Brussels, 2014-11-12

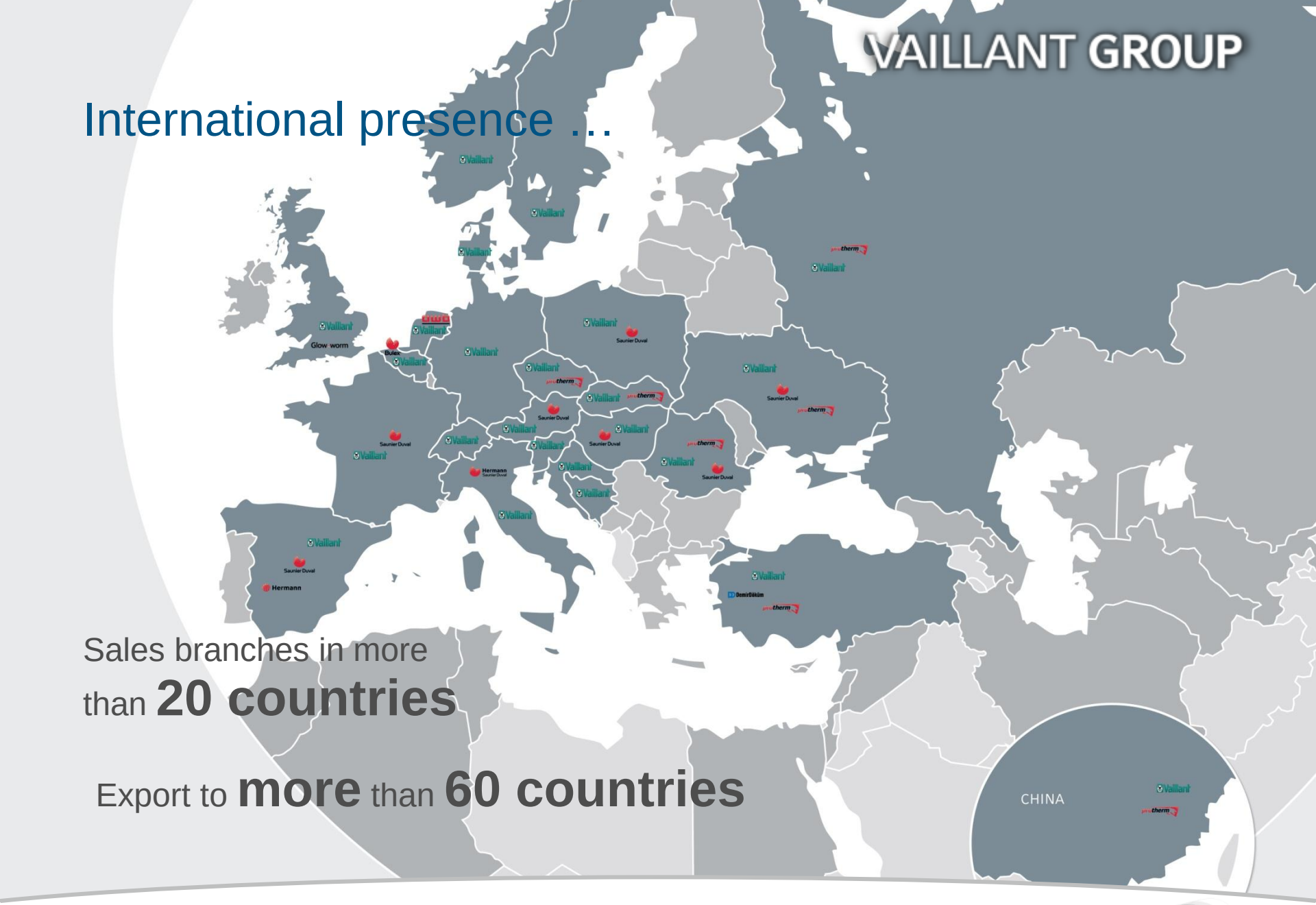
VAILLANT GROUP

# mCHP Fuel Cells in Europe

FCH-JU Annual Stakeholders Event

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

# International presence …




Sales branches in more than **20 countries**

Export to **more** than **60 countries**

