



FCH JU support to stationary fuel cells development and application

N. Lymperopoulos
Project Officer



www.fch.europa.eu

The 30th International Electric Vehicle Symposium & Exhibition
October 11, 2017
Stuttgart

- Relevant policy background
- What is the FCH JU and what are its objectives
- Overview of FCH JU support to Stationary FCs R&D and Demonstration projects
- Examples of projects

EU CLIMATE AND ENERGY FRAMEWORK

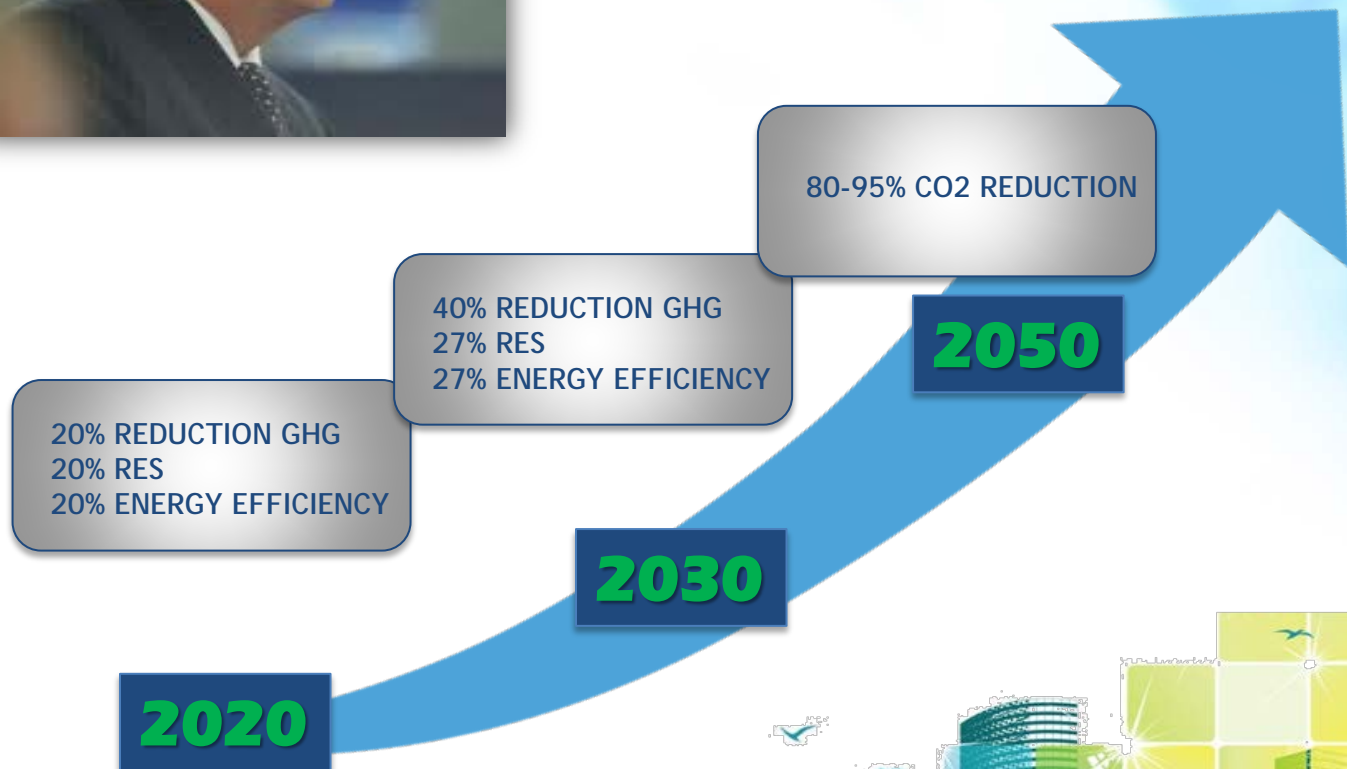
DECARBONISATION
OF EU ECONOMY

BOOST EU
COMPETITIVENESS

ENERGY SECURITY



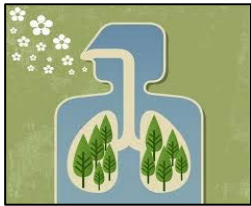
"I want to reform and reorganise Europe's energy policy in a new European Energy Union."



Why is the EU supporting fuel cells?



