

European Hydrogen & Fuel Cell Technology Platform

The Implementation Plan

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GM Fuel Cell Activities

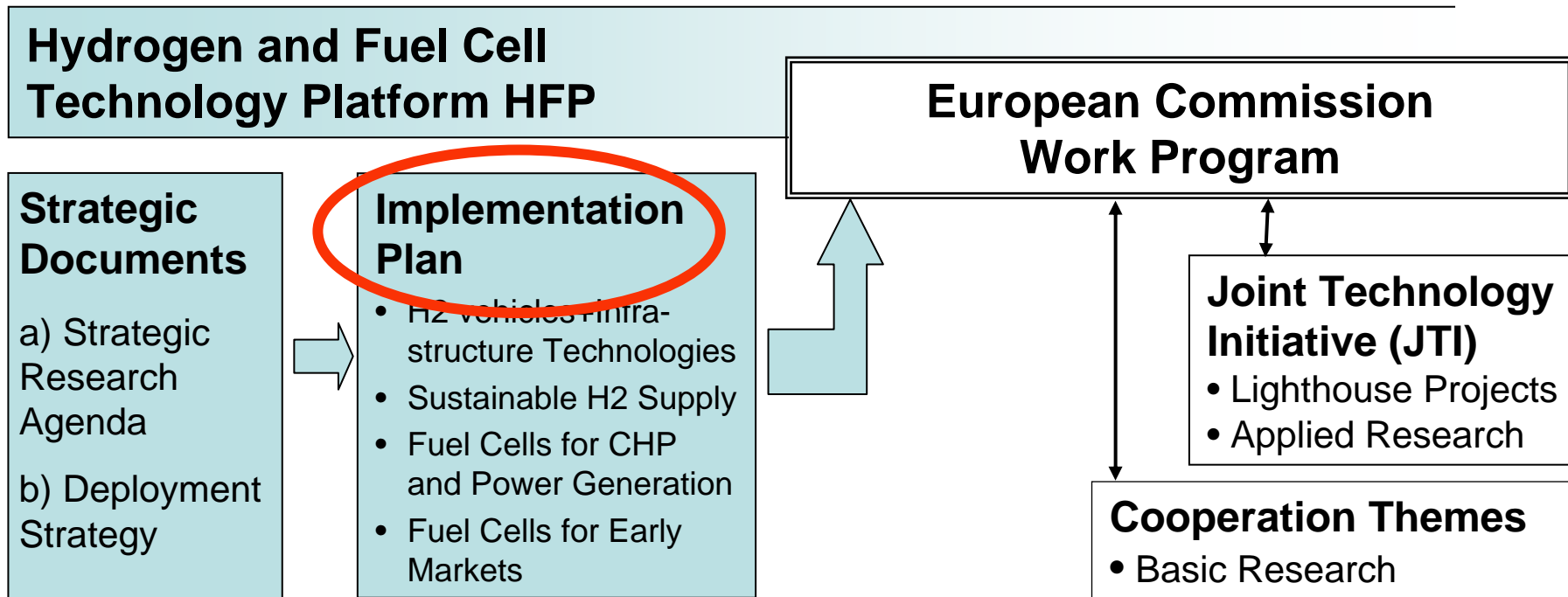


EUROPEAN HYDROGEN AND FUEL CELL TECHNOLOGY PLATFORM

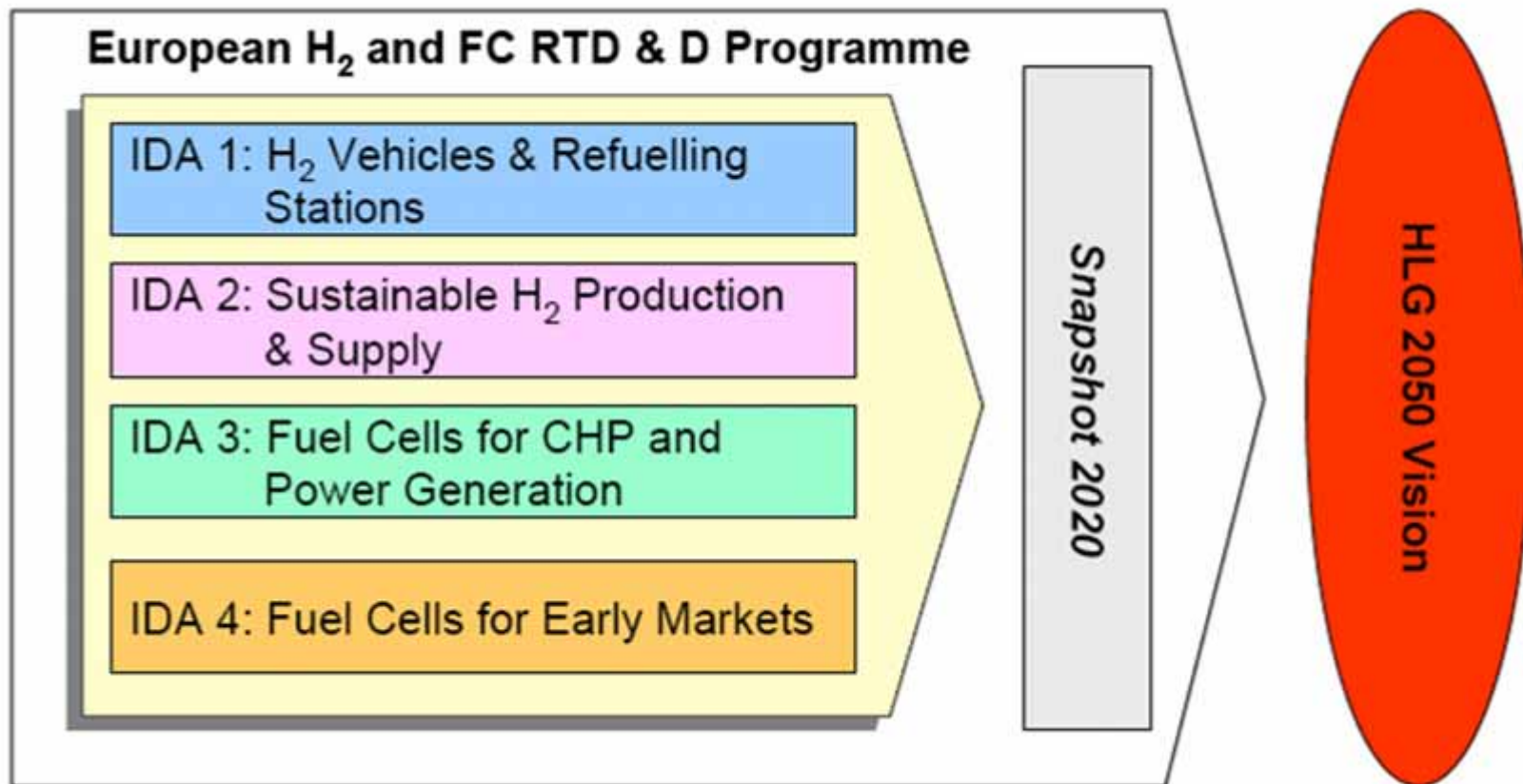


Preparing the framework

2004 2005 2006 2007 2008 →



Elements of the Roadmap



The "Implementation Plan"

- European Hydrogen and Fuel Cell Program from 2007 to 2015
- More than 100 European stakeholders involved and extensive public consultation carried out
- Development and Deployment as major program elements for secure and sustainable energy and a new, high value industry in Europe.
- Focus on four main innovation and development actions (IDA's)
- Investment Estimate: 7.4 billion €; which is consistent with current spending commitments from public and private sectors
- Joint Technology Initiative (JTI), an industry-led public-private partnership, as major framing structure for program execution



Four Main Innovation and Development Actions (IDA's)

1. Hydrogen Vehicles and Refuelling Stations

- Road transport + other transport applications
- Hydrogen fuel cell vehicles and their components, APU's
- Refuelling infrastructure
- Support for market deployment and industry capacity built-up

2. Sustainable Hydrogen Production & Supply

- Low temperature electrolysis for integration of renewable energy sources
- Biomass-to-H₂ and fossil-based technologies w. carbon capture and storage
- Advanced hydrogen production and storage technologies