# OUR CONTRIBUTION TO MEETING GLOBAL CHALLENGES


The biggest energy consumers are with **41% buildings**

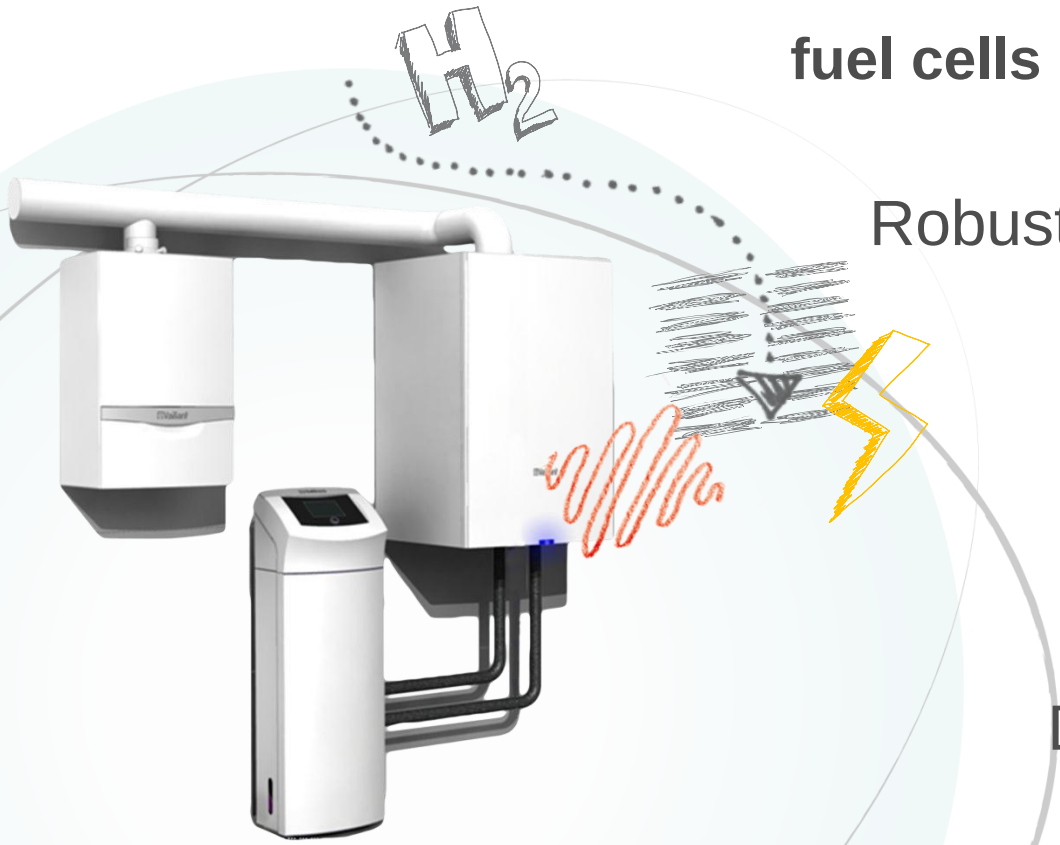
Of that amount, no less than **90%** is used **for heating** and hot water

The heating technology industry significantly contributes to **achieving the climate protection targets**

