cell 2017 Stuttgart

Stationary fuel cells for residential applications

HEXIS AG
Andre Vollmer, Product Manager



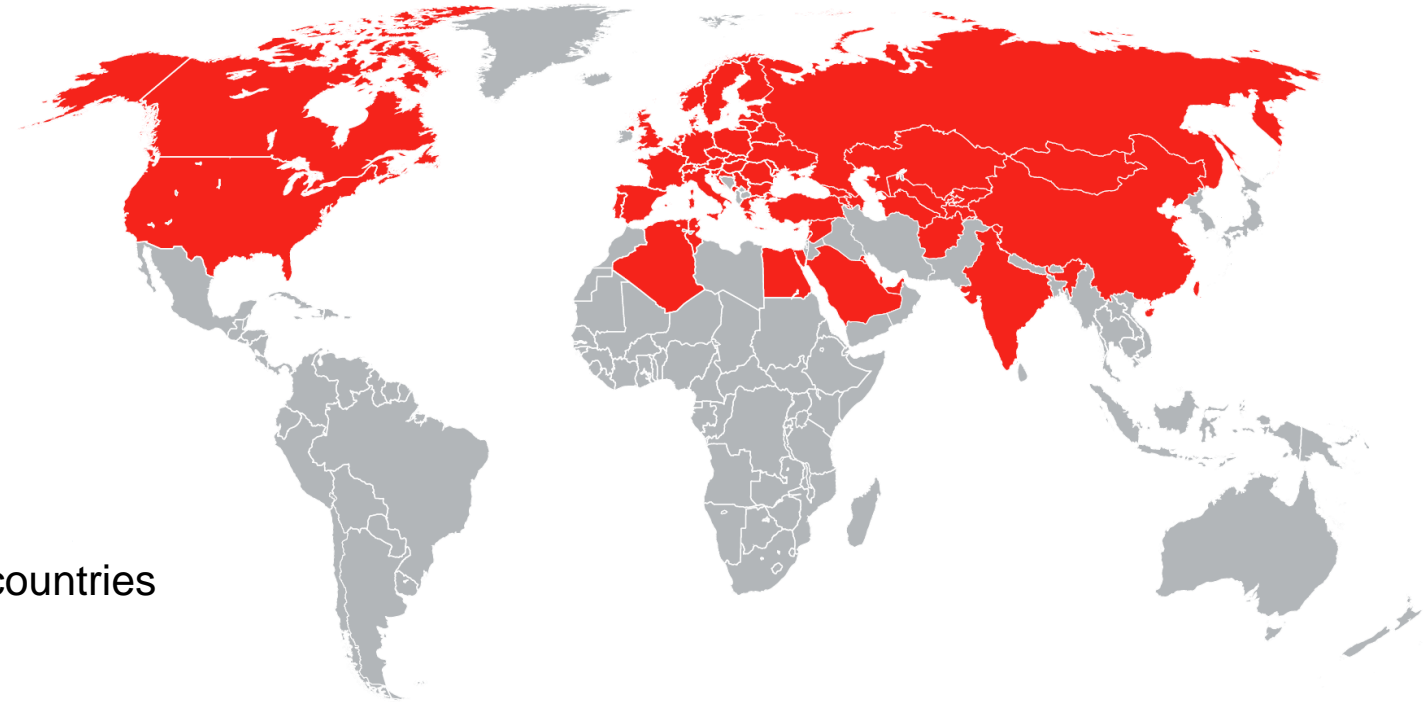
Viessmann receives
funds via PACE
from the EU



The Viessmann Group

Family owned enterprise with headquarters in Allendorf/Germany

- 1917 foundation
- 11.600 employees
- 2,2 bn. Euros of turnover
- 22 production branches in 11 countries
- 49 distribution companies, 35 sales partners in 58 countries and sales activities in 74 countries
- 120 sales branches worldwide
- 56 % turnover from outside of Germany



