Brussels, 2016-11-23

VAILLANT GROUP

Fuel Cells And Hydrogen Joint Undertaking

Micro CHP Fuel Cells on the way to market

Stakeholder Forum 23 November 2016

Charlemagne building, Brussels

Session 3: How did the FCH JU's contribution impact the sector?

Alexander Dauensteiner

Vaillant Group

Vaillant | Saunier Duval | awb | Bulex | DemirDöküm | Glow-worm | Hermann Saunier Duval | protherm

VAILLANT GROUP

Vaillant Group at a glance …

Heating

Hot water

Cooling

Service

More than …

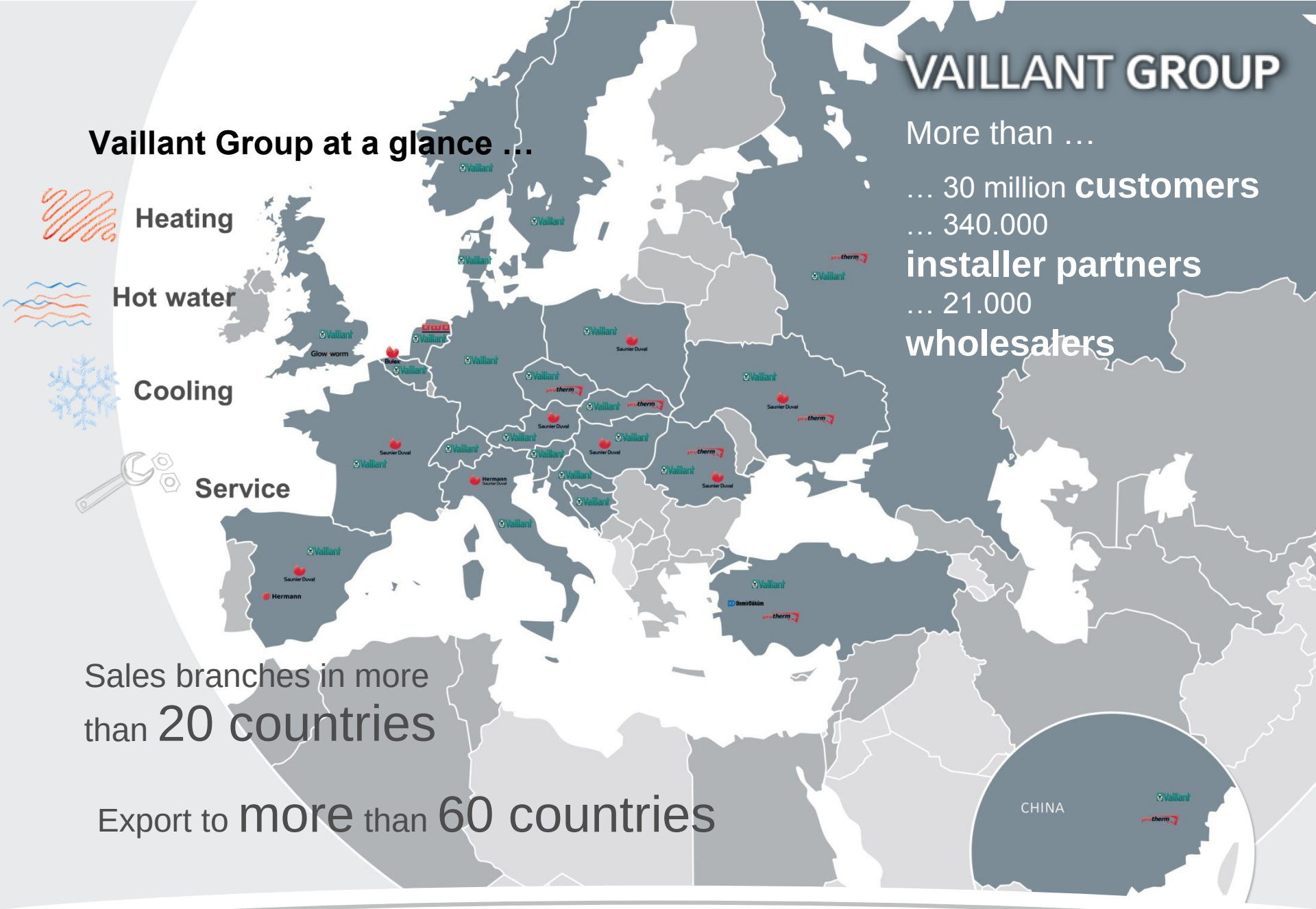
