EU policy & micro-CHP

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http://www.fch.europa.eu/

Background: The Energy Union

(European Commission Communication Feb.2015)

The 5 Pillars of the Energy Union:

1. Security of supply
2. Integrated European energy market
3. Energy efficiency
4. Decarbonisation
5. **Research and Innovation => SET-Plan**

Strategic Energy Technology Plan

The FCH 2 JU in the SET plan to realize EU 2030 targets

EU 2030 targets*:

27 % increase in renewables

27 % increase in efficiency

40 % decrease in emissions

Fuel Cells and Hydrogen Joint Undertaking

- FCH JU - EU body
- Budget: 1.4 bill.€ (2014-2020)**
- FCH JU Programme Office

*European Council, October 2014

** continuation of previous program for 2008-2013 with a budget of approx. 1 bill.€

Fuel Cells & Hydrogen technologies role in the Energy Union

Energy Security

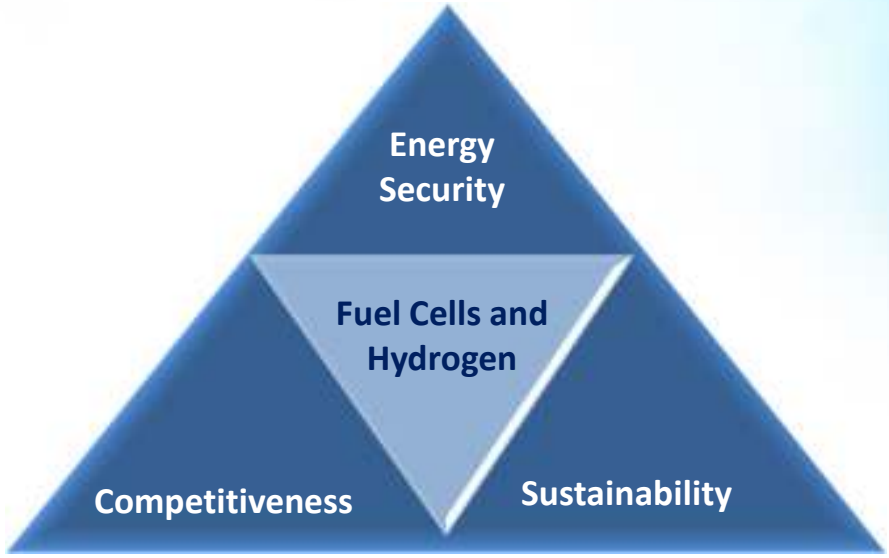
- Increase independence from unstable outside regions