■ Countries with own sales companies or -partners

HEXIS AG

...100% part of the Viessmann Group



Company

- Based in Winterthur (CH), and in Konstanz (D)
- About 38 Employees
- Since 06/2015 a 100 % part of the Viessmann Group



High-temperature fuel-cell

- SOFC's of small power
- From powders to a «ready to use» system
- More than 20 years of experience in SOFC research and development



Extensive test-laboratoies

- System-and stack test benches
- Button cell, short stack, fc-system
- Material-, long-term and process tests



Produktion

Cell production and stack-assembly

- Capacity for about 50'000 cells/a
- Quality controlled
- Capacity for about 10 stacks/d

Produktion of fuel cell module

- Capacity for 1-2 fcm/d
- CE cetrified assembly and final checking

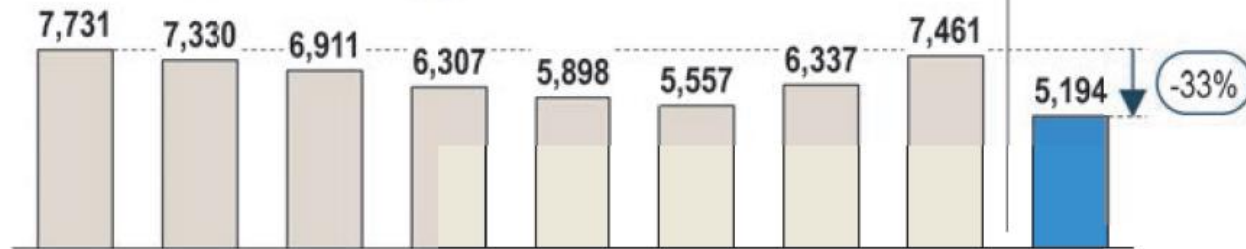
Why do we even need another new heating-technology?



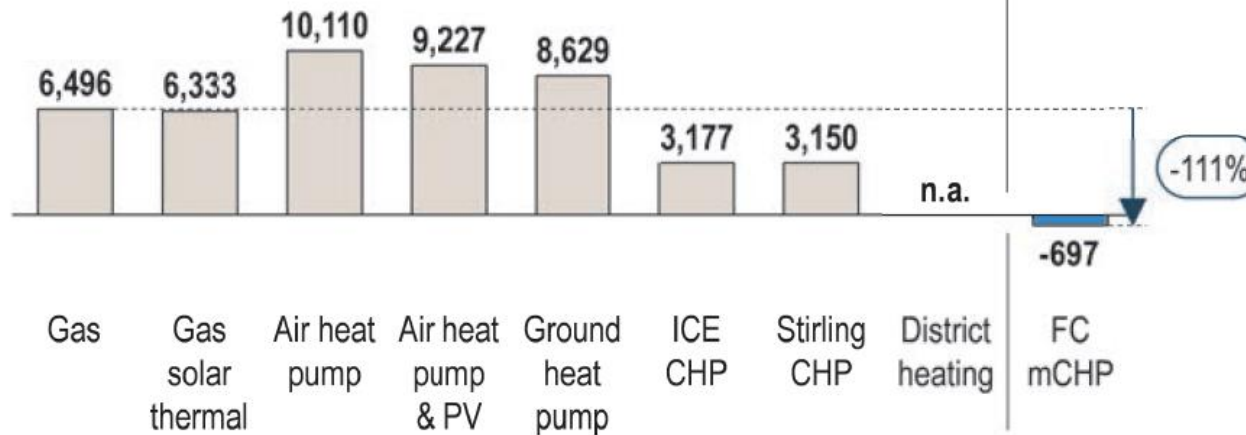
MUNICH

Residents	4
Heated space	103 m ²
Year of construction	1962
Heat demand	21,438 kWh
Electricity demand	5,200 kWh
Central heating	

Annual CO₂ emissions [kg]

