HyWays

Towards a “European Hydrogen Energy Roadmap”

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HySafe Workshop, Paris
09 March 2005

Objectives

Budget and Duration

Partners

Deliverables and Milestones

Methodology

First results

Next steps

HyWays is an ***Integrated Project*** to

- develop a harmonised ***European Roadmap*** for H_2 energy,
- provide recommendations for an ***Action Plan*** (Roadmap implementation),
- develop a **standard procedure** for the roadmap process,

by means of

- describing the ***future steps*** towards H_2's large-scale introduction,
- considering ***transport and power sectors*** (storage medium for renewables),
- using inputs from EU ***industry, R&D institutes*** and ***member state experts,***
- combining known ***technology databases*** and ***socio-economic analysis,***
- evaluating ***stakeholder scenarios*** for sustainable H_2 energy systems and
- reflecting real life member state ***opportunities and barriers***.

Initiation by HyNet: May 2002

(early involvement of MS initiatives HyFrance, H2-IT, etc.)

Start of HyWays: 01 April 2004

Duration: 3 years (in 2 phases of 18 months)

Total Budget: 7.9 M€

Funding: 4.0 M€

Industry

Member states

Institutes

L-B-Systemtechnik

H_2 infrastructure build-up analysis

Graphical assessment in time and capital investments and timescales

Economic impacts analysis

Impacts on micro-, meso- and macro-economic level (e.g. GDP, EU balance of trade, employment creation/substitution and security of supply)

Policy measures analysis

Effect of policy measures on H_2 market penetration (e.g. carbon trading, taxation and preferential city-centre access for clean vehicles)

Analysis of technology impacts

Technology learning (cost reduction, technology breakthroughs), e.g. price competitive durable FCs for transport and residential/ industrial use, H_2 storage, CO_2-capture and reliable sequestration

All analysis is on regional level considering country / region specific conditions

Emissions analysis

Potential GHG and pollutant emissions reductions for given scenarios

Development of the European Hydrogen Energy Roadmap

Integration of aggregated member state specific results into proposal for an EU Hydrogen Energy Roadmap:

- GHG emissions,
- preferred H_2 production and infrastructure technologies and
- build-up of supply infrastructure and end-use technologies

for the timeframes 2020, 2030 and 2050

In Phase II the Roadmap based on 6 member states‘ input will be broadened to other interested member states

The real benefit is not only ***„technical learning“*** from complex simulations based on an involvement of experienced partners…

…but also

„social learning“ by intense highly disciplined discussions among the HyWays partners and specifically an extended reach into the member states resulting in

- multiple mutual learning effects (European synthesis) and
- dynamic iterative generation of new insights.

