



FP5 (1999-2002) - The Energy Content - Overview

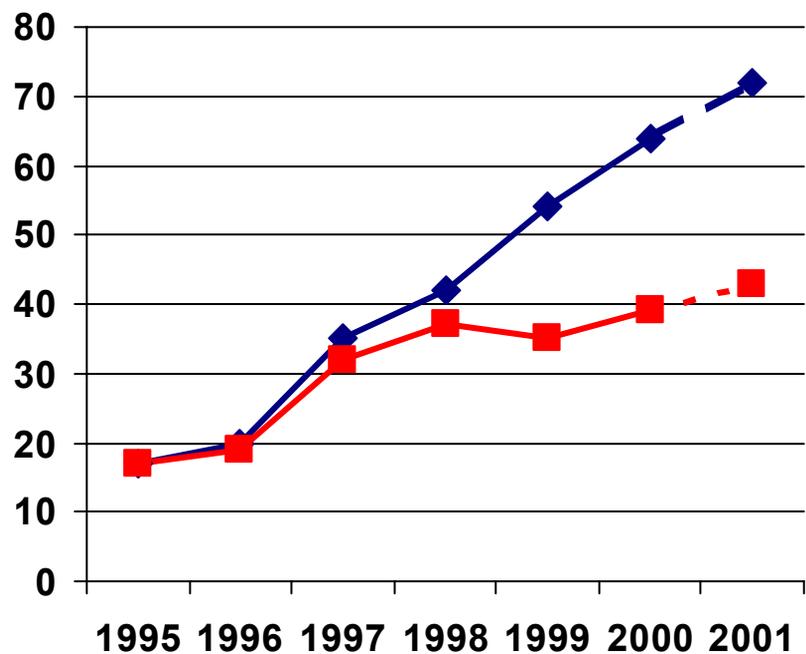
Clear Policy Targets:

- **Energy** oriented by doubling the Share of Renewable Energy Sources (from 6% to 12% in 2010 versus 1998) towards a better **security of energy supply**;
- **Environmental incentives** to meet the Kyoto Objectives (8% CO₂ reduction between 2008 and 2012 compared to 1990 level);
- **Socio-economic** measures recognising the impact of energy systems on competitiveness, employment, cohesions of regions,...