UP TO 60% η_E
80-90% η_{TOTAL}



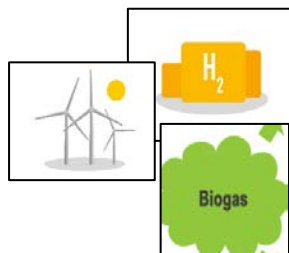
NO COMBUSTION



SECURE/RELIABLE SUPPLY



GRID BALANCING,
REINFORCING



EXISTING GAS
INFRASTRUCTURE
FUEL FLEXIBLE

CO₂/GHG reduction

Improved air quality

Complements RES

FCH 2 JU: Strong Public-Private Partnership with a focused objective

Industry-led Public-Private Partnership (PPP)

Fuel Cells & Hydrogen Joint Undertaking (FCH2 JU)



Industry Grouping
About 105 members
~ 50% SME



Research Grouping
About 65 members



The Joint Undertaking is managed by a Governing Board composed of representatives of all three partners and lead by Industry.



To implement an optimal research and innovation programme to bring FCH technologies to the point of market readiness by 2020

Legal basis:
Council Regulation: 559/2014 of 6 May 2014 (H2020)

FCH 2 JU Objectives



H₂ STORAGE FOR GRID BALANCING

Demonstrate on a large-scale hydrogen's capacity to harness power from renewables and support its integration into the energy system



HEAT & ELECTRICITY PRODUCTION

Increase fuel cell efficiency and lifetime



GREEN HYDROGEN PRODUCTION

Increase efficiency and reduce costs of hydrogen production, mainly from water electrolysis and renewables