… 30 million **customers**

… 340.000

installer partners

… 21.000

wholesalers



Sales branches in more than 20 countries

Export to more than 60 countries

The 2030 Energy Strategy

Our Targets for 2030

2030

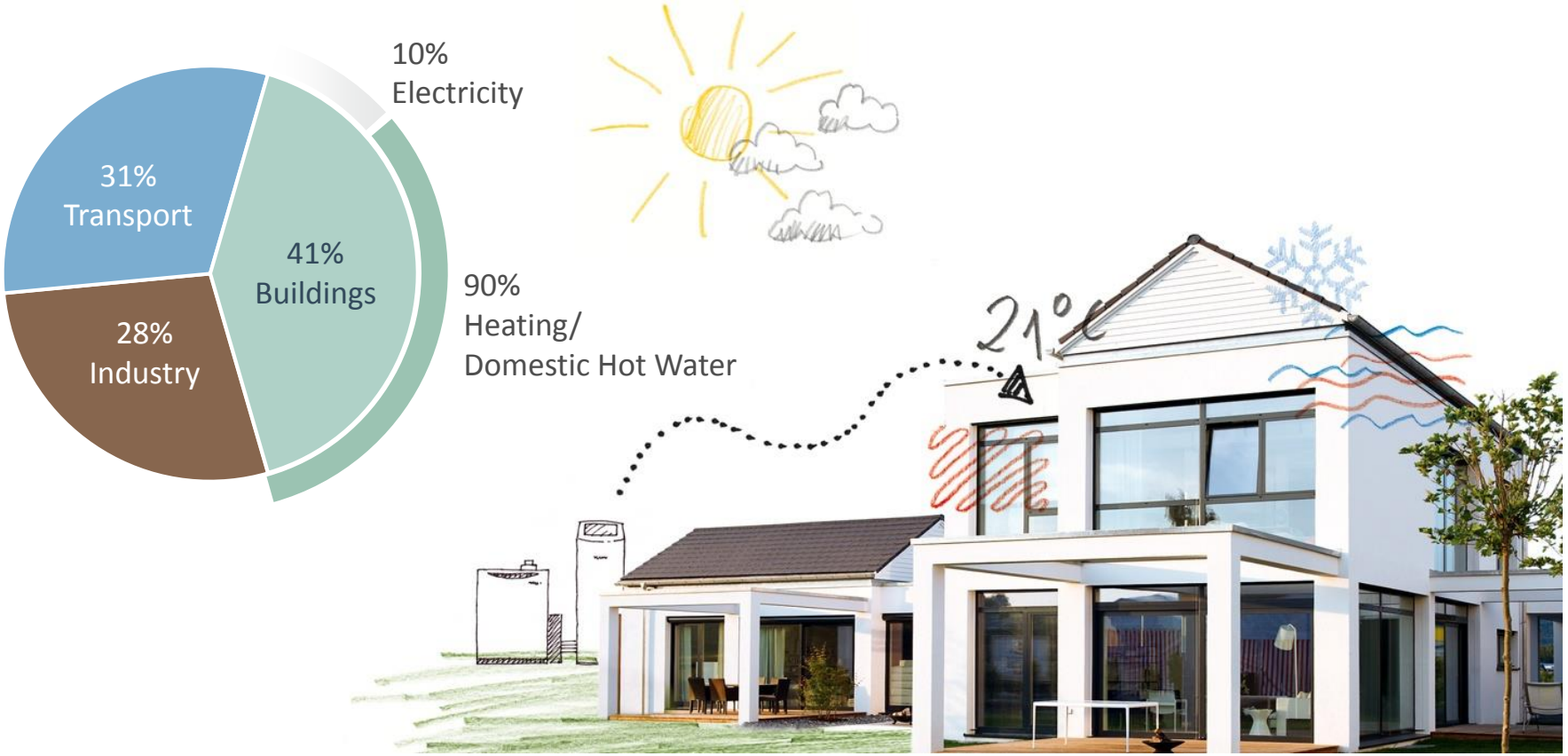
- a **40%** cut in greenhouse gas emissions compared to 1990 levels
- at least a **27%** share of renewable energy consumption
- at least **27%** energy savings compared with the business-as-usual scenario

Source: European Commission

Substantial reduction of GHG and increased energy savings necessary.