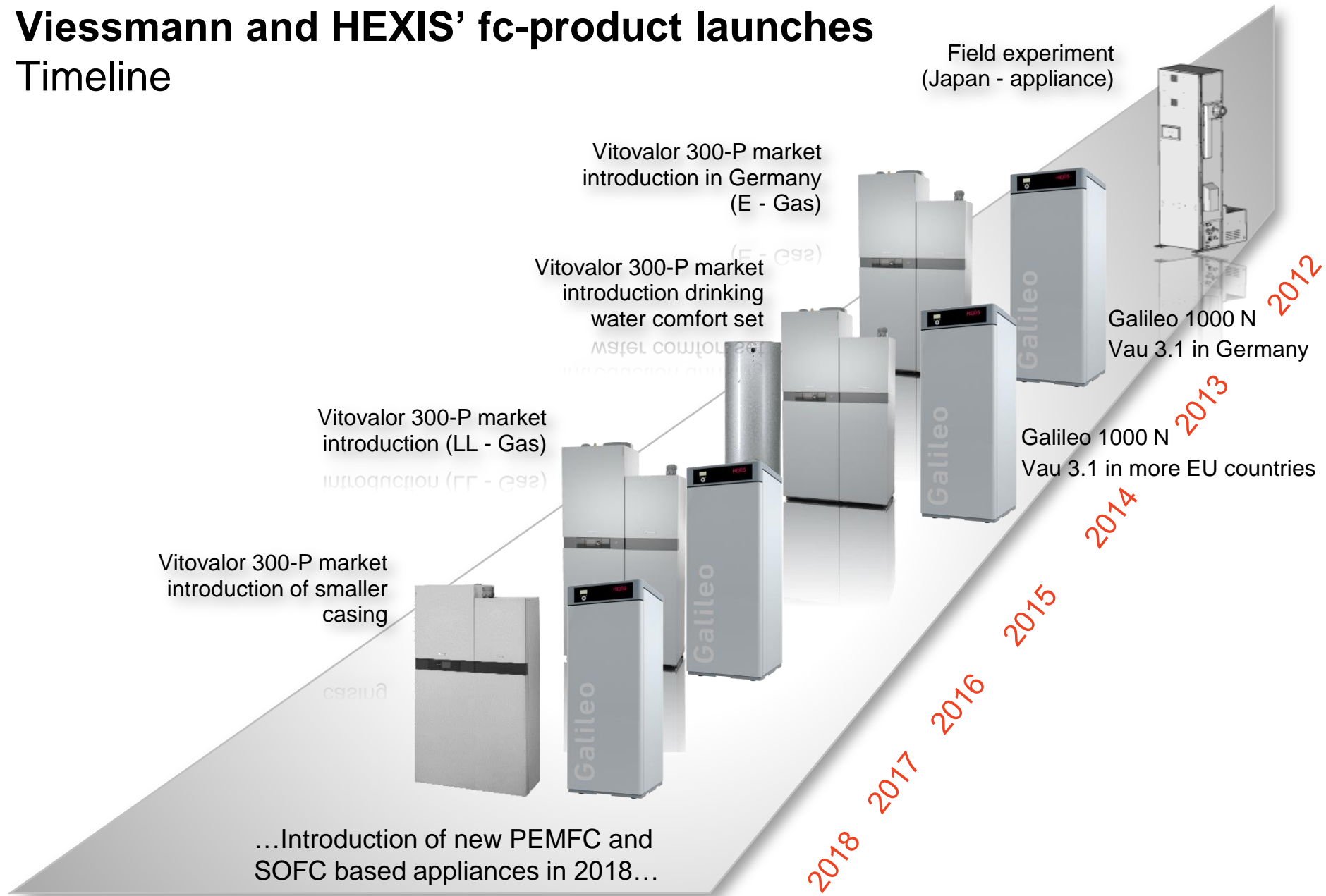


Annual NO_x emissions [g]