MINIMAL USE OF CRITICAL RAW MATERIALS

Reduce platinum loading

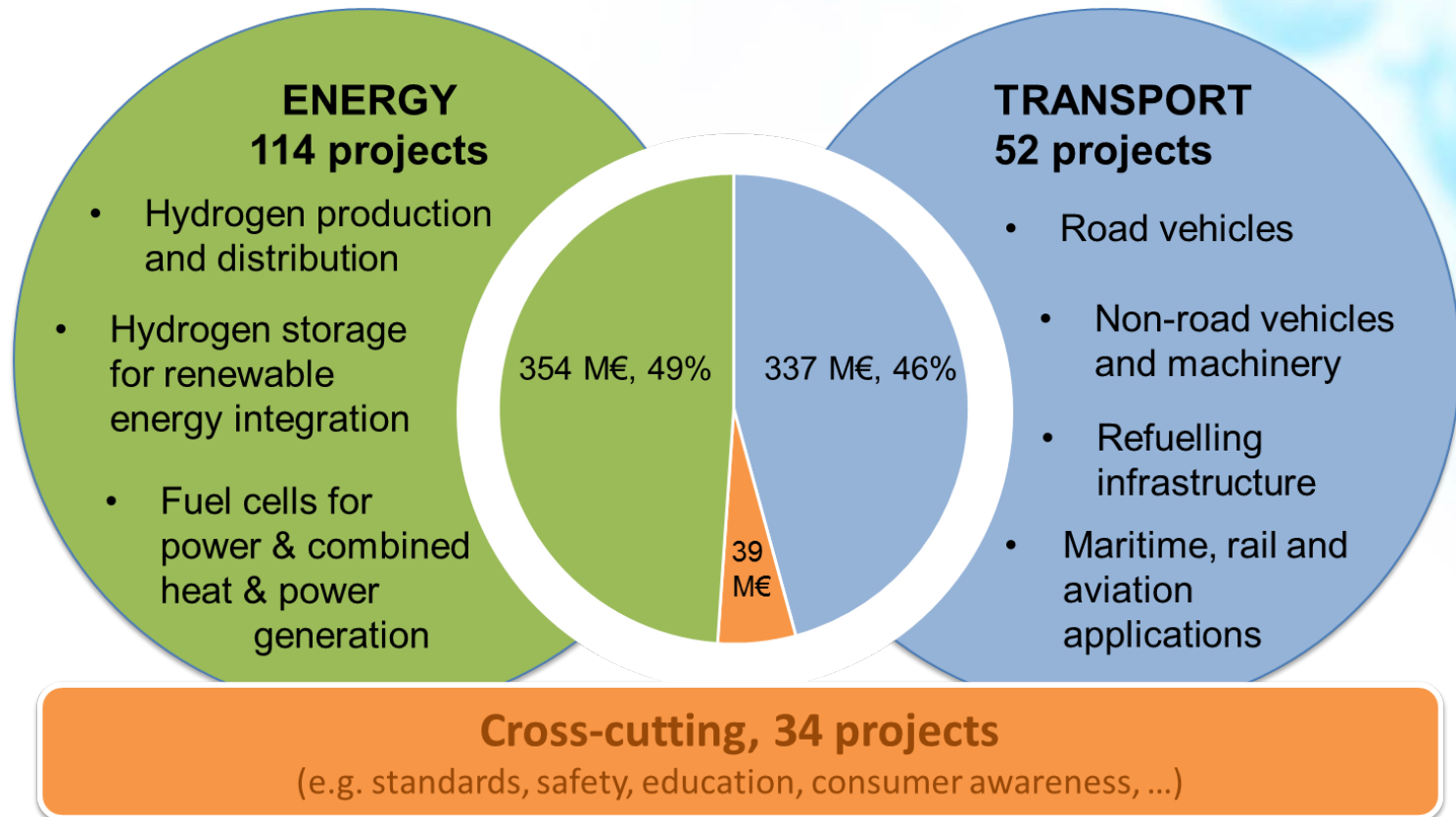


CLEAN TRANSPORT

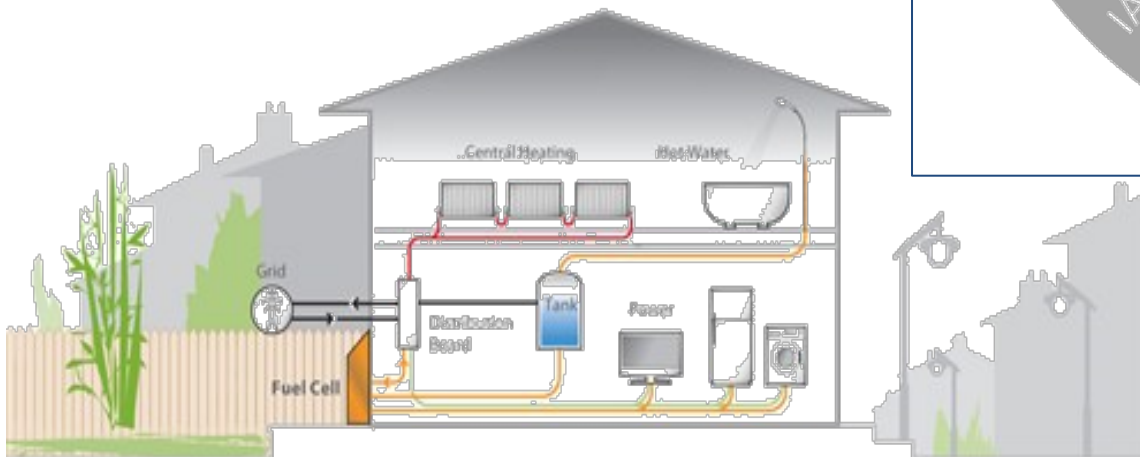