Competitiveness

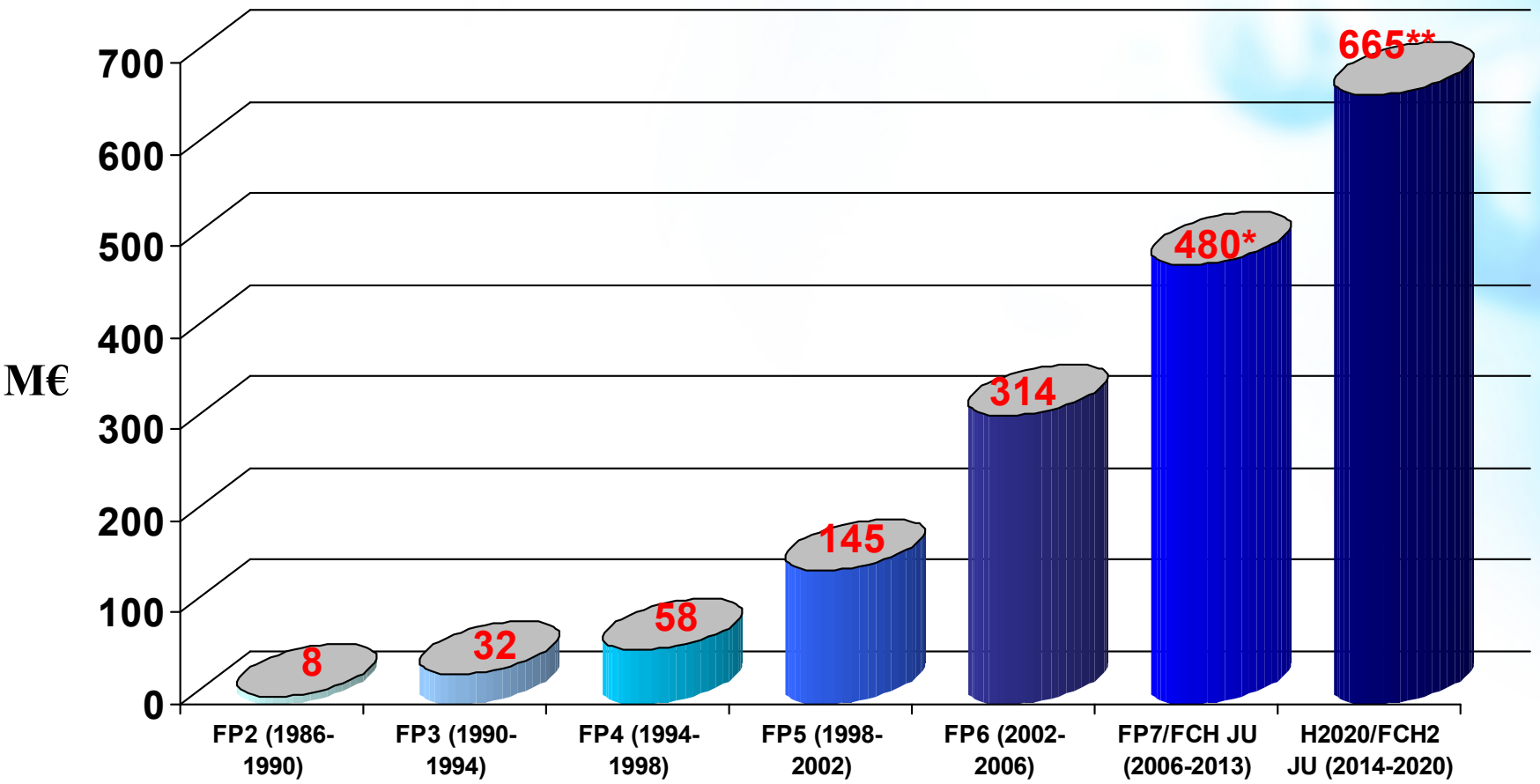
- research excellence leading to industry innovation and growth

Sustainability

- H_2 is a clean energy carrier
- Transport and Energy applications, generate electricity and heat with very high efficiency
- Possibility for storage of renewable energy sources
- Reduction of CO_2 emissions



Continuous Support in the EU Framework Programmes



** 470 mill EUR implemented by FCH JU + about 10 mill EUR already spent from EU 2007 budget, before FCH JU in place*
*** 665 mill EUR only to be implemented by the FCH2 JU + additional budget from EU programmes for low TRL (basic research) and structural funds/smart specialisation*

Strong Public-Private Partnership with a focused objective

Fuel Cells & Hydrogen Joint Undertaking (FCH JU)

Hydrogen Europe

Industry Grouping
Close to 100 members
~ 50% SME

European Commission

ON.ERGHY
RESEARCH ON FUEL CELLS & HYDROGEN

Research Grouping
Over 60 members

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

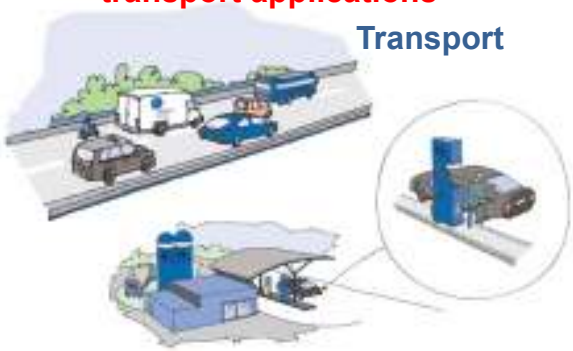
To accelerate the development of technology base towards **market deployment of FCH technologies** from 2015 onwards