Source: Fuel cells in distributed generation, Roland Berger, 2015

Viessmann and HEXIS' fc-product launches Timeline



Former experiences and actual demonstration projects



Callux: Field-test in Germany

- ~200 BZH by HEXIS (Galileo 1000 N)



PHAROS: Field-test in Switzerland

- 5 BZH by HEXIS (Galileo 1000 N)



ene.field: Field-test in some EU countries

- ~ 80 BZH by HEXIS (Galileo 1000 N)
- ~ 114 BZH by Viessmann (Vitovalor 300-P)



Pathway to a competitive European Fuel Cell micro-CHP Market

new!!!

PACE: Large scale demonstration in EU

- Planned about 600 Vitovalor 300-P
- Planned about 150 Vitovalor 300-S



This project has received funding from the Fuel Cells and Hydrogen 2 Joint Undertaking under grant agreement No 700339. This Joint Undertaking receives support from the European Union's Horizon 2020 research and innovation programme and Hydrogen Europe and N.ERGHY



Pathway for a competitive European Fuel Cell micro-CHP Market (PACE)



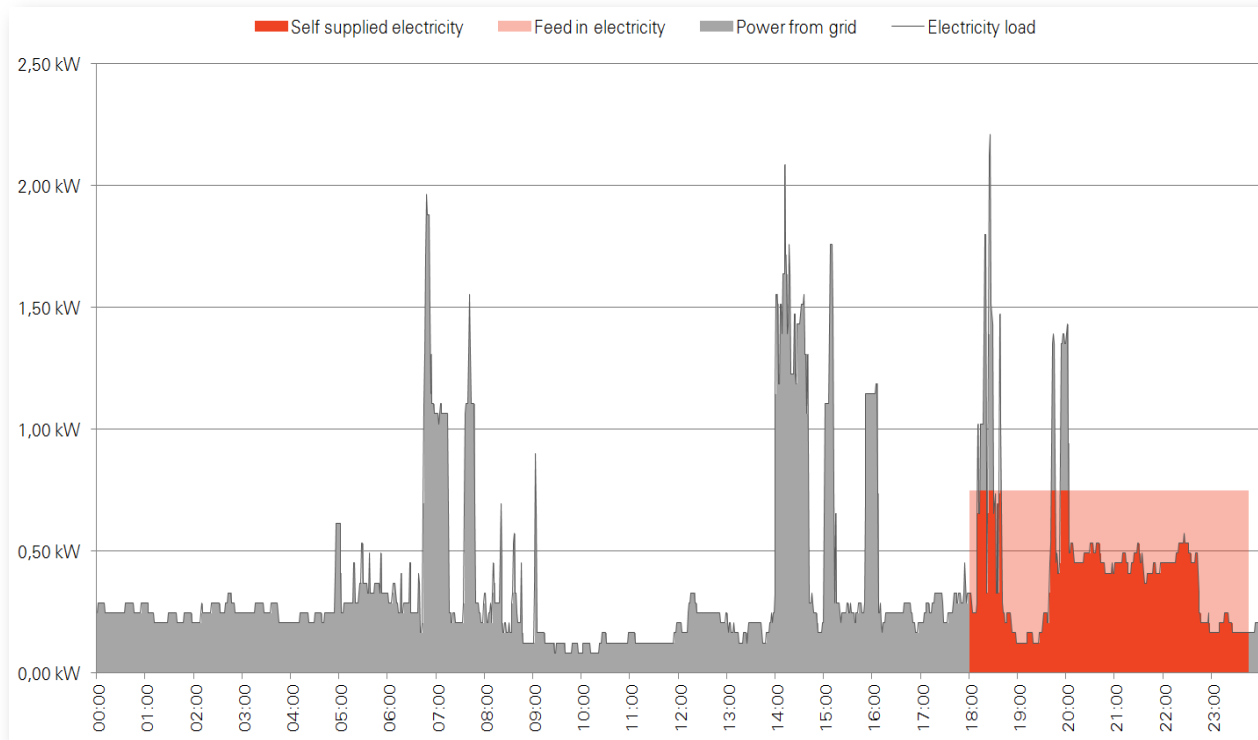
PACE is a project funded by the European Commission under Horizon 2020, the main focus is on the market launch of fuel cell heaters in the European heating market. It is supported by a consortium of manufacturers of stationary fuel cells, various institutions and coordinators, where the Viessmann Group is also part of.