The potential in buildings

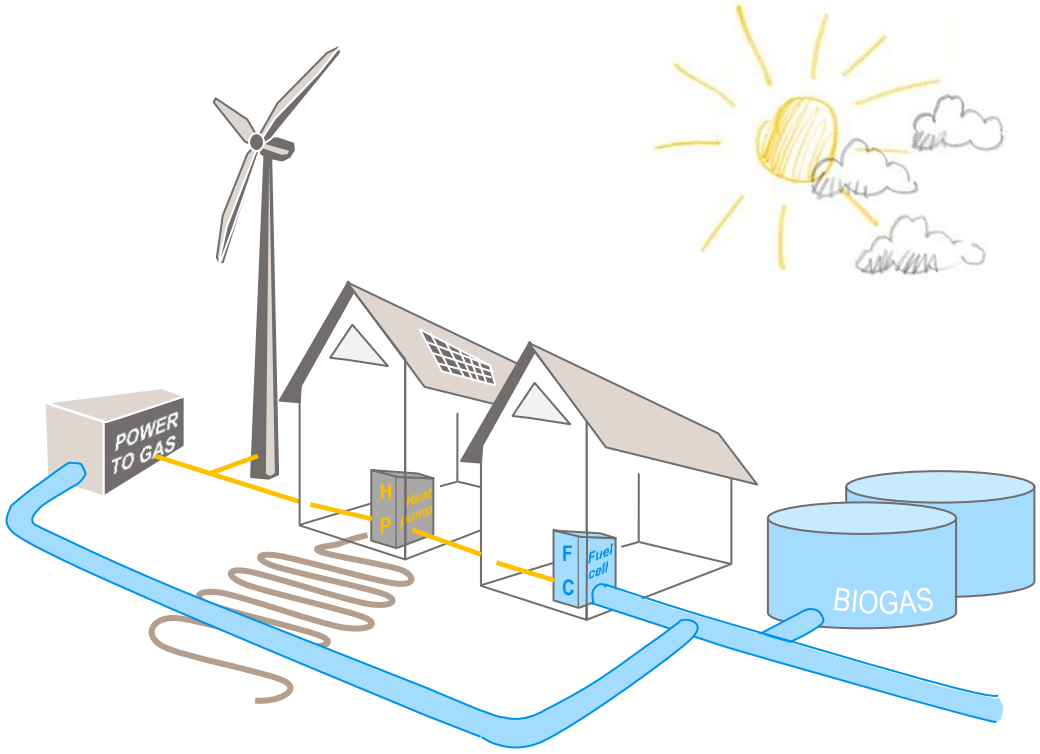
Primary Energy Consumption (Example: Germany)



The highest potentials for primary energy reduction are in buildings.

Stationary Fuel Cells and Renewable Energies: a contradiction?

European vision for stationary fuel cells



Fuel cell vision

> Highly efficient conversion of natural gas (and eventually green gas or pure hydrogen)