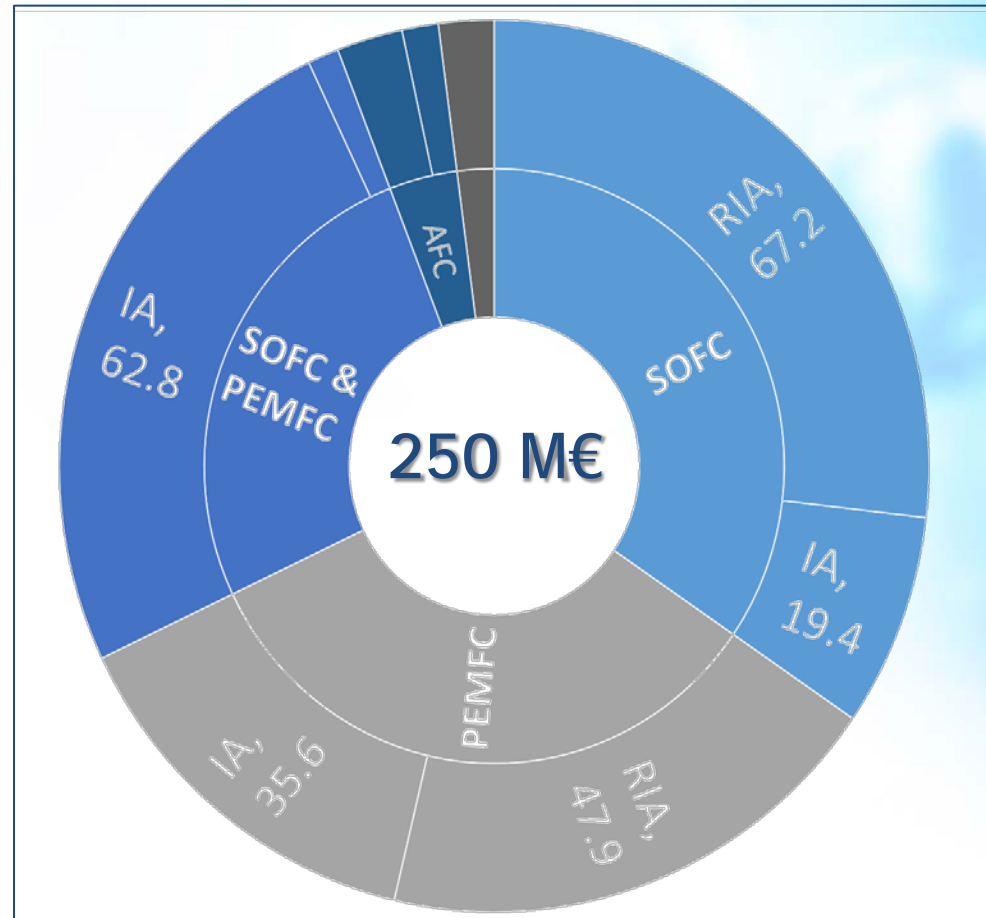
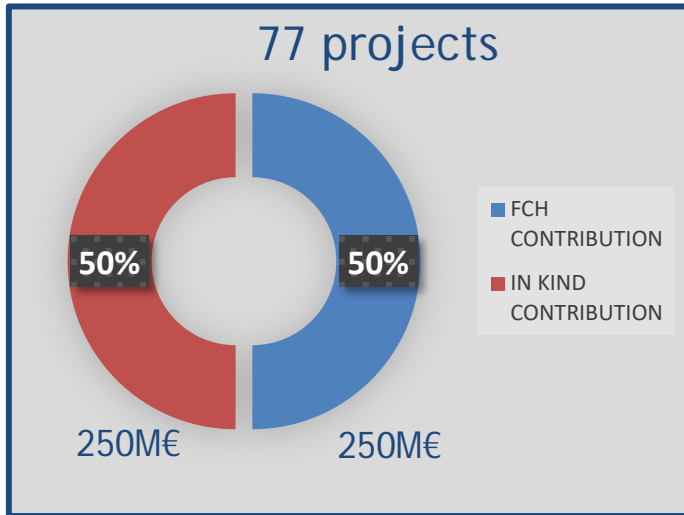
Reduce fuel cell system costs for transport applications