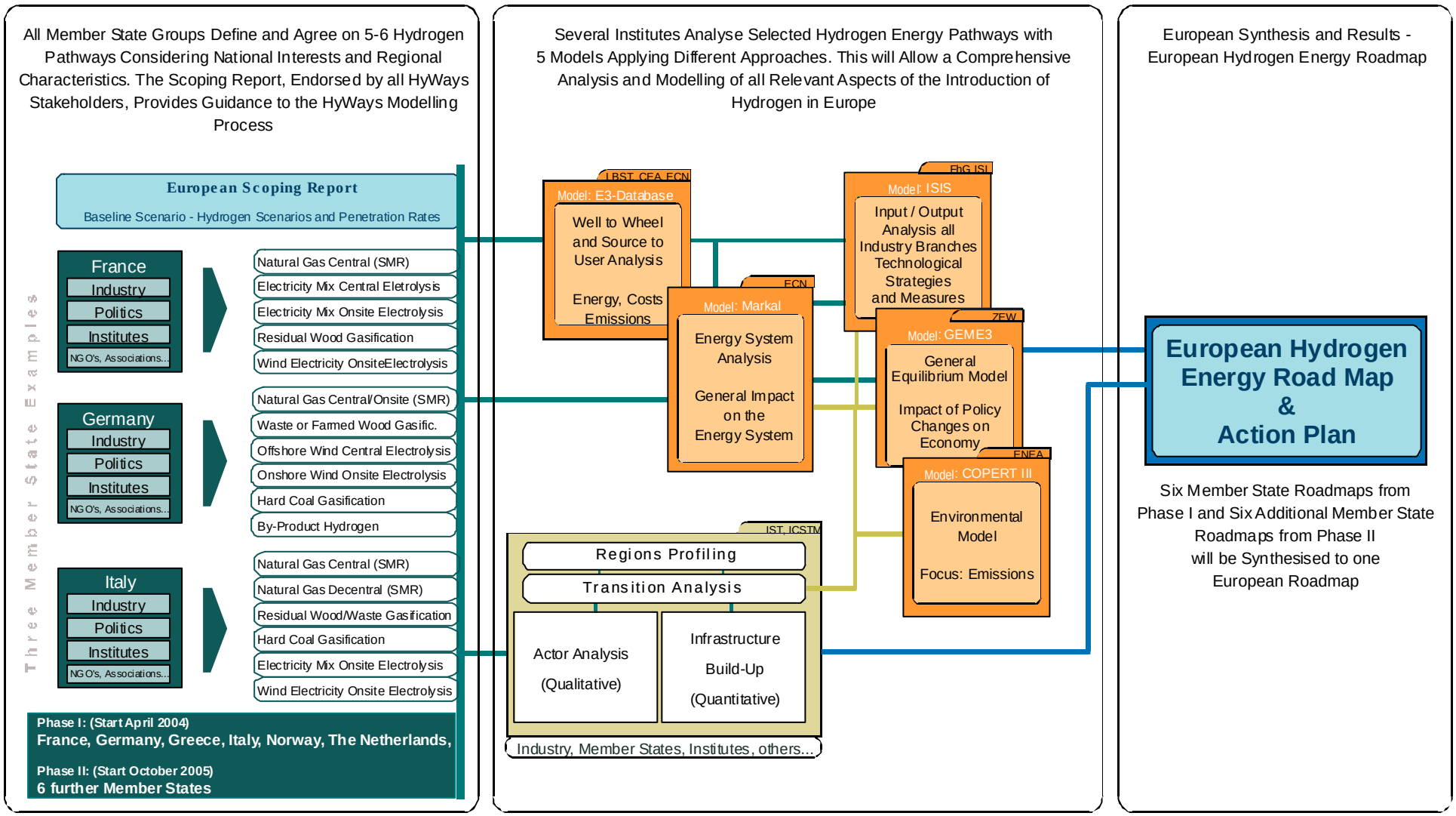
HyWays – Flow Chart (from the HFP Poster Presentation March 2005)

HyWays

All Member State Groups Define and Agree on 5-6 Hydrogen Pathways Considering National Interests and Regional Characteristics. The Scoping Report, Endorsed by all HyWays Stakeholders, Provides Guidance to the HyWays Modelling Process