**Efficient technologies offers substantial benefits for future energy system**

VAILLANT GROUP

# FUEL CELL FOR RESIDENTIAL APPLICATION – VAILLANT GROUP IS IN THE LEAD




Development of
**fuel cells heating appliances**
for residential application

Robust and efficient system concept with
SOFC technology

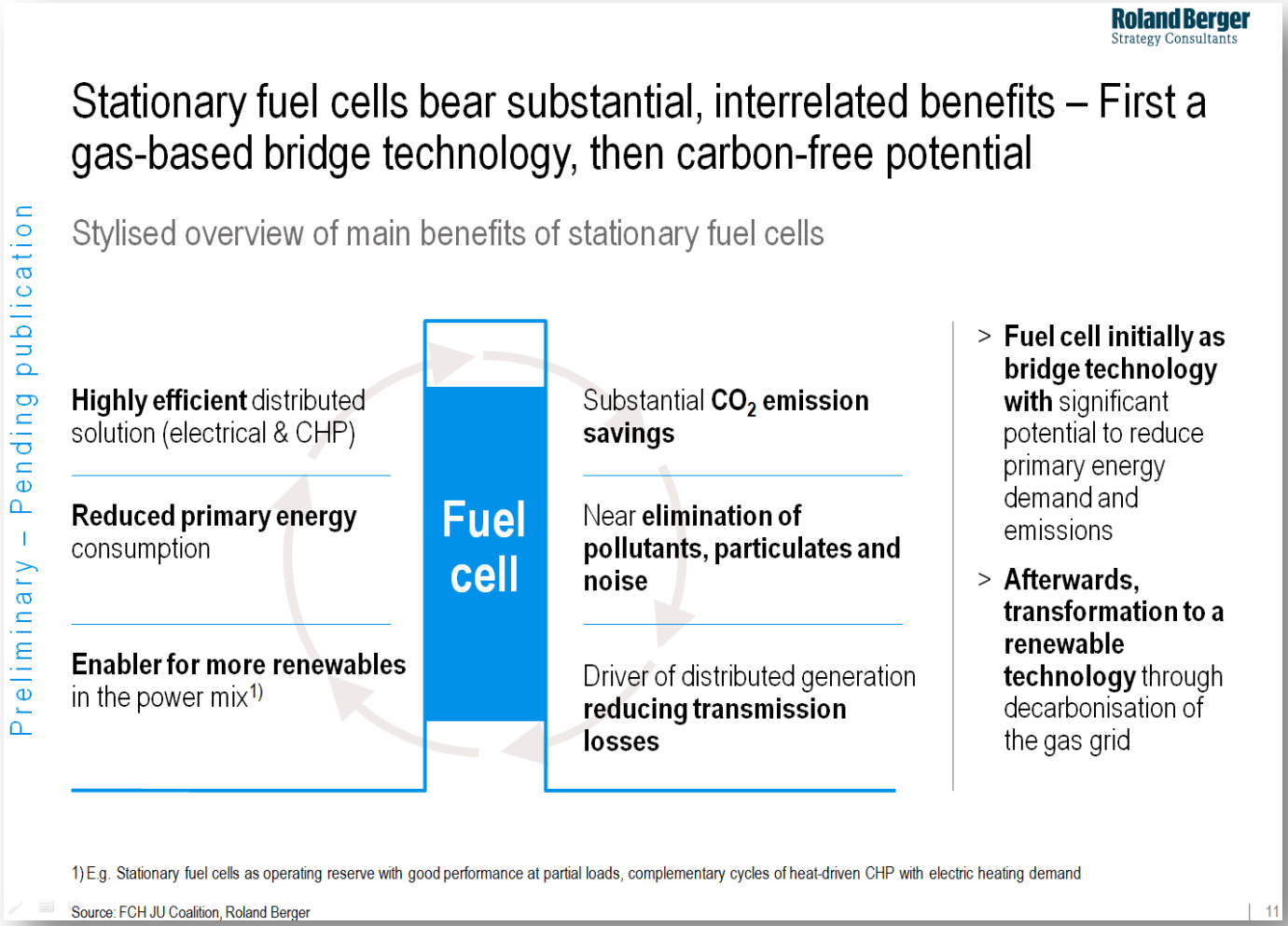
callux Praxistest Brennstoffzelle fürs Eigenheim (nip) ene.field

Successful field test
with more than 250 appliances
in CALLUX and ene.field

Development pioneer
of our industry

**Fuel cell technology is the future of mCHP. More than 15 years Vaillant experience**

# WHY FUEL CELLS IN DOMESTIC APPLICATIONS?




Source: FCH-JU Coalition, Roland Berger

**Stationary Fuel Cells offers substantial benefits for future energy system**

# PRACTICAL FIELD TRIAL CALLUX (DE) AND ENE.FIELD

## Callux: Germany's biggest practical test for fuel cell heating systems for domestic use

callux (nip)
Praxistest Brennstoffzelle fürs Eigenheim

- About 500 fuel cell heating appliances until 08/2014 installed
- Significant costs reduction
- Over 3 million operation hours operation
- system reliability confirmed