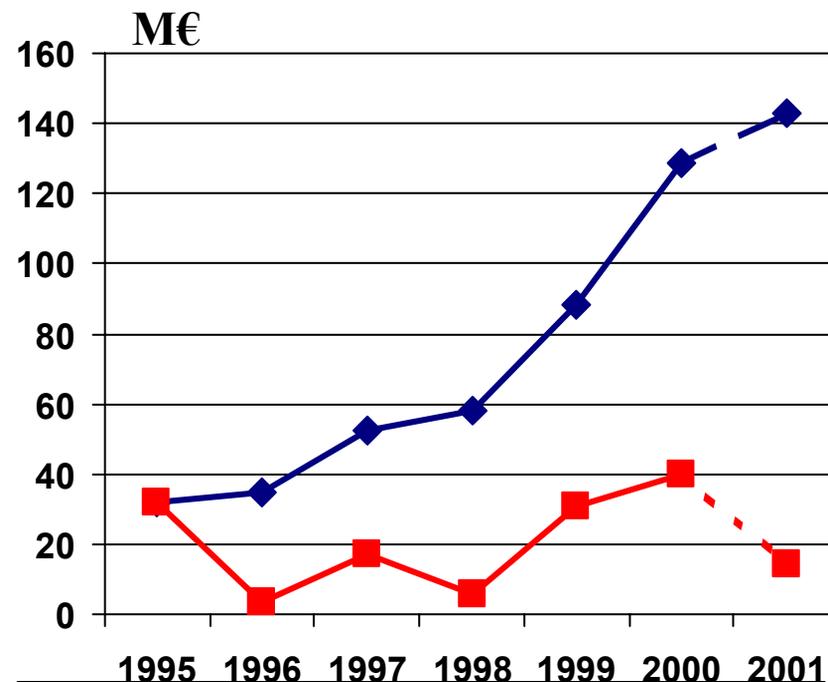




Dynamic of the Fuel Cell EU support since 1995



◆ Cumulative number of projects funded
■ Number of on-going projects

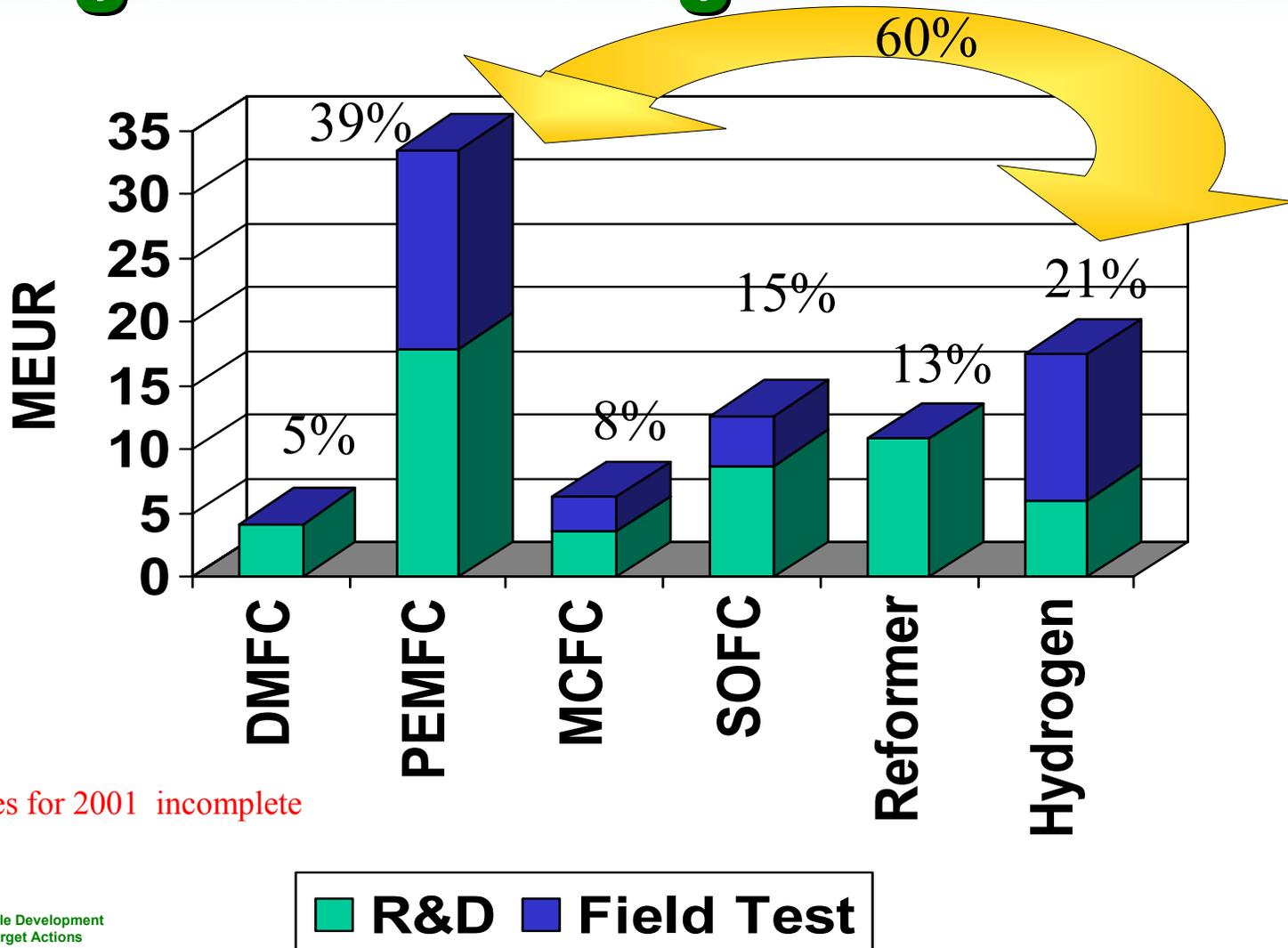


◆ Cumulative EC funding
■ Yearly EC funding

(*): Final figures for 2001 incomplete



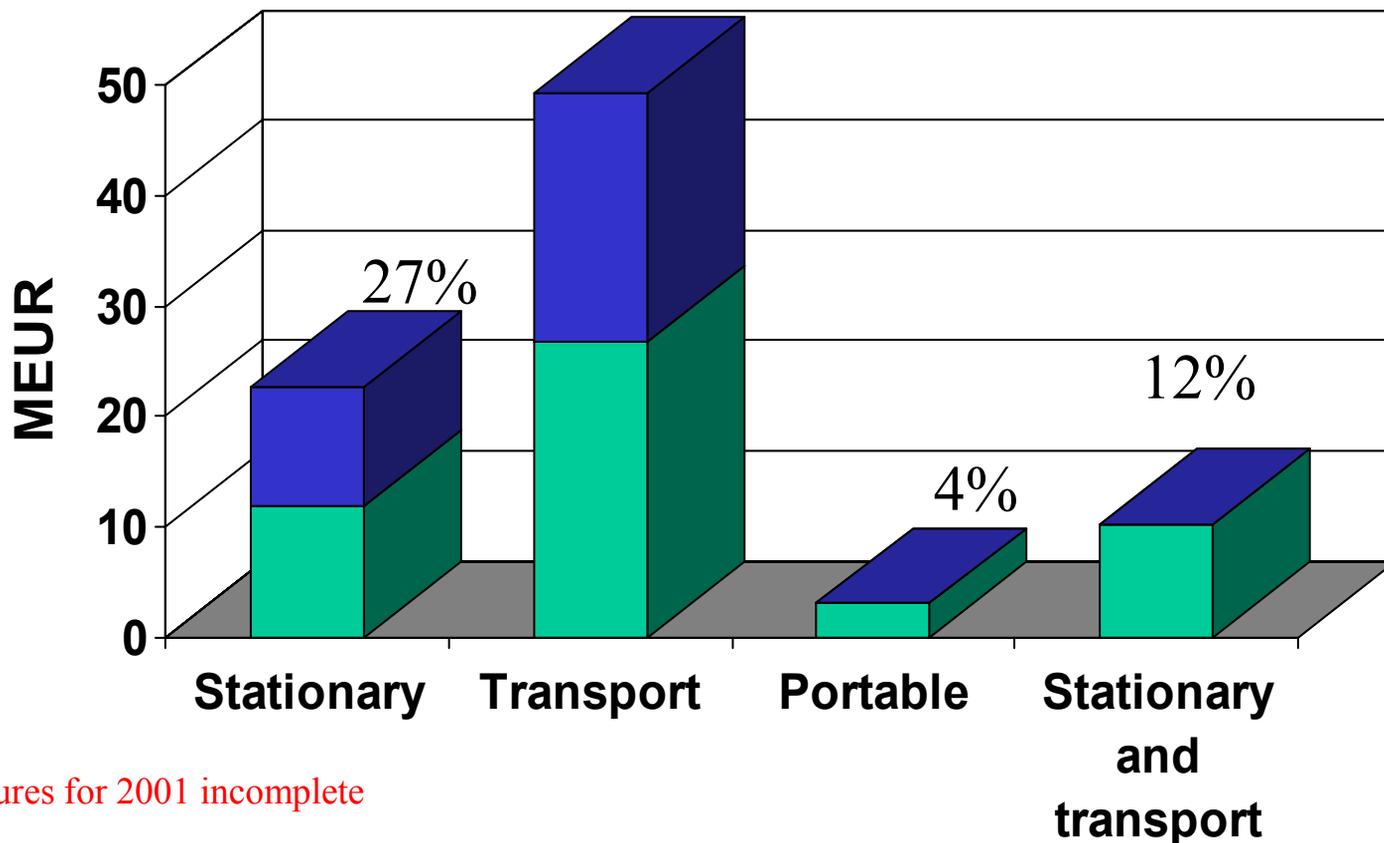
EC support to Fuel Cell and Hydrogen technologies 1999-2001





EC support to Fuel Cell and Hydrogen technologies 1999-2001

58% (including H₂ infrastructure and storage)



(*): Final figures for 2001 incomplete

■ R&D ■ Field Test / Demo



Overview of Fuel Cell yearly public funding in Europe (All types)

DE	FR	ES	IT	DK	UK	SE	SW	Total MS ⁽¹⁾	EU (EC)	Total (EU)
MEUR	MEUR	MEUR	MEUR	MEUR	MEUR	MEUR	MEUR	MEUR	MEUR	MEUR
8-10	11 ⁽³⁾	3	2,3 ⁽⁴⁾	2,7	2 ⁽²⁾	0,7	1	~31	~30	~61
SOFC MCFC PEMFC	All types	PEMFC MCFC	SOFC, MCFC, PEMFC	SOFC	SOFC, PEMFC	SOFC, MCFC PEMFC	SOFC, PEMFC PAFC		SOFC, PEMFC DMFC in M/LT	All types in ST

(1) : European Member States

(2) : New programme 2001-2005 starting , (3) : coordinated by the French FC Network,

with 29 M€/year for RES and FC

(4) : New programme to be adopted



New European projects for land FC vehicles (under negotiation)