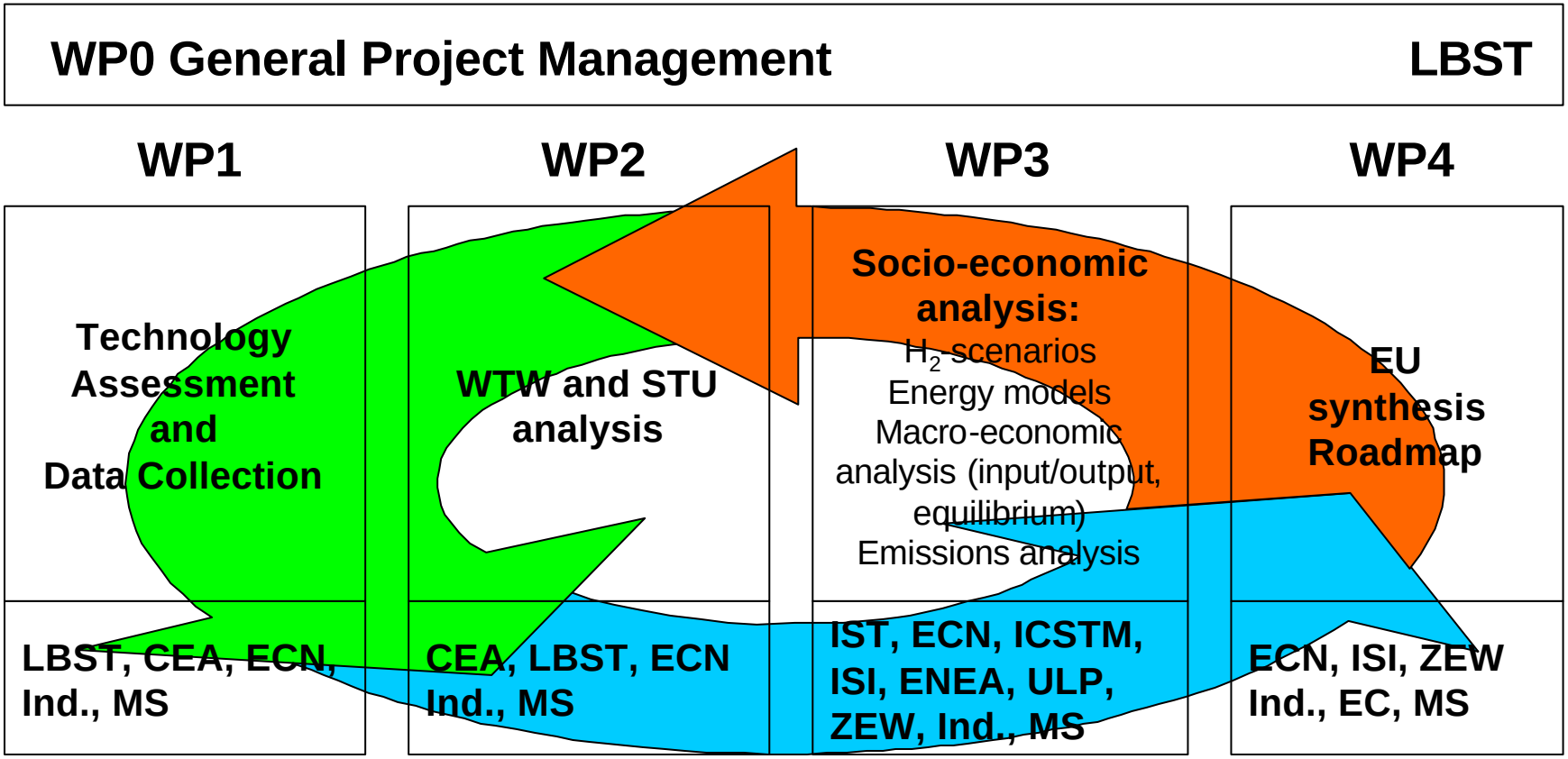
Several Institutes Analyse Selected Hydrogen Energy Pathways with 5 Models Applying Different Approaches. This will Allow a Comprehensive Analysis and Modelling of all Relevant Aspects of the Introduction of Hydrogen in Europe