203 projects supported for 730 M€

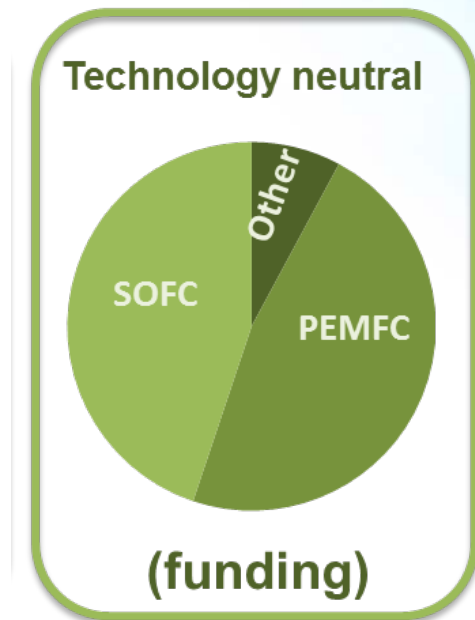
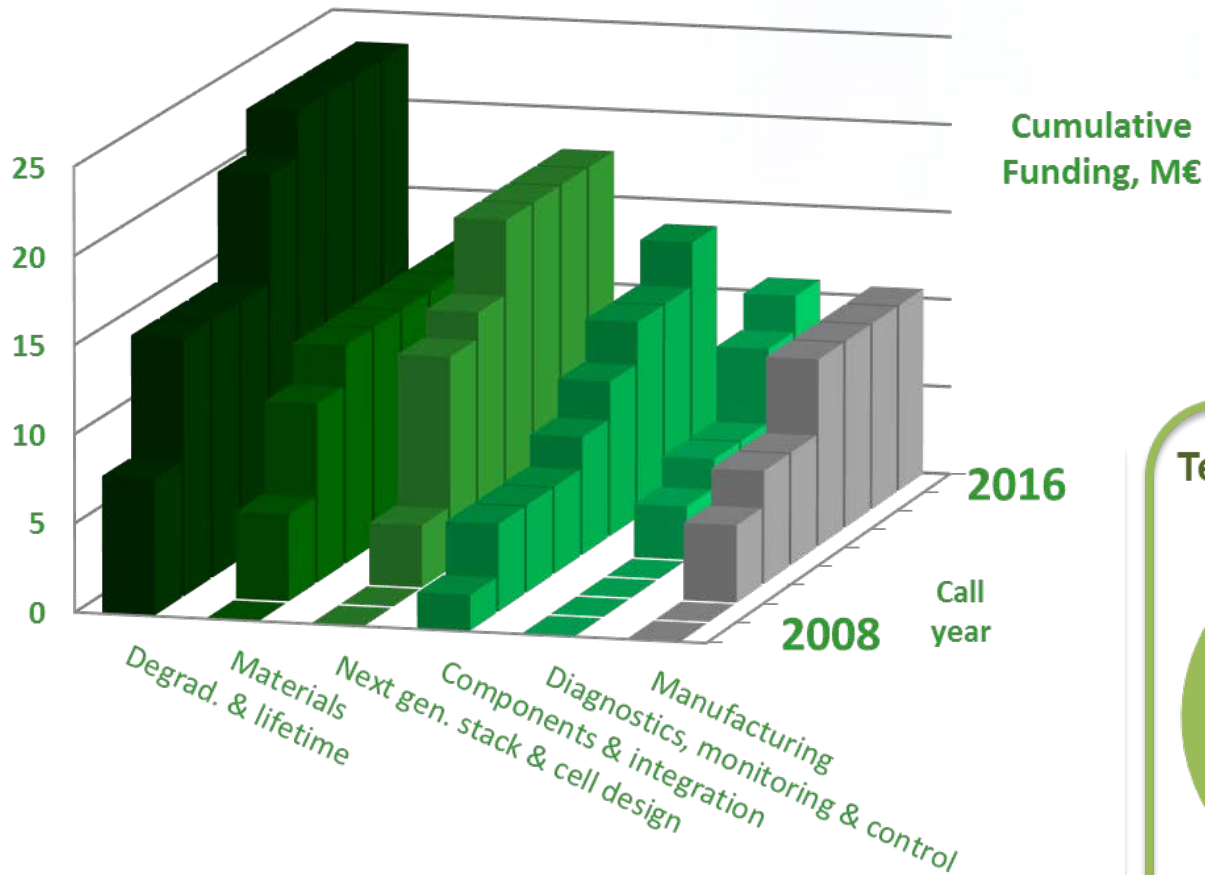
Similar leverage of private funding: 782 M€