FCH2 JU objectives

Reduction of production costs of long lifetime FC systems to be used in transport applications

Increase of the electrical efficiency and durability of low cost FCs used for power production

Transport



Industrial applications

Residential CHP

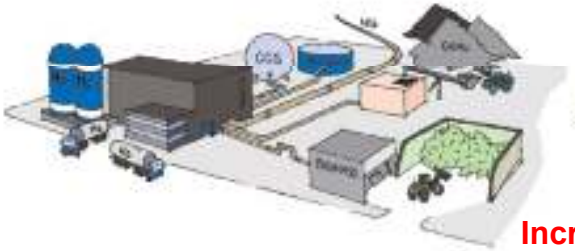
Feed to electricity grid

Reduce the use of critical raw materials

Existing natural gas, electricity and transport infrastructures

Methanisation feed to natural gas grid

By-product from Chemical Industry



Natural gas, biogas, coal, biomass

Increase the energy efficiency of low cost production of hydrogen from water electrolysis and renewable sources

Renewable generation, storage and 'buffering'

Large scale use hydrogen to support integration of renewable energy sources into the energy systems

2030 Energy Goals and FC potential contribution

Energy Goals by 2030:*

27 % energy savings

40 % less greenhouse gas

27 % renewable energy

Strong European economy

Energy security

Lower energy cost

Stationary Fuel Cells:

~25 % less primary energy

Up to 80 % less CO_2, no NO_x, SO_x etc.

Storage (H_2), grid support (flex base load)

Technology driver, job creator

Decentralized, grid support, lower import

Up to 60 % el. efficiency, lower grid loss

Higher chance to reach goals with Stationary Fuel Cells

**European Council, October 2014*

FCH JU Goals and Objectives
on Stationary Fuel cells

By 2015, demonstrate at least 1,000 m-CHP units and 5 MW large CHP

By 2020, decrease the CAPEX to 12,000 €/kWe (micro-CHP), respectively 3,000-4,000 €/kWe (large CHP)

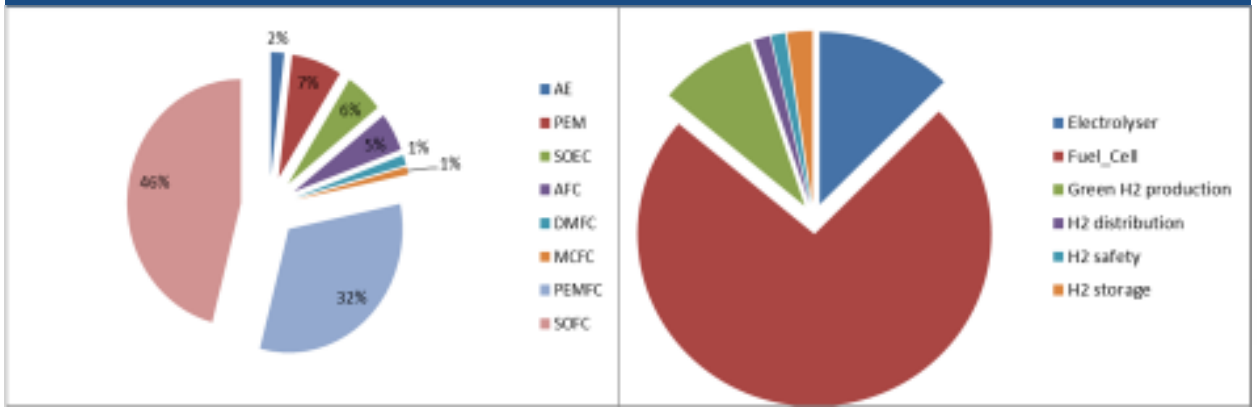
By 2020, increase durability to 40,000 h (12 years of operation for micro-CHP or even 20 years for large CHP), at 97% availability