> In distributed generation, i.e. at the site of consumption

> Lowering the carbon footprint of energy supply

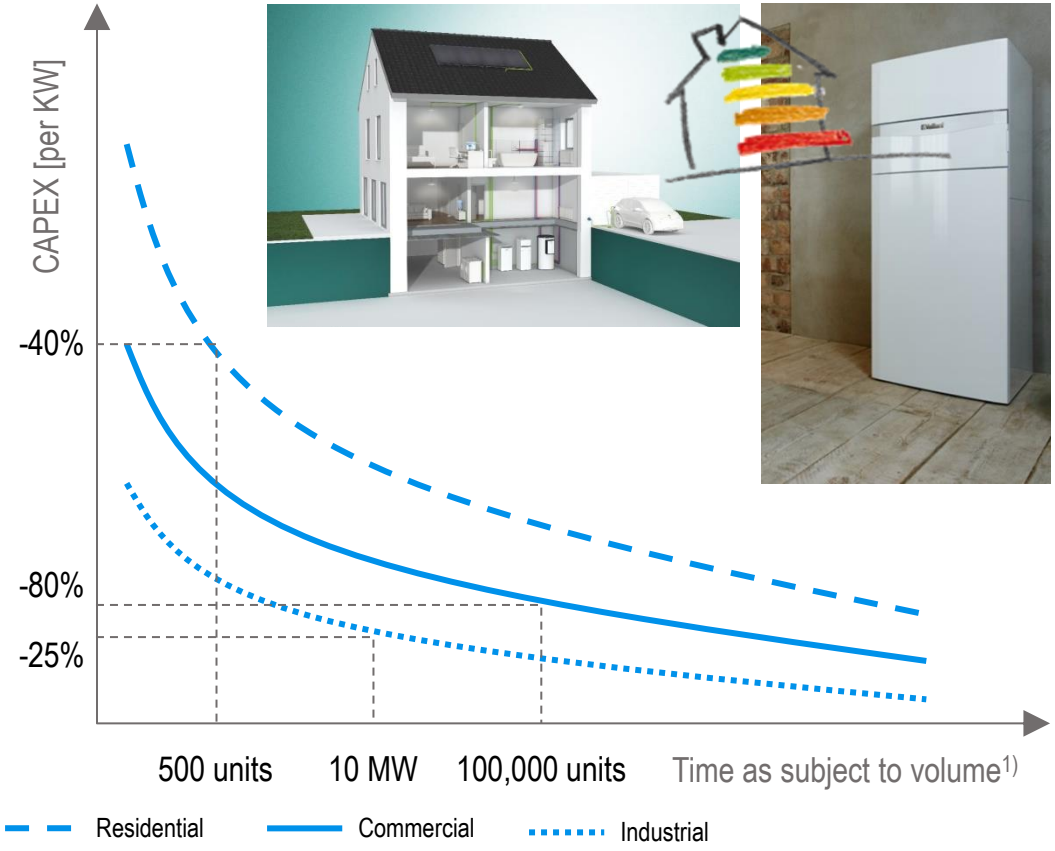
> Playing a complementary role to renewables[1)]

1) E.g. Stationary fuel cells as operating reserve with good performance at partial loads, complementary cycles of heat-driven CHP with electric heating demand
Source: FCH JU Coalition, Roland Berger

Fuel Cells will play a complementary role to renewables.

System costs can be significantly reduced with growing production volume

Expected cost reduction and potential levers with volume uptake and learning effects