3. Fuel Cells for CHP and Power Generation

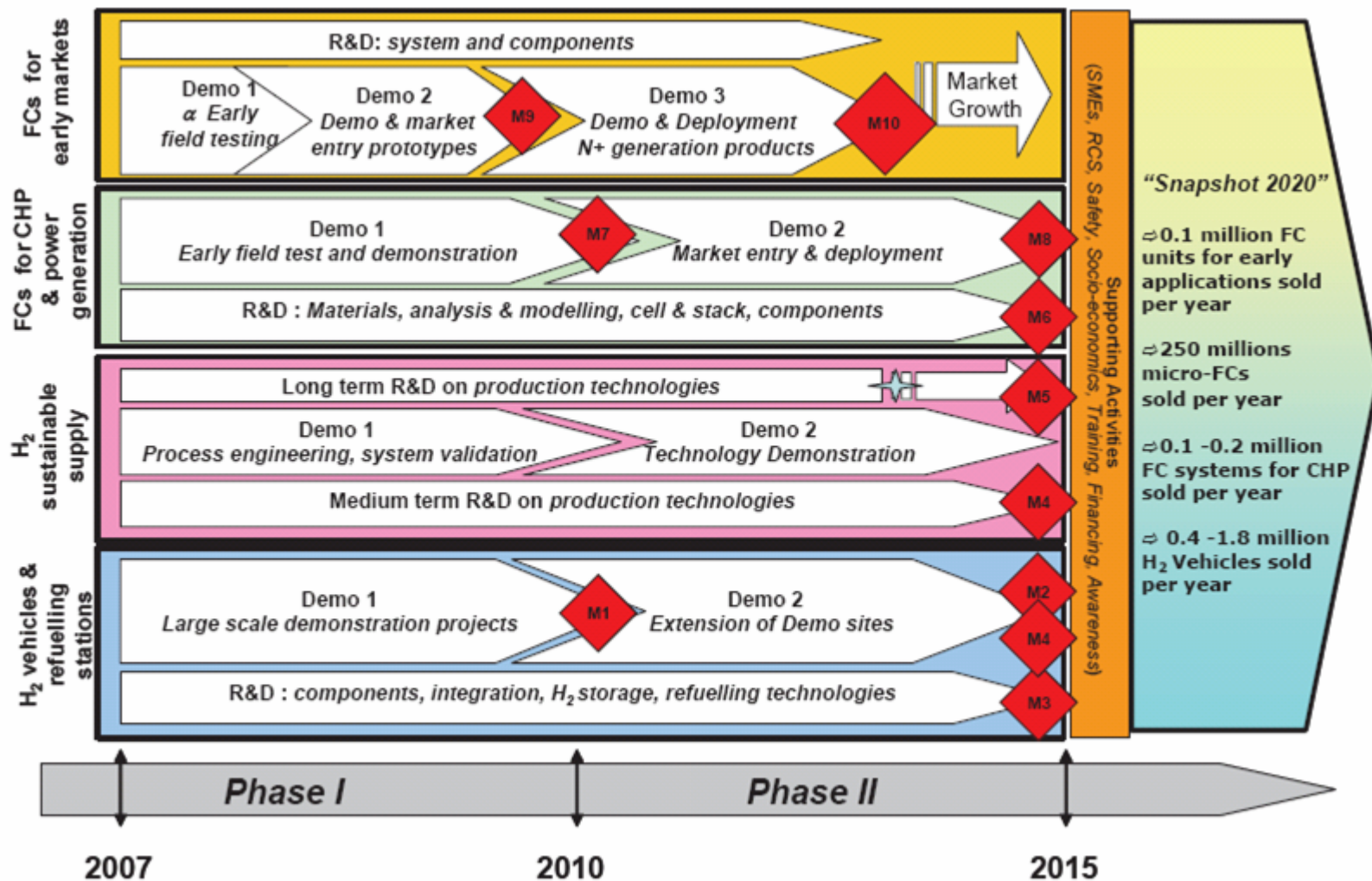
- Integrated approach for research, development and deployment of fuel cell technologies of different stages of maturity (PEMFC, SOFC and MCFC)
- Focus on SOFC (residential and industrial; strength of EU industrial base)

4. Fuel Cells for Early Markets

- Prepare "H₂ Economy": short-term demo, FC power module development, industrial capability built-up
- Sectors: Portable Generators, specialty vehicles, by-product H₂ power generations, micro fuel cells
- Integrated and iterative process of development and demonstration