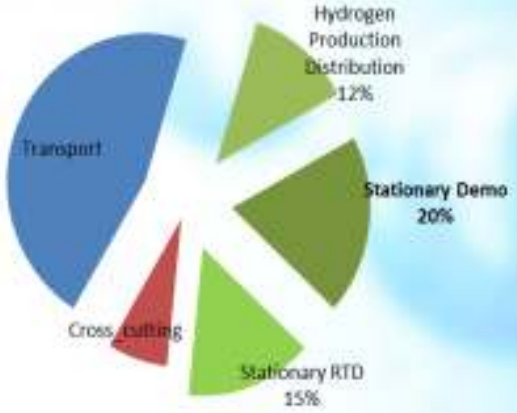
Electrical efficiencies >45% for power only units (towards 60% for SOFC systems), while Total efficiency > 80

Improve the technology for fuel cell stack and balance of plant components by bridging the gap between laboratory prototypes and pre-commercial systems

ENERGY portfolio

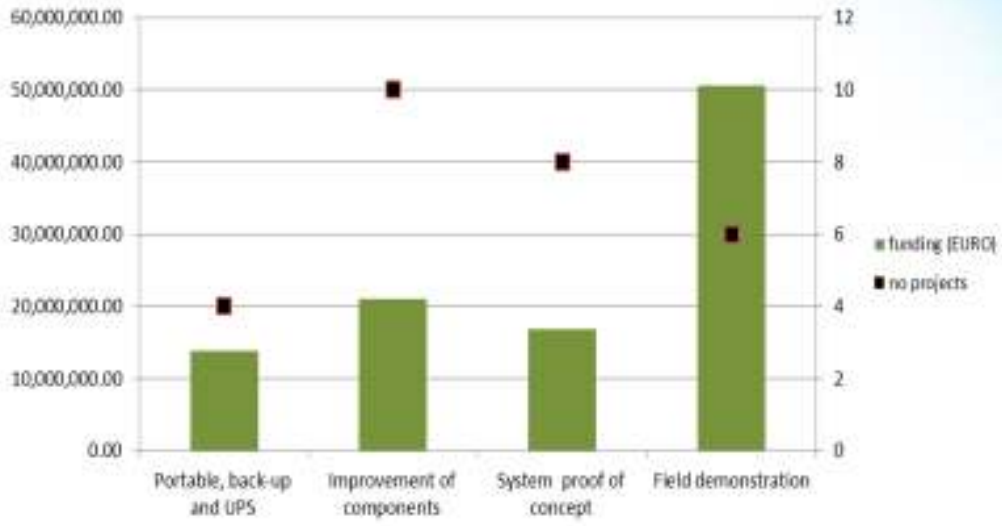
96 projects under Energy pillar, for more than 240 mill €





Technology neutral approach, however most support to Solide Oxide and PEM for both fuel cells and electrolyser applications

28 projects at TRL ≥ 3 for about 100 mill €
('Stationary Demo' type), mainly focusing on system integration and field demonstration (e.g. components development, including control systems; proof-of-concept; field demonstration of CHP and back-up power units)



Accomplishments and current field demonstration projects on micro-CHP

Residential Market Segment (< 5 kW)

PACE: Pathway to A Competitive European FC mCHP market

- **Product innovation and cost reduction** – constructing and demonstrating next generation FC mCHP units, designed for cost reduction, increased performance and mass manufacture.
- **Supply chain development** – working to build a more competitive EU component supply chain.
- **Policy collaboration** – working collaboratively with member states to develop policy to enable the transition to wider roll-out.
- **Demonstrating and verifying primary energy savings, and testing grid benefits** – for innovative business model application.