- **APOLLON**: - R&D of new more active and cost effective electro-catalytic materials for hydrogen fuelled PEMFC (70-80 °C) with CO tolerance < 0.5% (test of a 1 kW stack)
 - The development of methanol or hydrogen (with CO tolerance > 1%) fuelled PEMFC (150-200°C) based on a new generation cheap polymeric electrolyte membranes.
- **ACCEPT**: - development of a 2 kWe ammonia fuelled PEMFC system integrating tested with 2 different ammonia crackers including the simulation of dynamic operating of power trains
 - testing of direct ammonia fuelled SOFC
 - Safety assessment for ammonia production and distribution including storage feasibility and benchmarking with other alternatives fuels (to be integrated possibly into FUERO)



New European projects for land FC vehicles (under negotiation)

- **MINIREF:** - development of a compact micro-channel gasoline reformer
- **FEBUSS:** - development and testing over 5.000 hrs of a 100 kWe standard PEMFC power module fuelled with hydrogen for CHP and public transportation (net efficiency of 50% and power density of 0,6 W/cm²)
 - pre-normative research aiming at amending EIHP on certification of PEMFC power modules for fuel cell vehicles
 - cost targets assessment and power module requirements for future commercialisation
- **CUTE:** - Demonstration of 27 FC buses in 9 cities



Last Call in FP5 - Indicative timetable and budget

Target Actions 60% of total budget

Short-Term

50% of total Target Action budget

4th call: ID "TA-ST"

2nd closing date: 14.12.2001

Budget: ~75 Meuro

Topics covered:

- Application Driven Fuel Cells
- Integration of RES - distributed generation
- Bio-electricity
- RUE: Eco-buildings

Medium to Long-Term

50% of total Target Action budget

5th call: ID "TA-MLT"

2nd closing date: 14.12.2001

Budget: ~75 Meuro

Topics covered:

Topics covered:

- Fuel Cells and hydrogen
- Bio Energy
- Integration
- Cleaner fuels for transport
- Storage
- Photovoltaic



Last call in FP5 - Indicative timetable and budget

General Call 40% of total budget

Short-Term

50% of total Target Action budget

6th call: ID "GEN-ST"

2nd closing date: 14.12.2001

Budget: ~50 Meuro

Topics covered: short-term
actions covering all areas of the
WP

Medium to Long-Term

50% of total Target Action budget

7th call: ID "GEN-ML"

2nd closing date: 14.12.2001

Budget: ~75 Meuro

Topics covered: Medium to
long-term actions covering all
areas of the WP



The concept of Cluster

- **Supporting the exploitation of synergies between EU projects and programs;**
- **Improving and reinforcing the exchange of information between developers, manufacturers and end-users to better integrate research;**
- **Addressing specific common problems by increasing the mass of effort to make it more competitive**
- **Defining and suggesting new RTD projects at national and EU levels (large integrated projects)**
- **Stimulating co-operation in EU and explore possible international-operation**
- **Mapping the technology and stakeholders and benchmarking**
- **Dissemination of information**



The FUERO Cluster

December call :

- Hydrogen storage (look after objectives of FUSCHIA)
- Air compressor
- APUs (e.g. proposal APUS 5 - 10 kW)
- Diesel reforming I.e. for APU
- SOFCs for APUs ?
- demos (if emphasis on ST and LT, talk with DG RTD and DG TREN)
- Networking (FUERO, ELEDRIVE, EIHP and HYPNET)



The FUERO Cluster

- **Broaden cluster participation in FUERO e.g. other EU players as Opel, D-C, Ford for cooperation on supporting issues** (education, training, safety, refueling infrastructure i.e. definitions of pressures, refueling times, safety of installation, bencharking, develop component supply chain e.g. connectors, valves,etc)
- **Feasibility study for large integrated projects e.g. exploiting synergies between stationary and transport** (central reforming of NG to fuel some kWe fuel cell CHPs (or Direct reforming FC) and about 10 hydrogen fuelled fleet vehicles (refueled overnight with possibility of bencharking with participation of gas and electricity utility, automotive industry, refueling equipment suppliers, FC developers, mucipality,etc)



The New Framework Programme (2003-2006)