European Synthesis and Results - European Hydrogen Energy Roadmap



Methodology – Work Package Structure and Participation

HyWays

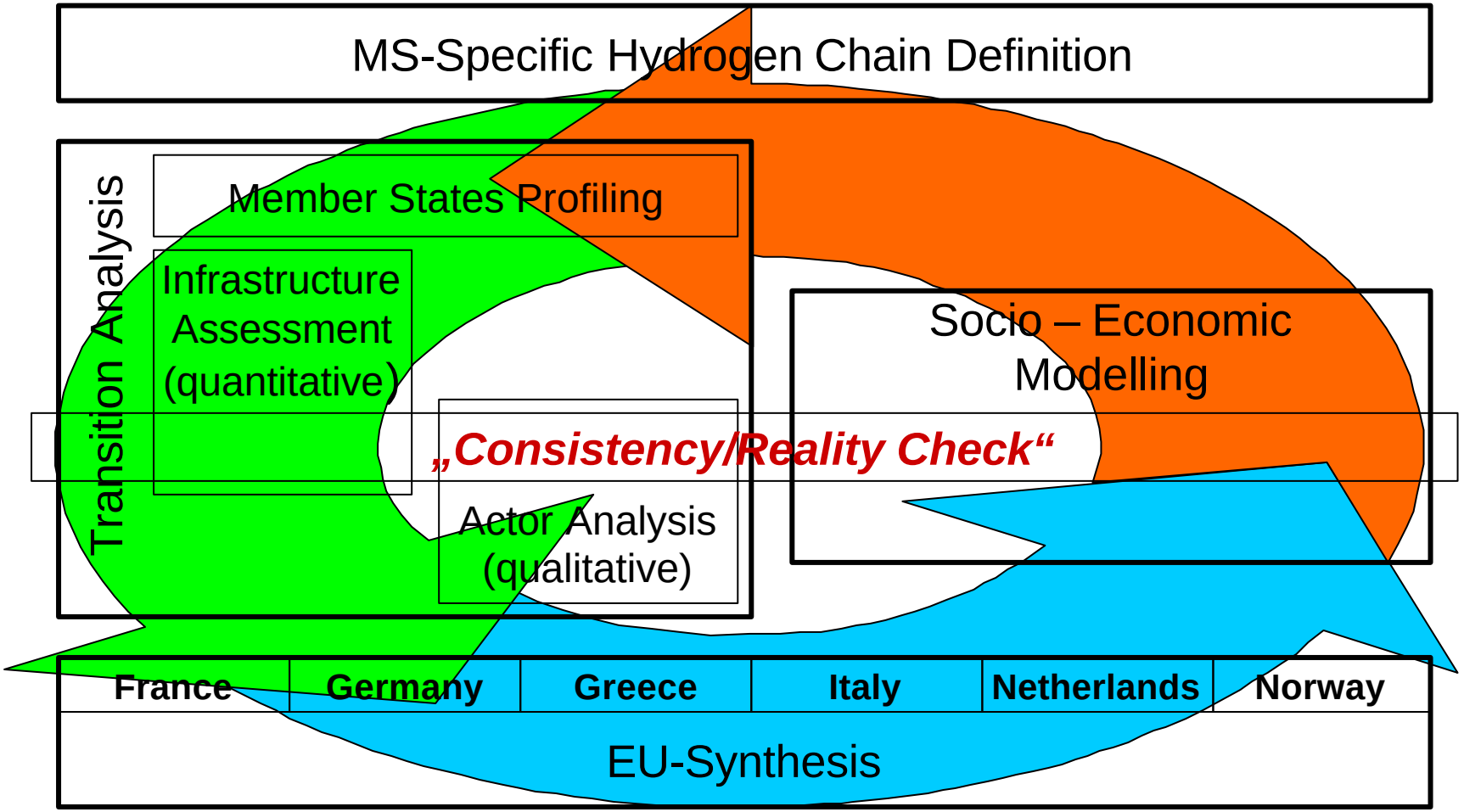


Ind. - Industry (21 auto, energy/oil and process companies)
MS – 6 regional or member state experts

Industry participates in all WPs and performs reality check

Methodology – A Multi-Dimensional Approach

HyWays



HyWays

HyWays is highly innovative:

- Simultaneous multi-disciplinary approach
  - Technological development
  - Socio-economic effects
  - Policy developments, e.g. GHG emission limitations, economic competitiveness and security of supply
- Simulation framework addressing micro, meso and macro level
  - Setting international and European scope as framework
  - Synthesis from member state to European level
- Involvement of industry, r&d institutes and member states
- Use of widely accepted recent databases
- Balanced team of hydrogen experts
- Transparently interfacing with larger stakeholder group in HFP

Innovation also means challenges:

- complexity of multi-layer definition / multi-dimensional simulation task
- pioneer in testing ***Integrated Project*** as new EC-funding instrument
- risk of missing consensus
  - between partner interest groups with naturally diverging views
  - when raising the MS input one hierarchy level up
- PRIMES I modelling identified as inconvenient starting point (outdated for energy price projections, way off for some growth figures (cars....) and no consideration of fossil resources (< 2030))
- need to apply policy simulation instruments to incorporate industry
- highly competitive process to choose Phase II member state partners

Finalised:

- European Scoping Report with technical annex
- Member state profiling reports for D, F, GR, I, N and NL
- Up to six main hydrogen energy chains WtW and StU for D, F, GR, I, N and NL
- Handbook for further member state partners
- Interface description for software tools E3 Database, MARKAL, ISIS, GEM-E3 and COPERT (handover via EXCEL sheets)
- Image brochure and flyer

In progress:

- Socio-economic and emissions modelling at micro-, meso- and macro-level
- Actors analysis
- Infrastructure build-up analysis
- European synthesis

Selected Results – Choice of Greek H_2 Energy Chains

HyWays

	Feedstock	Production	1st Conversion	Transport/distribution	End-use
1	Wind electricity	Central Electrolysis	-	GH_2 pipeline CGH_2 FS	FC car
2	Wind electricity	De-central Electrolysis***	-	CGH_2 Fuelling Station	FC car
3	Natural gas	Central SMR*	-	GH_2 pipeline + CGH_2 FS	FC car
4	Hard Coal	Gasification*	-	GH_2 pipeline + CGH_2 FS	FC car
5	Wind Electricity	Central Electrolysis	-	GH_2 pipeline + local H_2 grid	CHP system
6	Wind Electricity	De-central Electrolysis	-	Local H_2 grid	CHP system
7	Natural Gas	Central SMR*	-	GH_2 pipeline + local H_2 grid	CHP system
8	Hard coal	Gasification *	-	GH_2 pipeline + local H_2 grid	CHP system
9	Natural Gas	Central SMR**	-	GH_2 - NG pipeline	Regular Boiler

*With Carbon Capture & Storage **Mix H2 into the NG grid ***Dedicated on-shore wind electricity for island

This project is financed by the HyWays partners and by funds from the European Commission under FP6 Priority [1.6] contract number 50 25 96.

The co-ordination of HyWays is a rewarding and satisfying task due to the innovation potential and creativity of the HyWays partners.

The co-ordinator would like to thank the EC to create the right framework for the discussion process, and the HyWays partners for their support during the long and exhausting proposal and contract preparation phase.