Project partners

BOSCH · VIESMANN · EWE · Vaillant · SOLID POWER · DTU · BDR THERMEA · elementenergy · COGEN

- 2,660 units across 11 member states
- 500–770 units/manufacturer
- >30% cost reduction (per manufacturer)

ene.field

more than 500 units installed in 10 countries of Europe, reliabilities confirmed, very good customer satisfaction (70% positive feedback),

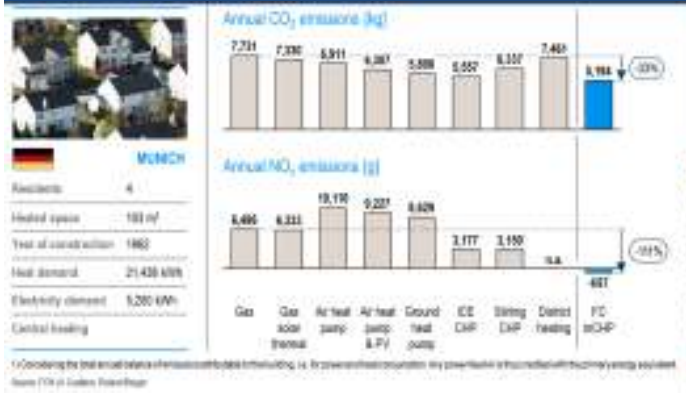
SOFT-PACT

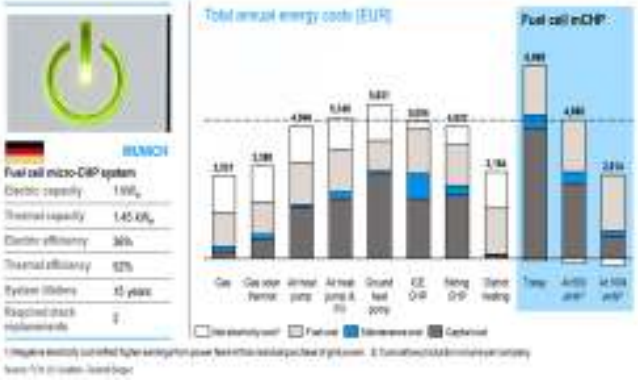
65 fuel cell systems, electrical efficiency higher than 42 % over lifetime (total efficency higher than 78%), 25% cost reduction

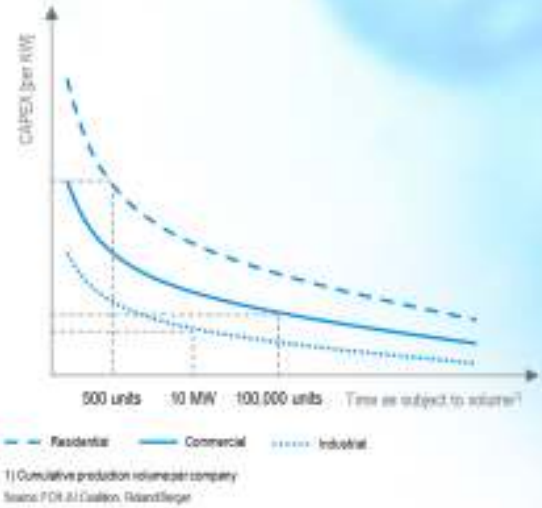
Developing targets/Studies

Roland Berger Study: ***Advancing Europe's energy systems: Stationary fuel cells in distributed generation***

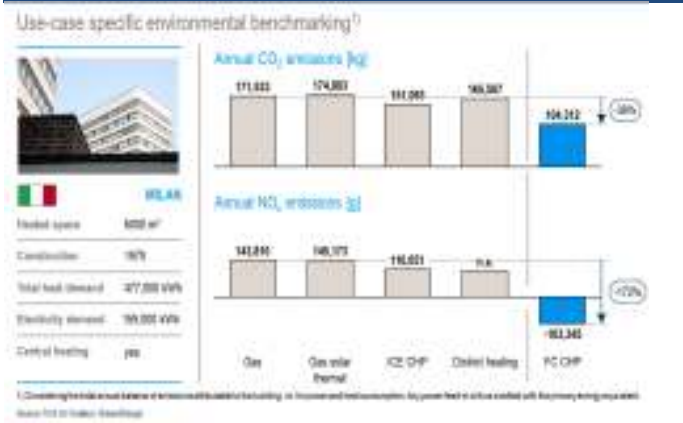
- Industry coalition composed of more than 30 stakeholders – Results reflect common understanding
- The most comprehensive assessment of the commercialisation potential of stationary fuel cells in Europe (4 focus markets, 6 generic fuel cells, 35 years time horizon, 45 different use cases, >30 benchmark technologies, >3 energy scenarios, >34,000 resulting data points)