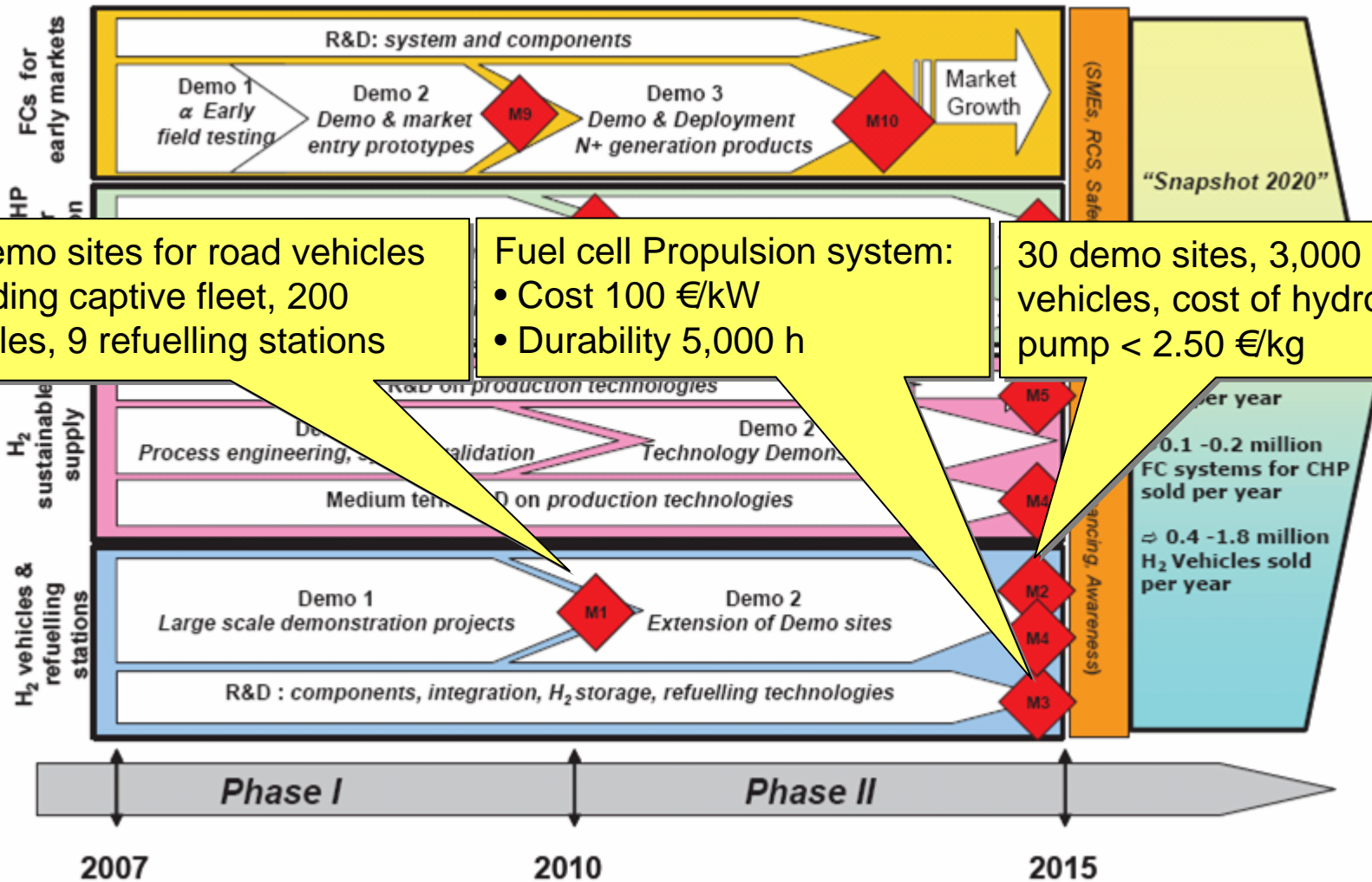


European Roadmap for Development and Deployment of H2 & FC Technologies



IDA 1: H2 Vehicles & Refueling Stations

Goals & Milestones



13 demo sites for road vehicles including captive fleet, 200 vehicles, 9 refuelling stations

Fuel cell Propulsion system:

- Cost 100 €/kW
- Durability 5,000 h

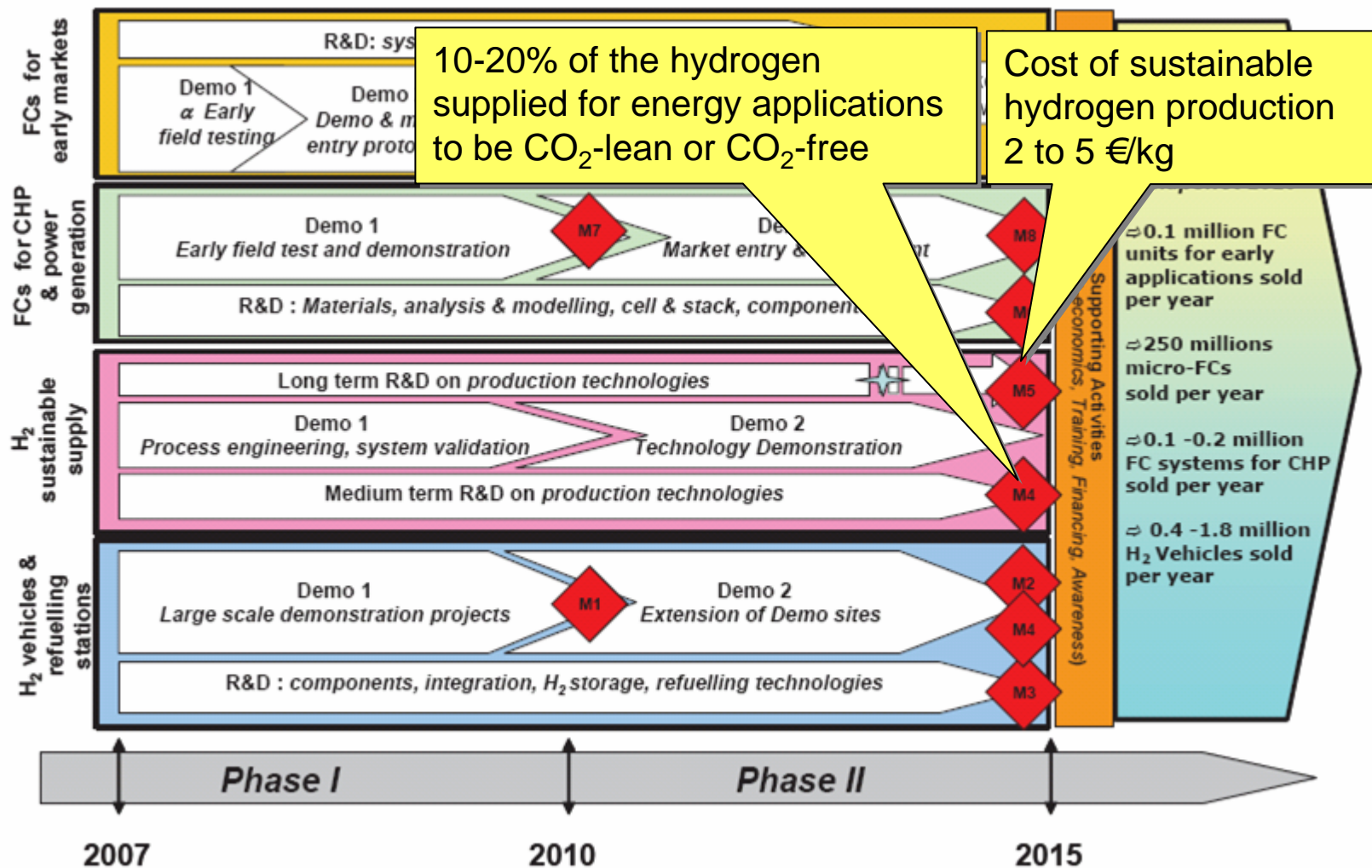
30 demo sites, 3,000 vehicles, cost of hydrogen at pump < 2.50 €/kg