## ene.field: first EU deployment of units in EU member states

New Energy World IG
fuel cells & hydrogen for sustainability

ene.field

- Demonstration of up to 1,000 units in Europe with 26 partners from industry and research in 12 key EU Member States
- Commitment: ene.field has to and will show potential of market segment

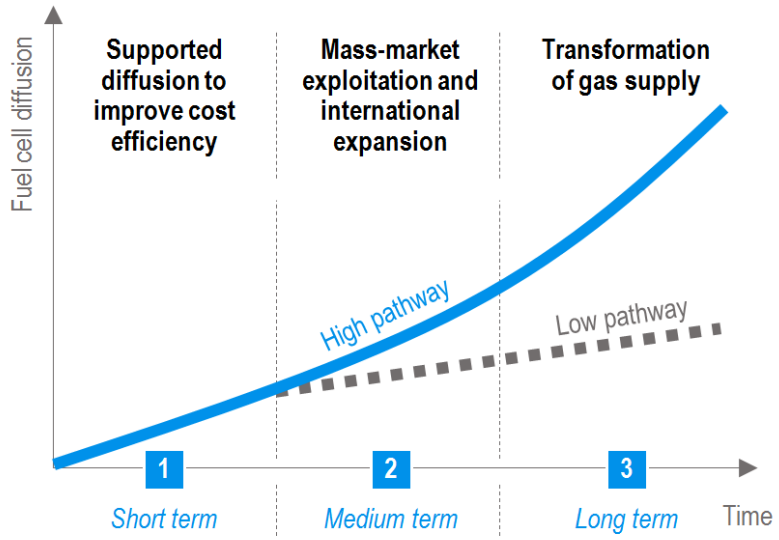

**Demonstration projects have shown reliable performances and significant cost reduction**

# 3 PHASES TOWARDS MASS-MARKET-TECHNOLOGY?

Roland Berger
Strategy Consultants

## The commercialisation of fuel cells will go through three main phases – Long-term potential as mass-market technology

Potential development stages and pathways of the fuel cell technology




**1 Fuel cell systems reach competitive cost level to high-end heating solutions**
- > Policy support to trigger market pick-up and thus cost reduction
- > Starting point in the residential segment

**2 Fuel cell systems reach competitive cost level to mass-market solutions**
- > Continuous support if cost targets are reached
- > Commercial segment to be supported

**3 Fuel cell systems become a renewable technology through decarbonisation of gas supply**
- > Further growth and mass-market solution possible if gas supply becomes greener and more domestic

Preliminary – Pending publication

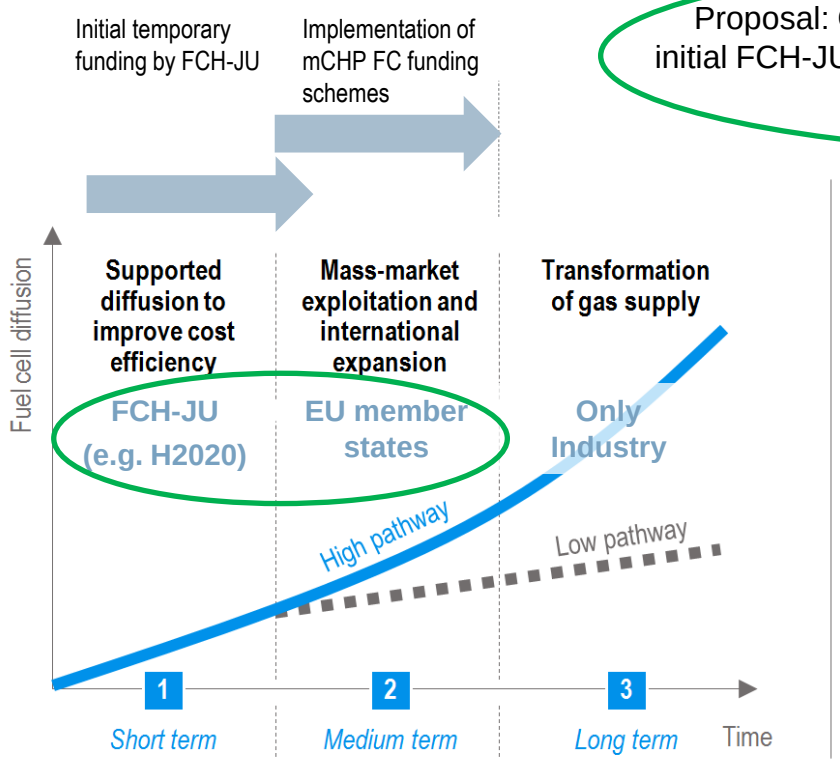
Source: FCH JU Coalition, Roland Berger

55

Source: FCH-JU Coalition, Roland Berger

**Stationary fuel cells have mass market potential - if cost level by volumes can be achieved. Starting point for policy support in the residential segment**