1) Cumulative production volume per company

Source: FCH JU Coalition, Roland Berger

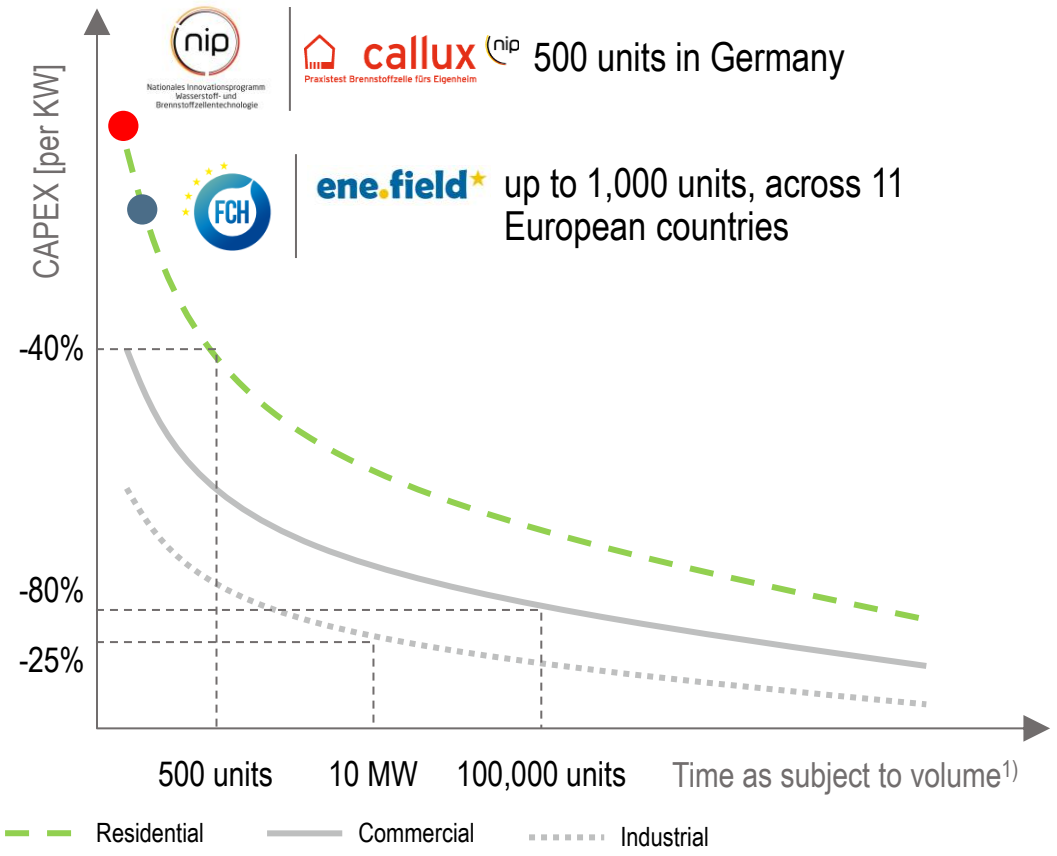
Main levers to reduce CAPEX

- Production volume must go up quickly to enter industrialisation stage
- Many production steps are still manually performed – Learning effects from Japan cannot be adopted
- Larger volumes allow for automation and bundled sourcing strategies
- Standardisation must increase within and across technology lines
- Industry is fully committed to decreasing cost with sufficient installation volumes

Main challenge is the commercialisation.

In order to achieve this targets it needs a plan

Micro CHP Fuel Cell demonstration and industrialisation pathway



1) Cumulative production volume per company

Source: FCH JU Coalition, Roland Berger, Initiative Brennstoffzelle, NIP Germany, BMWi, KfW

From Field Trial to Market

> Field trials, demonstration programmes and the KfW 433 subsidy scheme smooth the way towards commercialisation

> Strong coalition of Industry, Science and Policy

> Common targets and commitments: improvements of TRLs and product reliabilities, preparation of markets, support of supply chain, etc.

> Other markets must follow!

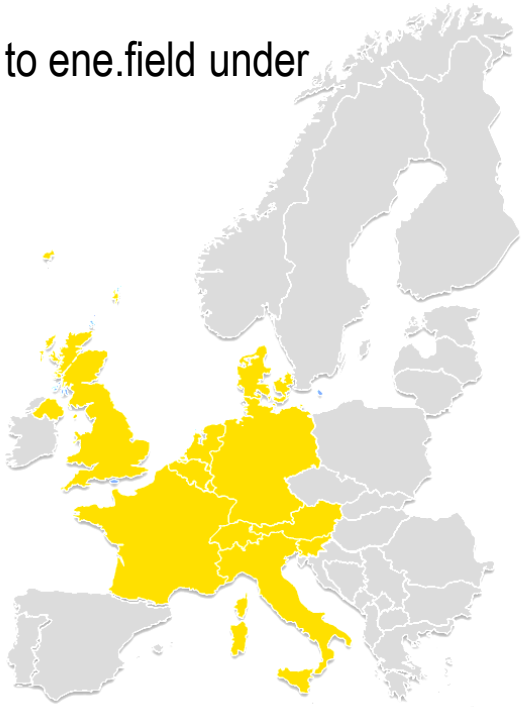
Common approach of industry and policy over the past years.

FCH-JU Project ene.field

Largest European Demonstration of Fuel Cell MICRO-CHP to date

ene.field

FCH JU is committing €26 million to ene.field under the EU's FP7



On track for over 800 systems to be installed in 11 European countries across the field trials

Ene.field at a glance

- aims to deploy up to 1,000 Fuel Cell heating systems in 11 key European member states
- Project duration of 5 years. Systems will be demonstrated for 2 to 3 years
- Detailed performance data
- LCC & LCA assessments
- Market analysis & commercialisation strategy
- Policy recommendations

Source: ene.field, BDR, Hexis

ene.field is now entering its final phase and publication of key reports.