Cumulative FCH JU financial support for Stationary FC

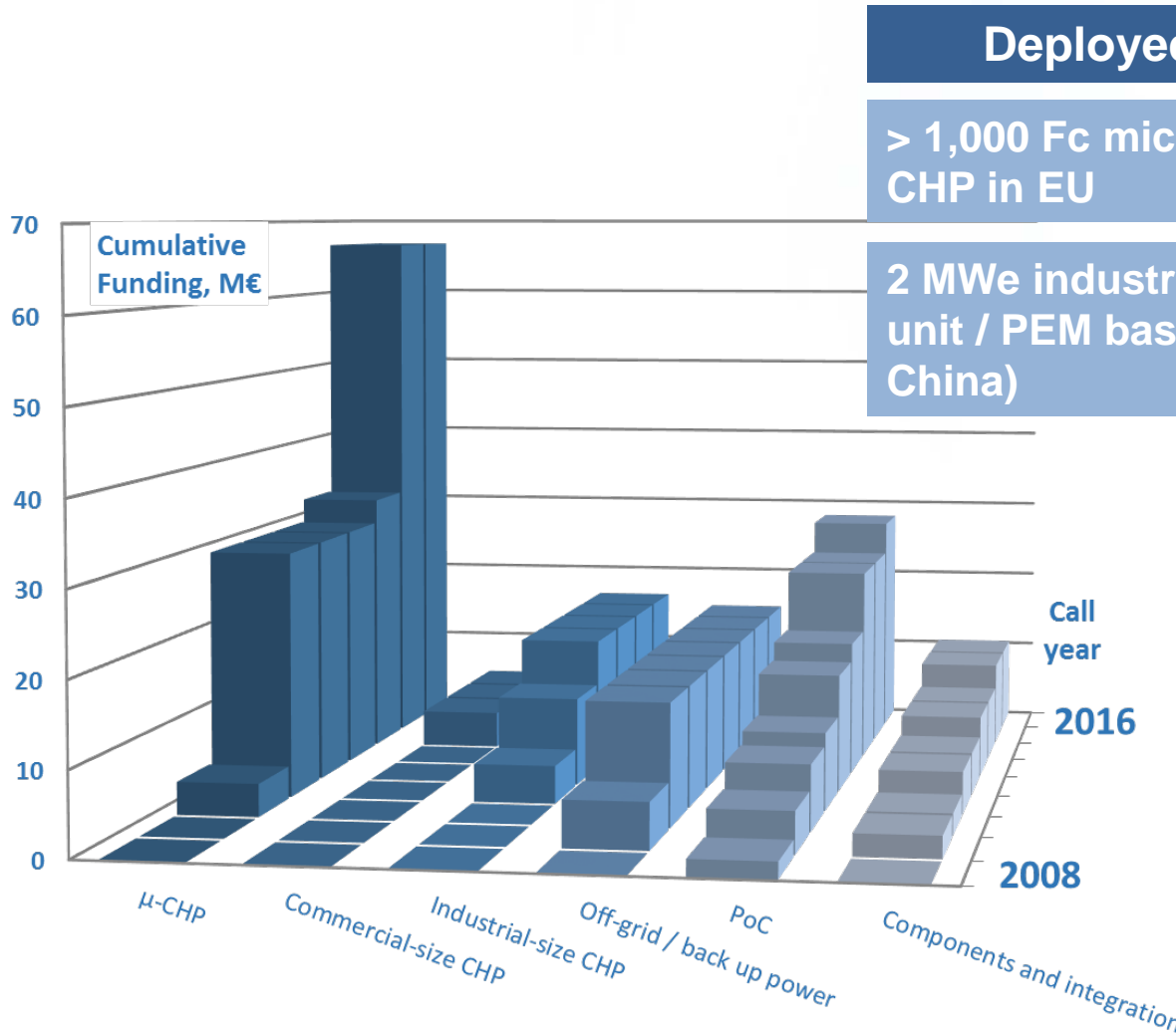


Stationary FCs R&D portfolio



50 projects for 222 M€

Stationary FCs Demonstration portfolio (1/2)



Deployed

> 1,000 Fc micro CHP in EU

2 MWe industrial FC unit / PEM based (in China)

Ongoing

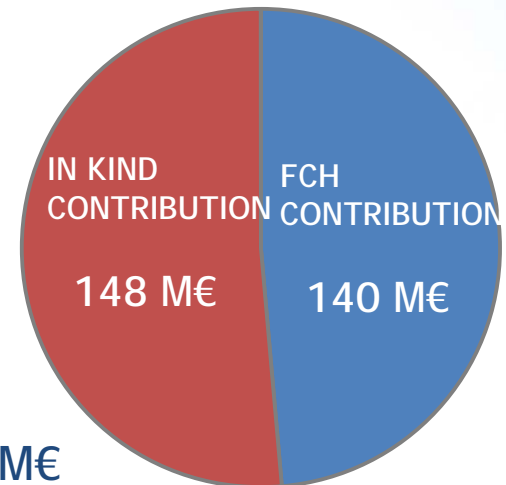
> 2,500 FC mCHP in EU

~250 kWe AFC using industrial waste H₂, Lower Saxony, DE

1 MWe PEMFC (refinery in French overseas)

174 kWe SOFC fro WWTP (Torino, IT)