# PHASE 1 AND PHASE 2: COOPERATION OF FCH-JU AND MEMBER STATES




Source: FCH JU Coalition, Roland Berger

Proposal: Cooperation of FCH-JU and members states to follow initial FCH-JU funding by development and implementation of funding schemes as e.g. in Germany

**1**

- Large scale demonstration mCHP Fuel Cells
- achieve significant cost reductions
- laying the foundation for deployment on a mass market scale

**2**

- implementation of general mCHP support
- Technology Introduction programmes (TIP) in member states in addition to lead market Germany

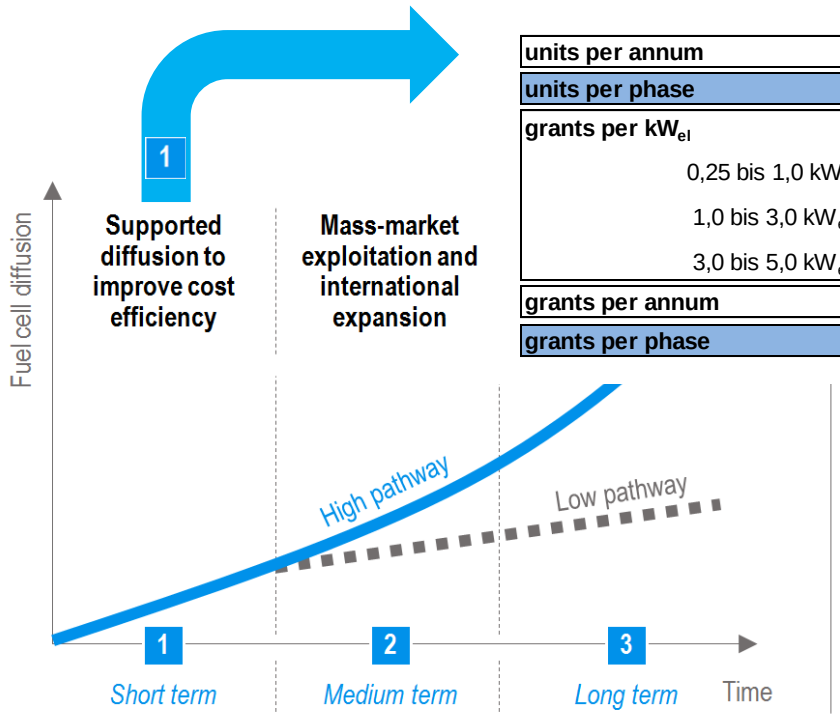
**3**

- Transformation of green gas becomes highly visible
- Power-to-gas is competitive
- Renewable heat market