- Consortium of 4 manufacturers + Element Energy + Cogen Europe + Danmarks Tekniske Universitet
- Establishment of Viessmann as a leading manufacturer of innovative fuel cell technology on the European heating market
- Supported installation and operation of a total amount of 2'650 fuel cell heaters, about 750 fuel cell heaters are planned by Viessmann
- Establishment of the fuel cell technology as a standard solution for installers and end users
- Increasing the production capacity, establishing new production technologies and improving automation processes
- Reduction of the manufacturing costs by means of scale effects, extending stack lifetime and increasing the electrical efficiency of the various fuel cell technologies
- Test operation of a VPP (Virtual Power Plant), whereby a large number of BZHs should be able to successfully display their smart grid capability via the Internet



Former experiences and actual demonstration projects

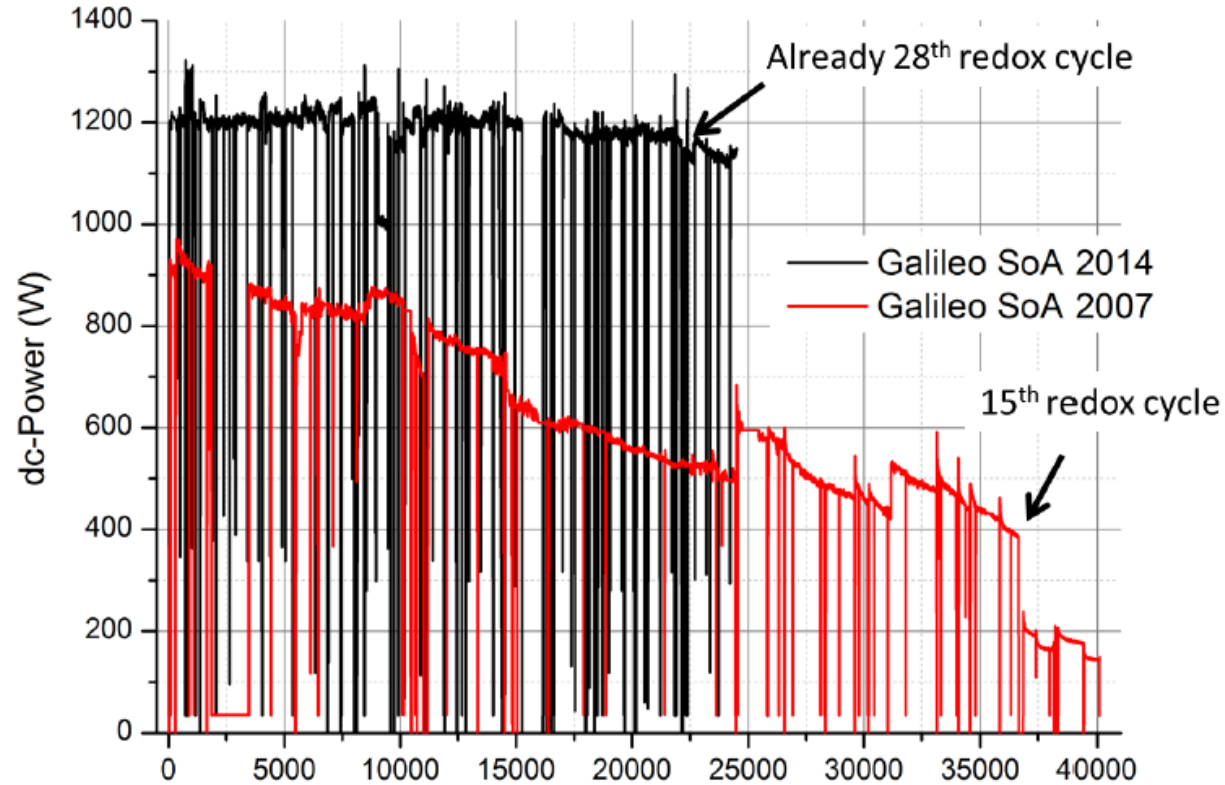
Vitovalor 300-P (PEMFC)