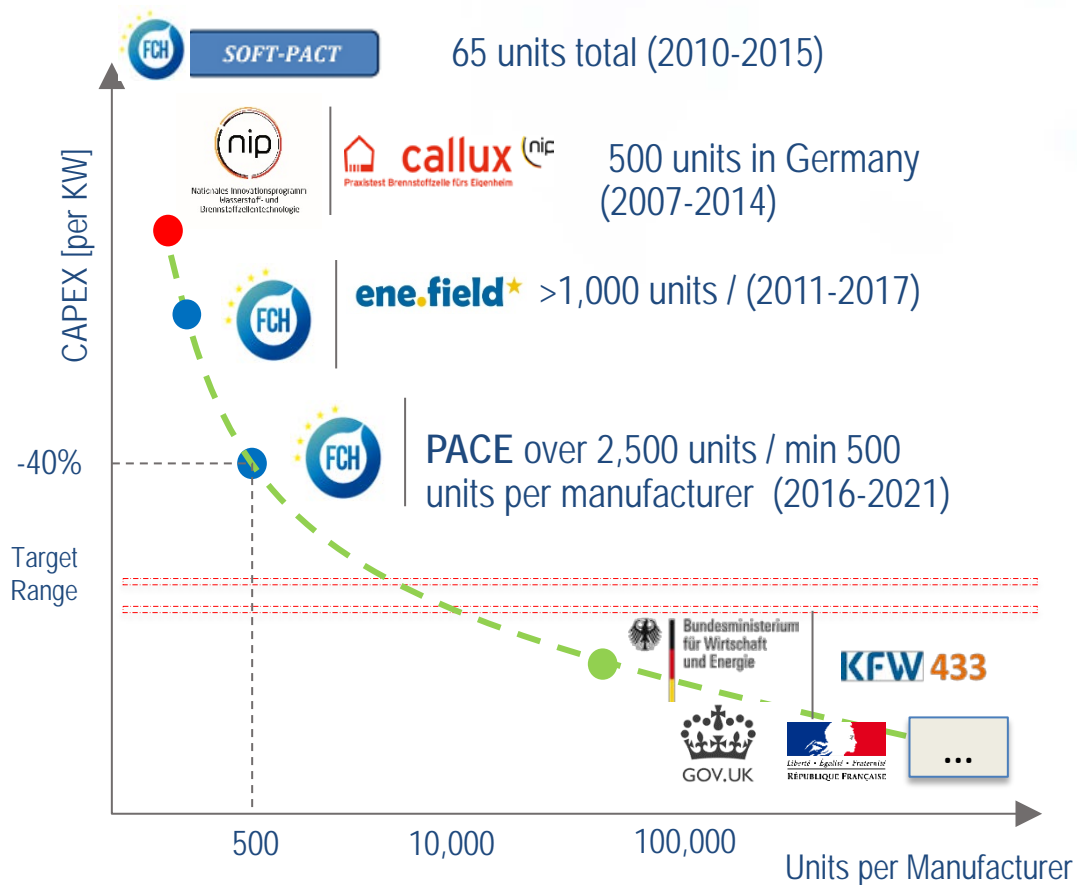
1.6 Mwe PEMFC for large bdg / DH



27 projects for 288 M€





Stationary FCs Demonstration portfolio (2/2)

Industry scaling up: from hundreds to thousands



1) Cumulative production volume per company

Stationary FCs Achievements

	FCH JU project results 2015	Objectives 2017	Non-European SoA
CAPEX, €/kW		< 14,000	6,100-7,200
Durability, y		> 12	10-20
Electrical efficiency, %		33-60	39-52
Thermal efficiency, %		25-55	35-56
LCOE, €/kWh	-	< 2.5*grid parity	0.62-0.90
NO _x emissions, ppm	-	< 2	



SOFC CHP, 174 kWe, 89 kWth fed by biogas from WWTP in Torino, IT

Driven by improved
local air quality
(reduced NO_x, SO_x,
and PM).

Objectives

- $\eta_e > 45\%$,
- CAPEX < 7,000 € /KWe



Market potential
5,141 WWTPs in EU

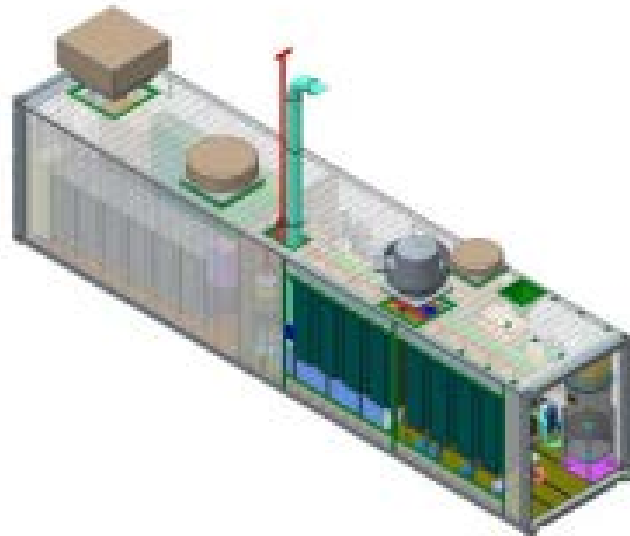
- First 60 Kwe module commissioned
- Full plan expected to be commissioned first half 2018

PEM FC, 1 MWe

fed by by-product H₂ from a refinery plant located at Martinique, overseas French territory

Driven by high power generation costs in the island

- Full plant expected to be commissioned first half of 2018



Large Demonstrations

Chlor-alkali plant (2015-2018) 10.5M€/5.5M€

PEM FC, 2 MWe

- installed at a chlor-alkali plant in China
- plant produces chlorine and caustic soda (lye) and high purity H₂
- Vented H₂ contains 45% of the energy that is consumed in the plant
- FC uses the H₂ by-product as fuel
- driven by high power generation costs
- uses EU technology
- targets net $\eta_e > 50\%$