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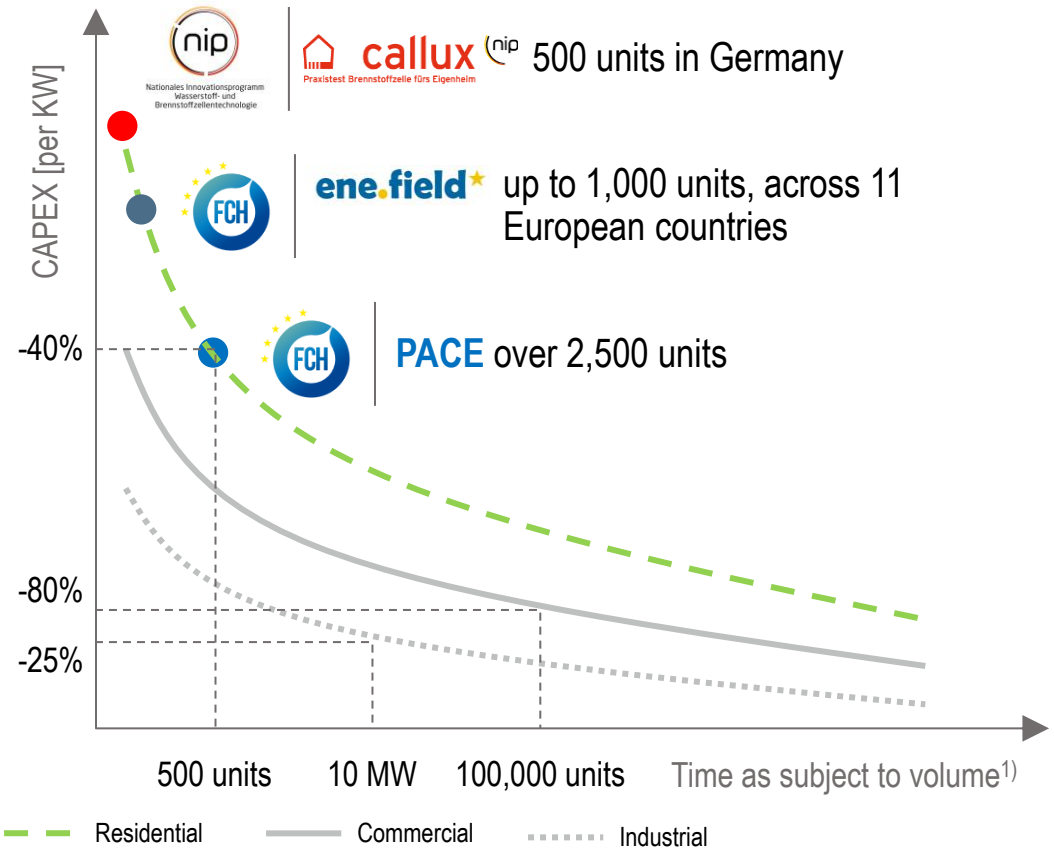

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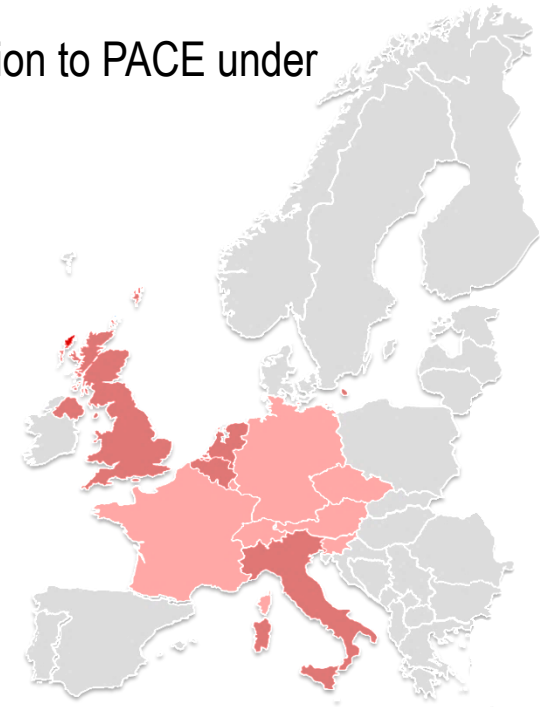
FCH-JU Project PACE

Pathway to a Competitive European FC mCHP Market

PACE

FCH JU is committing €33,9 million to PACE under the EU's H2020



PACE will enable to scale up production using new series techniques, and increased automation.