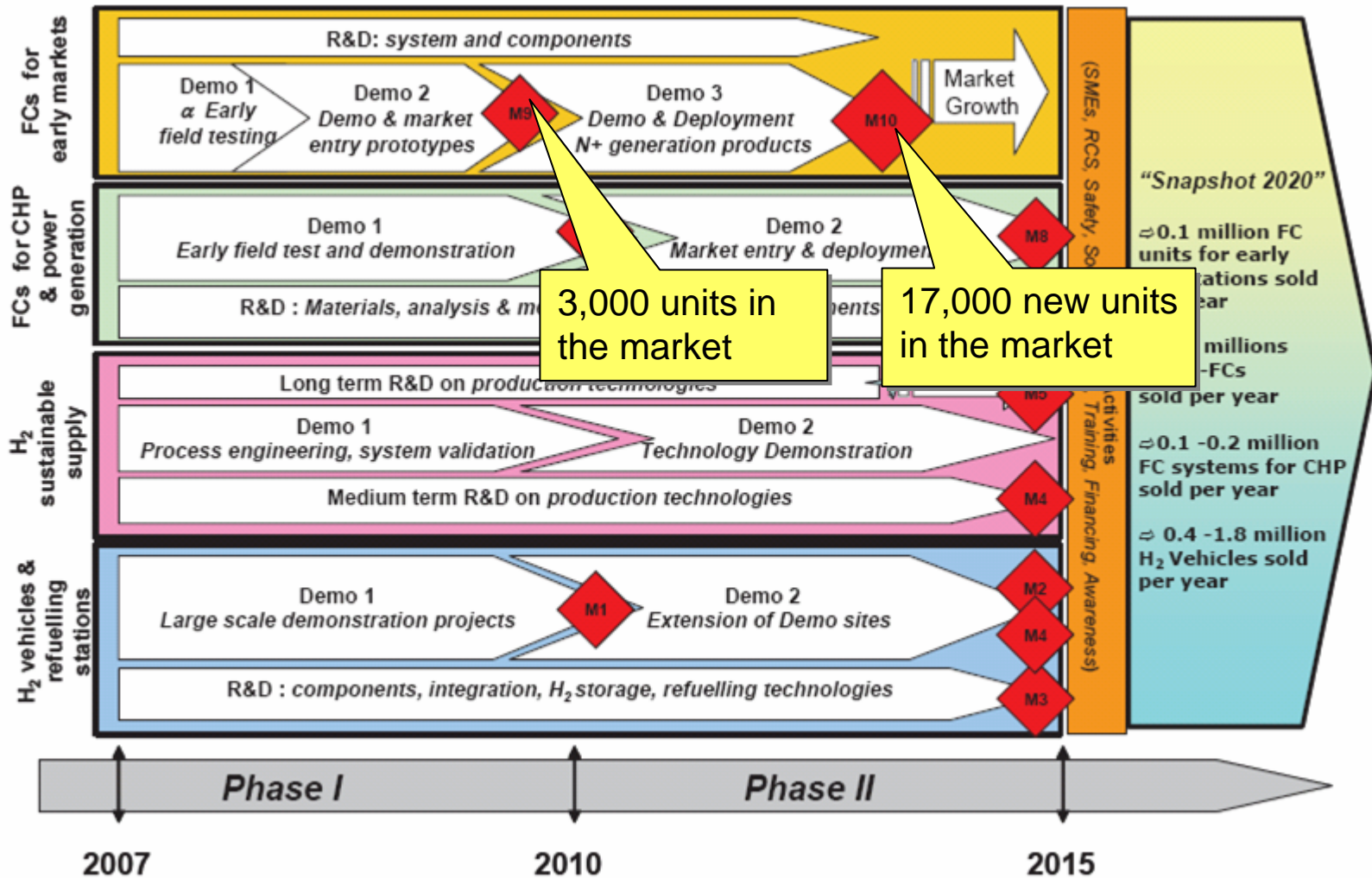
H₂O



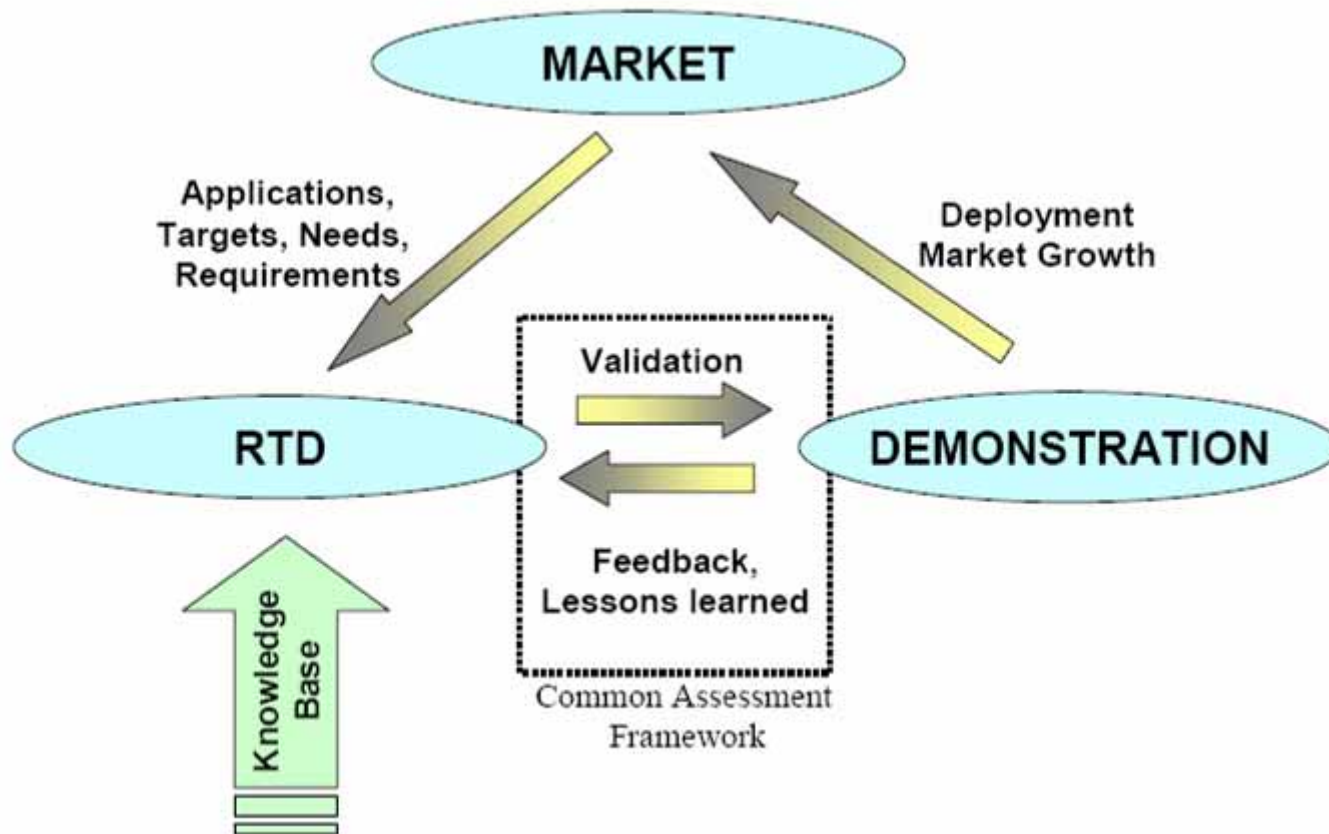
IDA 2: Sustainable H₂ Production & Supply Goals & Milestones



IDA 4: FCs for Early Markets Goals & Milestones



Programme Interactions



Resource Requirement Estimation

	Ressources	R&D	Demo	Support Activities
IDA 1	2,661 M€	30 %	63 %	7 %
IDA 2	759 M€	56 %	38 %	6 %
IDA 3	2,853 M€	25 %	74 %	1 %
IDA 4	1,110 M€	13 %	72 %	15 %
Total	7,383 M€	28 %	66 %	6 %



Comparison to Budget Figures

Budget Estimate

FP 6: 300 M€ in 4 years	→ 75 M€ p.a.
+ FP increase by 40 %	→ 30 M€ p.a.
+ national budgets (HyCo estimate)	→ 200 M€ p.a.
+ additional Programmes	→ 50 M€ p.a.

Total **Ca. 350 M€ p.a.**

- Currently foreseeable public budget: 2.2 to 2.5 bn €
- Together with private budgets (match 50%), program seems feasible
- Increase over current spending is necessary for full implementation
- Funding at european level is important for focusing on common goals
- Major contributions from member states and regions will be necessary