- Plant commissioned in Oct 2016



Large Demonstrations

Tri-generation of H₂ and CHP 6.9M€/4M€



Start: 2017
Duration: 42 M
Budget: 6.8 MEuro

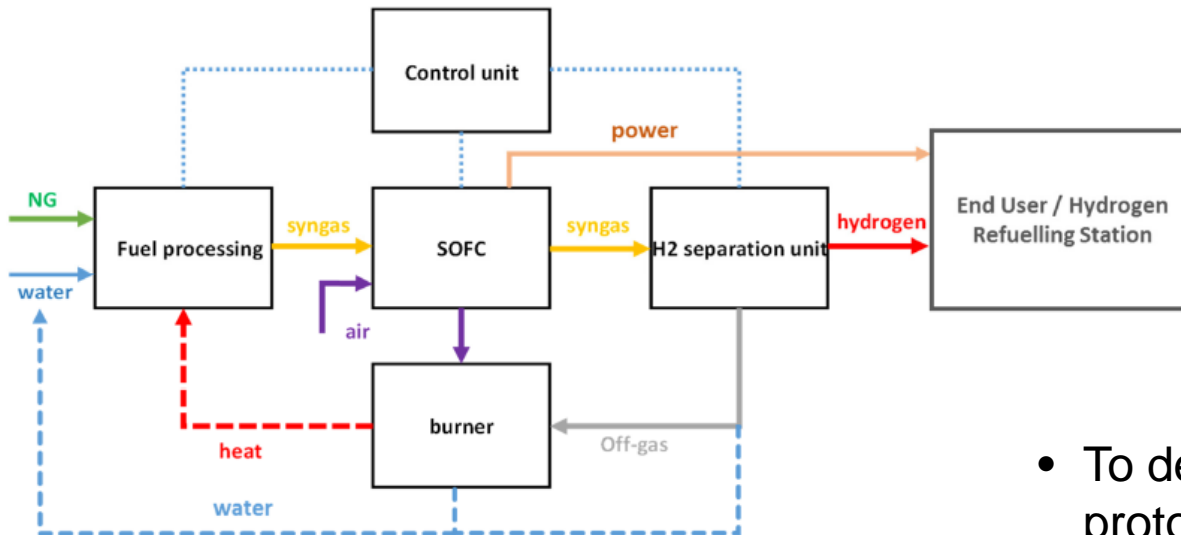


Figure 2. Schematic representation of CH2P concept

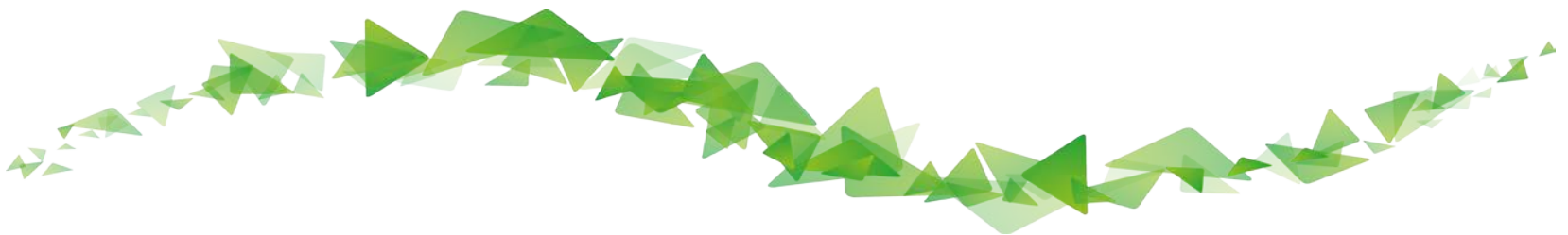
CH2P: Cogeneration of Hydrogen and Power
using solid oxide based system fed by methane rich gas

- To deliver a 100kg/day prototype cogeneration system
- Installed in HRS operated by Shell
- 85-90% efficiency for Hydrogen Production
- 5,000/kw estimated CAPEX
- 4.5 euro/kg H₂

What have we achieved and where are we heading?



- Efficiencies: 60% η_e / 80-90 η_{total}
- Lifetime: >40,000 hours
- Manufacturing: semi-automated manufacturing lines
- Shift to **fully automated** manufacturing lines happening
- Large scale demonstrations -> **track record** -> market confidence
- **Investors** are gaining confidence
- New/innovative **business models** being implemented
- Further **cost reductions** are possible
 - Continue supporting research for next generation of products
 - Help market to increase demand / policy support / market mechanisms



FCH JU STAKEHOLDER FORUM 2017

Join the FCH for the 10th year edition of the
STAKEHOLDER FORUM



Stakeholder Forum:
22 November 2017
Steinberger Hotel, Brussels

Program Review Days:
23 and 24 November 2017
Steinberger Hotel, Brussels

FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING
STAKEHOLDER FORUM 2017
CELEBRATING

