

# HyWays-IPHE: Comparing Hydrogen Analyses

Christoph Stiller  
Ludwig-Bölkow-Systemtechnik GmbH (LBST)  
on behalf of the HyWays-IPHE consortium

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Workshop Hydrogen Infrastructure Build Up  
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- Project outline, objectives and organisation
- WP2: Hydrogen energy pathway comparisons
- WP3: Further comparisons
- WP4: Dissemination
- Input to discussion topics and key questions

# HyWays-IPHE Partners

## EU Institutes



Ludwig-Bölkow-Systemtechnik



Fraunhofer Institute Systems and Innovation Research



Institute for Energy



INSTITUTO SUPERIOR TÉCNICO  
Universidade Técnica de Lisboa

## U.S. Institutes



DOE Hydrogen Program

## Industry monitoring group



DAIMLER



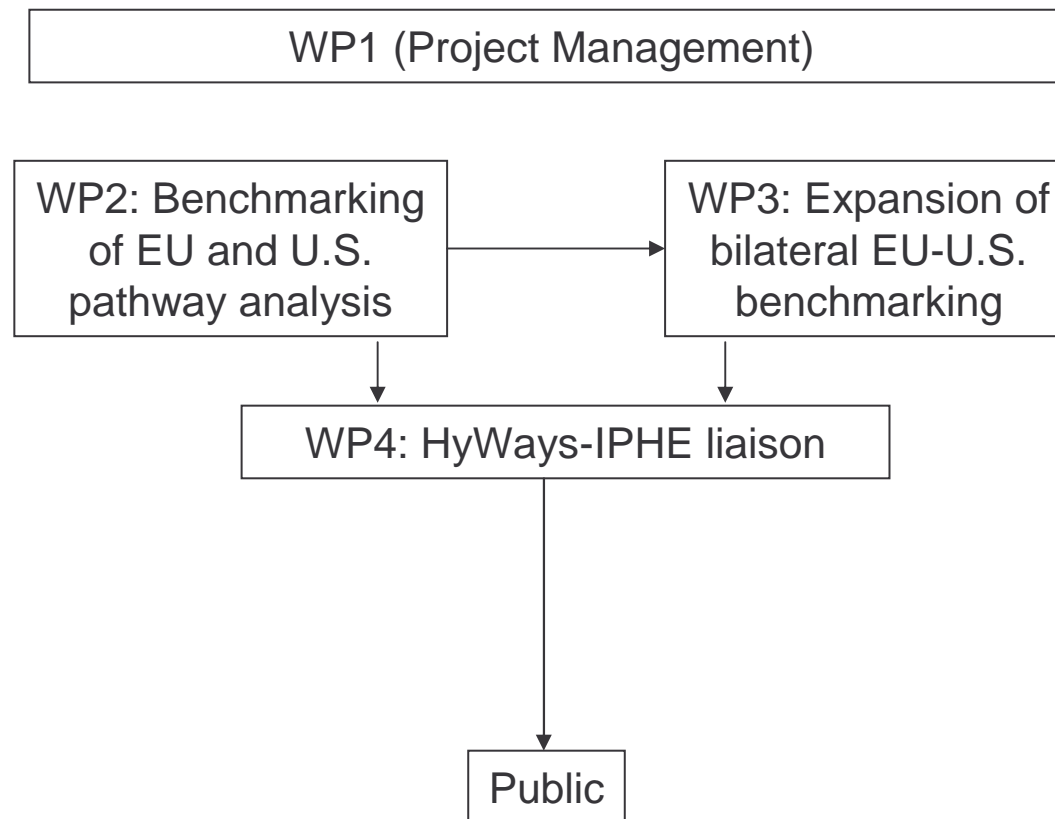
GE  
Oil & Gas



# Project Scope and Objectives

- Compare roadmapping and system analysis activities in Europe and USA (+other IPHE partners)
  - Improve understanding about the ongoing activities (common language, mutual understanding, alignment of int'l approaches)
  - Institutional and personal exchange under IPHE patronage
- ⇒ **Goal:** Develop recommendations for the preparation of an International Hydrogen Roadmap
- 24 month project (Oct 2006 – Oct 2008)
  - Total budget: 537 k€ (56% EC contribution; 30% US DOE, 14% industry)