Source: PACE, FCH-JU, Bosch

PACE at a glance

> PACE aims to install more than 2,500 FC mCHP, enabling thousand consumers to actively contribute to Europe's energy transition

> promote a successful transition to volumes in the order of 10,000 units/year post 2020

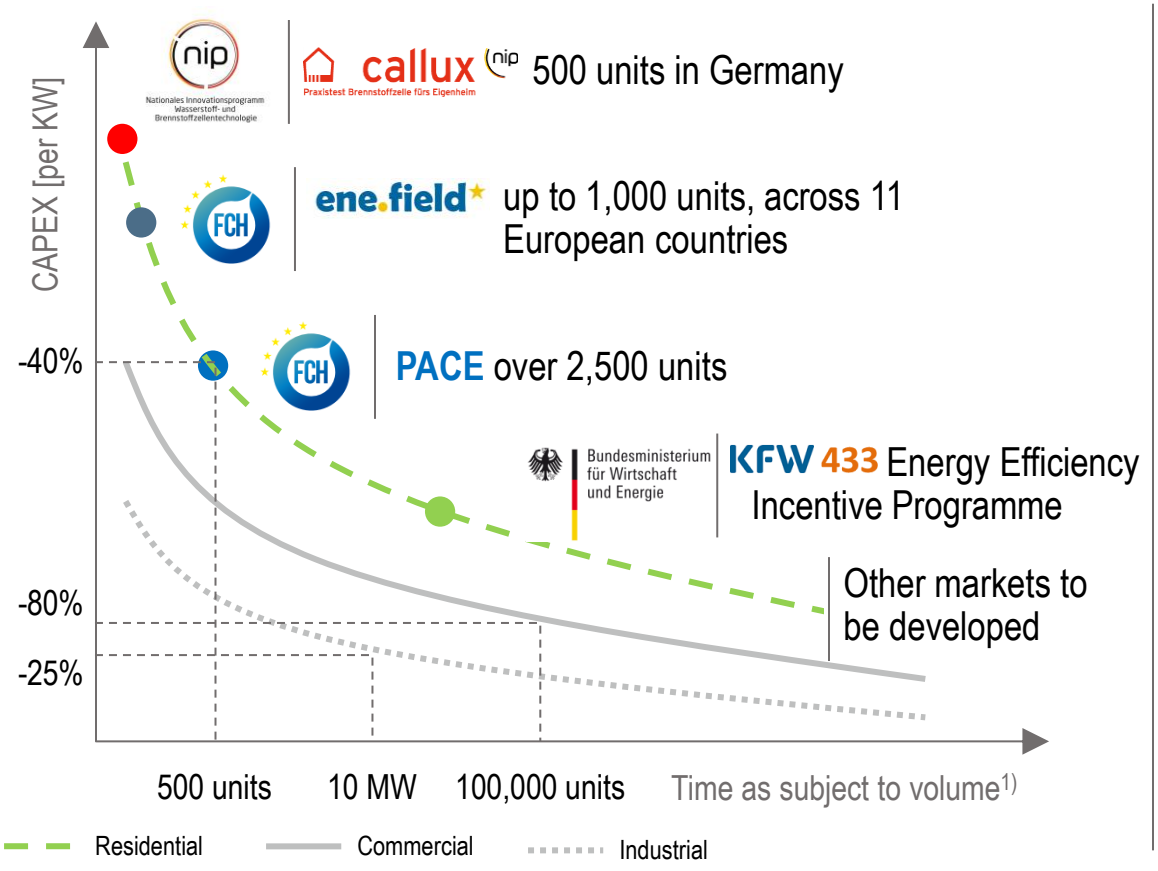
> demonstrate that FC mCHP products are smart grid ready

> brings innovative FC mCHP products through new business models

PACE is a major initiative to the next move to mass market commercialization.