- Electrical degradation in 10 years results in a maximum of only 15%, which is about 113 W
- Starting point of fuel cell is based on statistical optimum of historical data and actual load of buffer tank

Former experiences and actual demonstration projects

Galileo 1000 N (SOFC)



Comparison between 2007 and 2014 technology:

- Significantly increased initial power (DC)
- Improved amount of redox cycles
- Quasi linear degradation
- Extrapolation of the shown data leads to lifetimes that exceed 40'000 h (about 7 – 8 years of system operation)

Funding in Germany

The KFW 433 programme

- State-subsidized are the installations of stationary fuel-cell based mCHP applications between 0.25 and 5.0 kWel
- In residential and non residential buildings
- A funding basis of **5'700 € per installation** is granted and **further 450 € per 0.1 kWel** are added
- ...Vitovalor 300-P: **9'300 €!**
- ...Galileo 1000 N: **10'200 €!**
- A maximum grant is set by 40% of the eligible costs

Doppelte Zuschüsse für Brennstoffzellen-Heizgeräte
Staat fördert innovative Technologie

Basis-Zuschuss:
Festbetrag 5.700 Euro

Beispielrechnung
Brennstoffzellen-Heizgerät mit 1 kWel (1000 Watt)

5.700 Euro
4.500 Euro
10.200 Euro

Extra-Zuschuss:
450 Euro je 100 Watt elektrische Leistung (el)

BASIS Zuschuss

EXTRA Zuschuss

INITIATIVE BRENNSTOFFZELLE

→ Germany might soon become the lead market in EU, because economics of stationary fuel cells in residential applications are interesting for customers here! Most other EU countries still lack sufficient investment grants and feed-in tariffs!!!

Double headed fuel cell strategy

PEMFC and SOFC applications

PEMFC by Panasonic

- Fast start-up time and many starts
- Approved for many years in Japan
- Low maintenance costs
- Very low power degradation
- Low sound power level
- Heat driven and power optimized

SOFC by HEXIS

- High temperature level for radiators
- High electrical efficiency
- Low system complexity
- Wide power modulation
- No stopps necessary
- E-mobility ready

Energy demand per year

-

+

New-build SFH



Existing SFH



MFH and small commercial



Double headed fuel cell strategy

...technical specifications

μCHP - module

...by Panasonic

Electrical power **0,75 kW**

Thermal power **1,00 kW**

Electrical efficiency **37 %**

Total efficiency **90 %**

...by HEXIS

Electrical power **1.5 kW**

Thermal power **1.9 kW**

Electrical efficiency **40 %**

Total efficiency **90 %**

Summary

Stationary fuel cells as residential mCHP applications...

- ...can enable tremendous savings of carbon dioxide and NOx emissions
 - ...are technically ready for the market uptake in many EU countries
 - ...have proven robustness in former programs like «Callux» and «ene.field»
 - ...are further financially supported by the EU under the «PACE» programme
 - ...have the potential to replace today's gas-condensing technology in most EU countries
-
- **...are one of the most sophisticated heating technologies in the Viessmann Group with substantial potential for our future!**

Thank you for your attention!!!

Further questions and remarks?



VIESSMANN

climate of innovation

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Ein Unternehmen der **VIESSMANN** Group

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