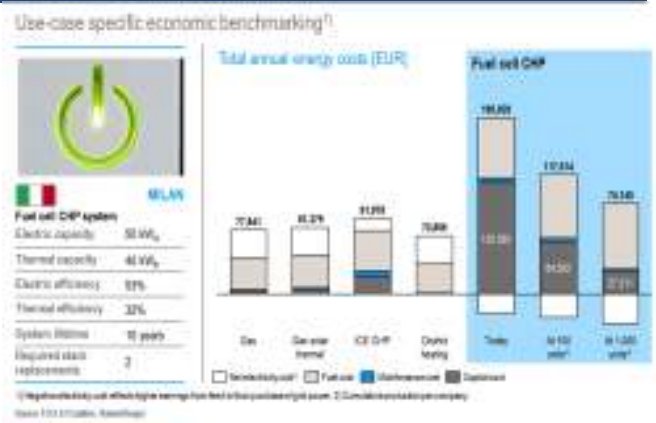






Today FC can reduce CO_2 emissions by more than 30%, while No_x emissions can be eliminated entirely; however, to become economically competitive, capital costs must be reduced substantially by increasing production volumes





Industry sees ambitious potential
(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 !

Road-Map for 2020/2023

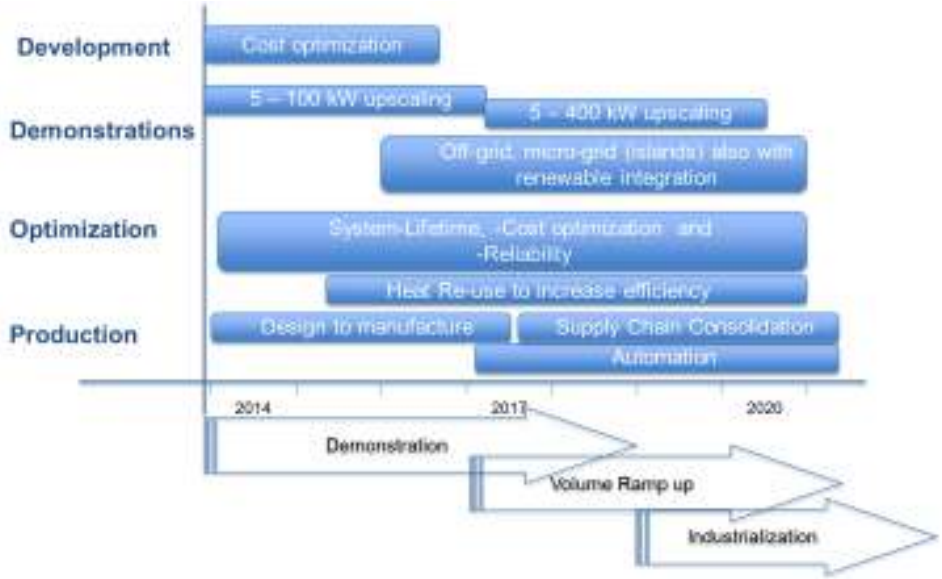
Market uptake needs to develop incentive schemes in parallel to large scale demonstration. This ensures a final and sustained take-up of initial funding.