# Organisation



## WP2: EU/U.S. pathway comparison

- Models: E3database vs. H2A Production/HDSAM/GREET
- 9 representative Well-To-Tank pathways compared (electrolysis, SMR, CTH; onsite/central, pipeline, trucked-in LH2)
- Costs, energy use and GHG emissions compared
- Key results:
  - Generally, results are similar
  - Some significant techno-economic differences (e.g. biomass gasification efficiency, pipeline configuration)
  - Different modelling philosophies for economic analysis (micro- vs. macro-economic)
  - Regional differences visible (fuel economy, taxes)
- **Current status:** Report preparation; reports available on [www.hyways-iphe.org](http://www.hyways-iphe.org) by November 2007

## WP3: Comparison of roadmapping elements

Task	Comparison type
<b>Infrastructure/ transition analysis</b>	<b>1. Compare model objectives, methodology, result type. 2. Philosophy behind the roadmapping process Models: MoreHyS/HyWays methodology vs. HyTRANS</b>
<b>Stakeholder involvement</b>	<b>Describe how SI works on each side (US: Tech teams, EU: HyWays) =&gt; Recommendations for EU/JTI</b>
Energy system modelling/ energy price	Impact of energy prices on results => use existing oil price sensitivities
Economic impacts	Describe and try to discuss the importance of employment/GDP on each side.
Interlinkage models and tasks	EU: Explain interfaces on models and overlapping, learnings and experiences. US: Incentives to start model developments
Probabilistic analysis	CO2/energy MonteCarlo analysis. H2A/HDSAM cost bandwidth, see where E3 value is in the bandwidth
H2 Vehicle costs and targets	Compare fuel cell, storage, electronics targets and state of the art

**Current status:** Ongoing, to be finished March 2008

## WP4: Dissemination

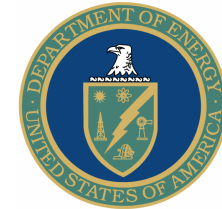
- Disseminate jointly developed understanding
- Workshops in other IPHE countries (e.g. China, India, Australia)
- Collect feedback from experts
- Further institutional & personal exchange
- **Current status:** Not started (Jan-Oct 2008)

- Lessons learned => Approaches and importance of different roadmapping elements in EU and U.S. (mostly modelling work)
- Scope of actions, pathways and infrastructure analysis for JTI => Insights from WP2/3 may be used (importance of elements on either side). Pathway and regional infrastructure analysis seem most important in the U.S. (rather than GDP / employment / actor analysis)
- Procedural approaches for consensus building/strategy development => Insights from WP3 task “Stakeholder interaction” may contribute
- Common modelling approaches/analysis language at EU level => Insights from WP3 task “interlinkage of models and tasks” may contribute
- Developing base case => Insights from different WP3 EU/U.S. comparisons may be used for cross-checking of assumptions (e.g. energy prices, vehicle costs, ramp-up curves)
- (Infrastructure build-up with RSFF)
- International co-operation: Suggestions for further extension of collaboration will be elaborated

- (Public-private structures needed for consensus strategy of infrastructure build-up)
- **Modelling tools sufficient? => Need for further developments may be derived from comparisons with U.S. models**
- (How and which infrastructure tools can be useful for JTI?)
- (Alignment EU level/Member State level?)
- **International cooperation dimension? => Common model developments/refinements with U.S./other key players?**

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HyWays - IPHE  
Benchmarking of Hydrogen Roadmap Models and Tools

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HyWays-IPHE  
area

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Welcome

**HyWays-IPHE**

HyWays IPHE is a specific support action (SSA) to assess and compare the development efforts for the European Hydrogen Energy Roadmap prepared by HyWays with international roadmapping or comparative activities of IPHE partner countries.

In a first step, it aims at an in-depth assessment and comparison of the individual elements of the national/ regional strategies, modelling approaches and experiences in the EU and the U.S.. This will include infrastructure analysis, stakeholder consultation processes, actor analysis, micro-, meso- and macro-economic modelling, Well-to-Wheels (WtW)- analyses, cashflow analysis, interfaces and interaction between the different types of models used, basis for scenario development, etc.

Modellers from the different nations/world regions shall compare in detail their models and experiences in dedicated workshops in order to foster a better mutual understanding of the models and their contribution to the hydrogen road mapping process, facilitate the exchange of the methodologies and, where applicable, endorse the adoption of individual approaches from each other. This may include tasks and goals of expected results, models used, stakeholders involved, process related issues, communication with stakeholders and dissemination activities, timelines, and progress. Whenever applicable a benchmarking between individual models (e.g. for the EU-US case: E3database and H2A+GREET) may be performed using generic datasets.

In a second step, the project aims at broadening its scope within IPHE by including and involving other IPHE partner countries such as Japan, China, India etc. Workshops will be held, introducing these partners into the EU-U.S. work and getting them engaged in this process.

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