In order to achieve this targets it needs a plan

Micro CHP Fuel Cell demonstration and industrialisation pathway



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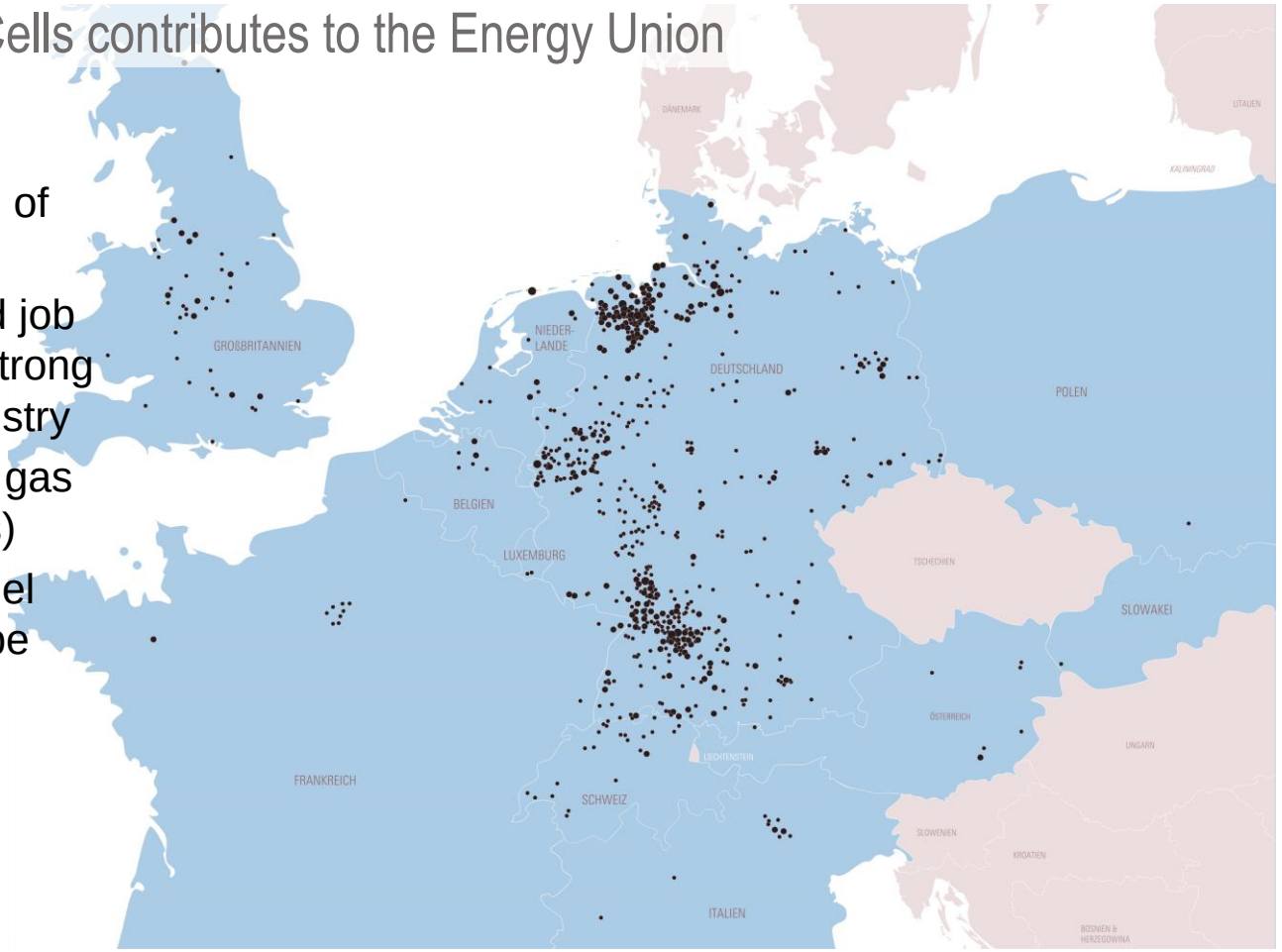
Fuel Cells contribution for Europe

How Micro CHP Fuel Cells contributes to the Energy Union

- Significant contribution of CO_2 reduction
- Green job creation and job protection of existing strong European heating industry
- decarbonisation of the gas grid (e.g. power-to-gas)
- About 2.000 mCHP Fuel Cells installed in Europe already



Source: IBZ, Germany

Already 2.000 units in Europe. Significant contribution to the Energy Union targets.

The industry and their products behind

The European industry is facing the industrialisation now

+ a lot more. Organised in

Hydrogen Europe

Source: Hydrogen Europe, Initiative Brennstoffzelle (IBZ)

Strong industry in Europe.

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Thank you for your attention!