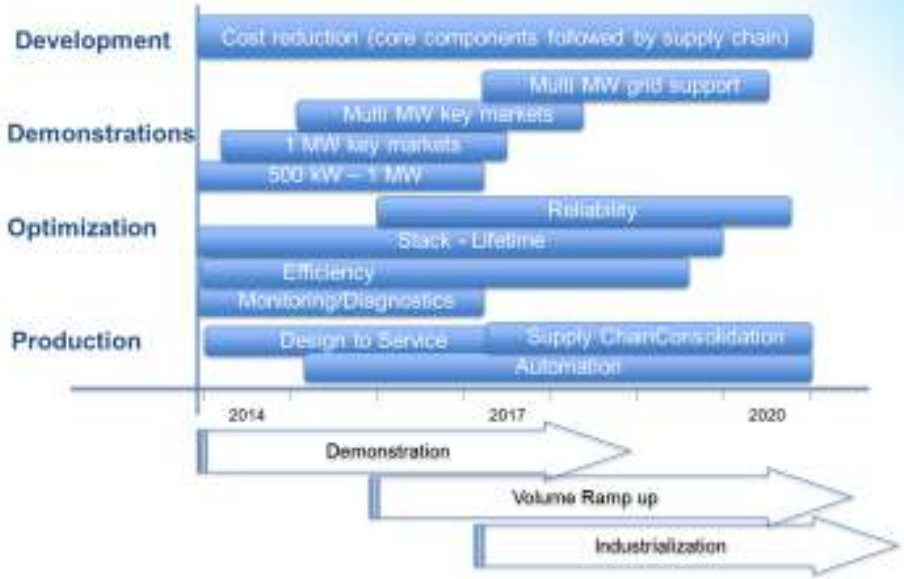
Industry Vision for Stationary Fuel Cells in 2023

350 MW – 2 GW installed capacity
Grid parity price of generated electricity

3 – 17 Mt/a less CO2 emissions
(equal to 1.6 - 8 million avoided car emissions)
0.8 – 4.6 Mt/a NOx emissions nearly eliminated

10,000 sustainable, green jobs created





Business models and financing arrangements for the commercialisation of fuel cells

Create a common understanding of the **main barriers** to growth, and **identify and build capacity** to enable these to be overcome

Action-orientated results to enable stakeholders to unlock the market opportunity in residential, commercial and industrial applications

Stationary Fuel Cells should be **"Market ready" by 2020:**

Perform successfully - minimum lifetime of 10 years (or the equivalent of 40,000 hours' runtime) and/or a managed stack replacement programme; demonstrating product reliability.

Offer a strong value proposition to customers - stationary fuel cell must offer an attractive tool for utility and ESCO customers in order to secure gas sales / customer retention or acquisition; **New, innovative business models will be critical for this.**

Have backing from heating and energy industry - will help with securing residential and non-residential market channels with their access to end-users, distributers, and installers, and will help to build reliable robust product; Utility partners can offer a direct route to market and assist with marketing and market creation efforts.

Strong project team, bringing the full range of required specialist experience and capabilities, consists of MPW (Germany), Element Energy, COGEN Europe and **led by Delta Energy & Environment-ee**

DELTA
Energy & Environment

Fuel Cells and Hydrogen Joint Undertaking Achievements

Hydrogen Packard car (1927) - Woikoski

Hybrid FC Buses

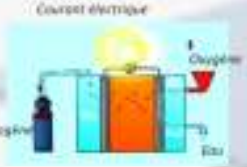
FCEV

FC in commercial planes

Marine & aerospace

Forklifts

FCEV RE

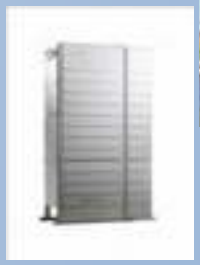


1995 2000 2005 2010 2015 2020

Backup power

Large scale stationary applications

Energy storage



CHP Systems

Portable applications

The scope of applications is widening with time

Thank you for your attention !

Further info :

- **FCH2 JU : http://www.fch.europa.eu/**
- **HYDROGEN EUROPE : www.hydrogeneurope.eu**
- **N.ERGHY : http://www.nerghy.eu**