➤ Designed to promote the setting up of ERA

- ❑ Status : EC proposal to EU Parliament and Council
- ❑ Overall budget : 16,3 BEUR
- ❑ Fuel Cell content : in Sustainable Development and Global Change (Budget 1,7 BEUR)
 - ❑ short term :
 - RES, more efficient and clean use of energy (urban areas), new concepts of energy efficient and cleaner transport
 - intelligent transport, rebalancing and integration transport modes
 - ❑ long term :
 - **Stationary & Mobile Fuel Cells**
 - Hydrogen technologies
 - solar photovoltaic technologies & biomass



The New Framework Programme (2003-2006)

➤ **Designed to promote the setting up of ERA
with 3 main instruments**

- Networks of excellence**
- Large-scale integrated projects (> 10 MEUR)**
- Participation of EU in MS research programmes**
 - with stimulation of International co-operation with third countries (particularly S&T agreements)**



EU/US workshop - 14/09/01

- **Direct methanol and PEM Fuel Cells for transport and stationary applications**
- **SOFC and high temperature fuel cell hybrid systems**
- **Codes and standards for stationary fuel cells**
- **Auxiliary Power Units**
- **Support studies, including socio-economic assessment of critical rare earth materials for high temperature fuel cells**
- **Bus demos, including fuelling infrastructure**
- **Codes and standards including fuel infrastructure, vehicles and APU's**
- **Fuel choice studies and socio-economic assessment of critical materials for low temperature fuel cells**



The potential of Fuel Cells

A Cleaner and more efficient technology:

- **Superior to combustion technologies (Automotive industry, power generation, heat and electricity supply in homes, commercial/business buildings and industries, portable devices);**
- **Contribution to the EU Energy policy (energy savings, environment respectful, sustainable and security of energy supply especially with hydrogen;**
- **Hydrogen-fuelled fuel cells : a bridge from today's fossil-based energy economy to a future sustainable energy economy provided cost targets can be reached;**





'Strategy' Goals for RTD - FP5

- **Qualitative** : **Cost reduction**
Improve life time of critical parts
Contribute to solve the fuelling options
 (fuel choice and re-fuelling infrastructure)
Pre-normative / socio-economic

- **Quantitative** : **Stationary** **Transport**
 - **System cost** **< 1.000 EUR/kW** **< 100 (50) EUR/kW**
 - **life time** **50.000 - 100.000 hrs** **> 5.000 (10.000) hr**
 - **Modularity** **< 300 kW**



A FUEL CELL RESEARCH, DEVELOPMENT & DEMONSTRATION STRATEGY up to 2005 (2)

- All fuel cell types are in principle considered (application and problem solving oriented programme);
- Applications for Low temperature FC will address in transport the road, rail, marine + hybrid vehicles and in stationary the co-generation in buildings and decentralised electricity production and portable devices;
- Applications for high temperatures FC (including the combination with turbines) will address de-centralised electricity production and co-generation in buildings and process industry, large scale power generation in stand alone or grid connected mode + possibly APU;



A FUEL CELL RESEARCH, DEVELOPMENT & DEMONSTRATION STRATEGY up to 2005 (3)

- In transport, research should address the fuel choice problem (methanol, NG, gasoline-naphta, diesel) and infrastructure.
- In stationary electricity production and co-generation, the multi-fuel capability and flexibility should be addressed and explored as well as the capturement of CO₂ + reversible electrolysers;
- In buildings, special attention should be given to fuel cell applications for co-generation and HVAC, adapting heat and electricity supply to the demand including the integration with heat pumps, electrolysers, storage systems,...
- Socio-economic and pre-normative research



Last Call in FP5 (Short-term)

Application driven fuel cells

- Demonstrate technical and economical viability of innovative FC concepts and of new energy systems combining FC, RES and H₂ infrastructure
- introduction of FC systems in intermediate markets; use of FC in industry; distributed FC networks
- test-beds for various re-fuelling infrastructures





Last call in FP5 (medium to long-term)

Fuel cells and hydrogen technologies

➤ Introduction of fuel cells in a REs and H₂ based supply scenario by reducing cost

➤ RTD limited on **Proton Exchange Membrane Fuel Cell** and related **Direct Methanol Fuel Cell** and **Solid Oxide Fuel Cell** and related technologies for stationary and mobile applications





Priorities of Strategic importance to the EU (general call)

All types of fuel cell projects are eligible provided they contribute to at least one of the following priorities :

- Management of Greenhouse Gases emissions and climate change**
- Exploiting the potential of new ICTs in energy RTD including e-science issues**
- Socio-economic research related to energy technologies and their impact**
- International co-operation, co-ordination with MS research programmes and EU wide research networks**
- Pre-normative research of interest at EU level**