Source: FCH-JU Coalition, Roland Berger, IBZ

**We need an agreement for follow-up the initial funding by adequate market schemes in EU member states**

# PHASE 1: REQUIRED INITIAL FUNDING




Source: FCH JU Coalition, Roland Berger

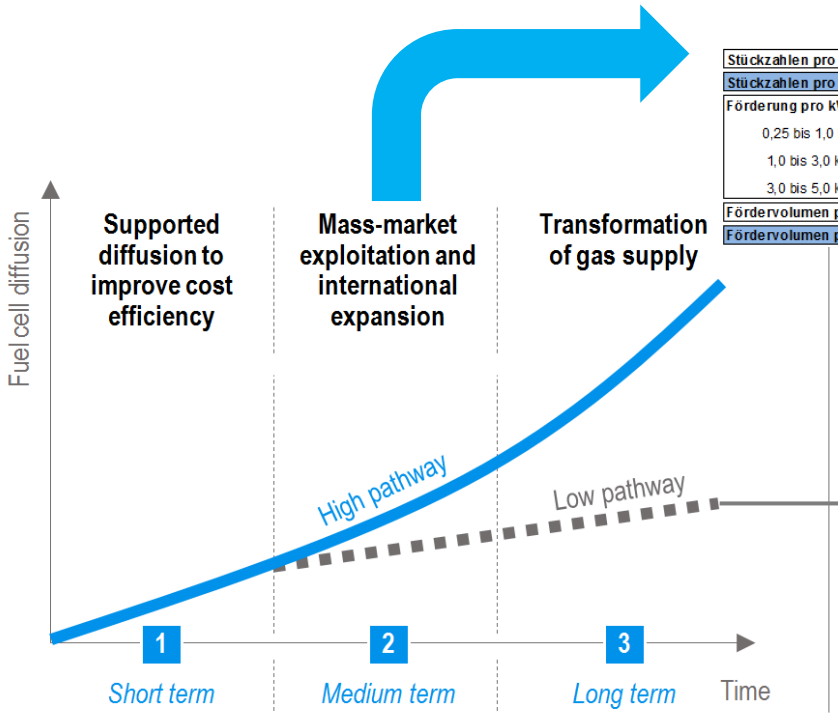
| | 1. Phase Commission | | |
|---|---|---|---|
| | 2016 | 2017 | 2018 |
| **units per annum** | 1.000 | 1.500 | 2.000 |
| **units per phase** | | **4.500** | |
| **grants per $kW_{el}$** | | | |
| 0,25 bis 1,0 $kW_{el}$ | 12.000 € | 10.000 € | 8.000 € |
| 1,0 bis 3,0 $kW_{el}$ | 6.000 € | 5.000 € | 4.000 € |
| 3,0 bis 5,0 $kW_{el}$ | 3.000 € | 2.500 € | 2.000 € |
| **grants per annum** | 11.600.000 € | 14.500.000 € | 15.466.667 € |
| **grants per phase** | | **41.566.667 €** | |

initial Funding for large scale demonstration needs a budget of about 40 m€

Source: FCH-JU Coalition, Roland Berger, IBZ

**Initial funding for large scale demonstration by FCH-JU**

# PHASE 1 AND PHASE 2: COOPERATION OF FCH-JU AND MEMBER STATES




Source: FCH JU Coalition, Roland Berger

Example: **T**echnology **I**ntroduction **P**rogramme (TIP) in Germany

| | Vorlaufphase | 1. Phase | | | 2. Phase | | 3. Phase | |
|---|---|---|---|---|---|---|---|---|
| | 3.+4. Quartal 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
| Stückzahlen pro Jahr | 300 | 1.500 | 3.500 | 9.000 | 15.000 | 26.000 | 45.000 | 75.000 |
| Stückzahlen pro Phase | 300 | 14.000 | | | 41.000 | | 120.000 | |
| Förderung pro $kW_{el}$ | | | | | | | | |
| 0,25 bis 1,0 $kW_{el}$ | 8.000 € | 7.700 € | 7.200 € | 6.700 € | 4.100 € | 3.500 € | 1.500 € | 1.500 € |
| 1,0 bis 3,0 $kW_{el}$ | 2.000 € | 1.800 € | 1.600 € | 1.400 € | 750 € | 500 € | 250 € | 250 € |
| 3,0 bis 5,0 $kW_{el}$ | 1.000 € | 800 € | 700 € | 600 € | 350 € | 300 € | 150 € | 150 € |
| Fördervolumen pro Jahr | 2.408.571 € | 11.657.143 € | 23.865.600 € | 57.052.403 € | 58.274.596 € | 84.969.225 € | 62.989.955 € | 105.096.768 € |
| Fördervolumen pro Phase | 2.408.571 € | 92.575.145 € | | | 143.243.821 € | | 168.086.723 € | |

- Milestones for programme assessment
- decreasing funds over the 10-years period
- end-customer incentives for different power classes
- Low pathway very likely if EU member states will not be active in cooperation with industry and FCH-JU

Source: FCH-JU Coalition, Roland Berger, IBZ

**Germany as the lead market are working on a Technology Implementation Programme**

# Thank you for your attention!