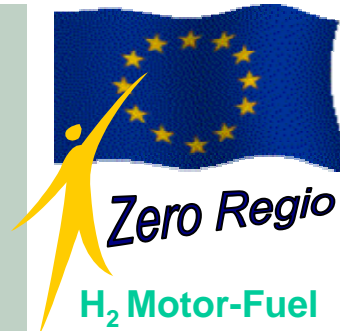


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ZERO REGIO

www.zeroregio.com

Lombardia & Rhein-Main towards Zero Emission:
Development and Demonstration of Infrastructure
Systems for Hydrogen as an Alternative Motor Fuel

Project Start – Nov.15, 2004, Duration 5 Years
Overall Objective - Developing zero emission transport systems
for European Cities

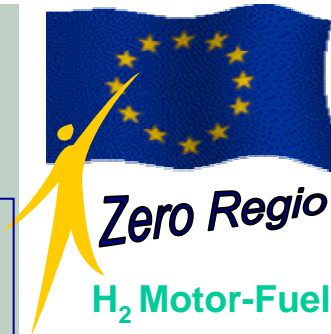
Project Co-ordinator: Infraserv Höchst - Frankfurt, Germany

heinrich.lienkamp@infraserv.com

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Project Consortium



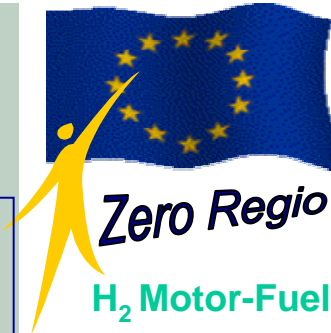
16 Partners from 4 countries

- | | | |
|-----|--|---------------------------------|
| 1. | InfraserV GmbH & Co. Hoechst KG | Germany, Industry, Coordinator |
| 2. | Linde AG, Linde Gas & Engineering | Germany, Industry |
| 3. | DaimlerChrysler AG | Germany, Industry |
| 4. | Fraport AG, Frankfurt Airport Services Worldwide | Germany, Public Admin. |
| 5. | TÜV Technische Überwachung Hessen GmbH | Germany, Industry |
| 6. | Agip Deutschland GmbH | Germany, Industry |
| 7. | Lunds Universitet | Sweden, University |
| 8. | Roskilde University | Denmark, University |
| 9. | Saviko Consultants Ltd. | Denmark, Industry-SME |
| 10. | European Commission-DG Joint Research Centre | Italy, EC |
| 11. | EniTecnologie S.p.A. | Italy, Industry |
| 12. | Regione Lombardia | Italy, Public Admin. |
| 13. | Sapio Produzione Idrogeno Ossigeno S.r.l. | Italy, Industry |
| 14. | Comune di Mantova | Italy, Public Admin. |
| 15. | Università commerciale Luigi Bocconi | Italy, University |
| 16. | C.R.F. Società Consortile per Azioni | Italy, Industry-Research Centre |

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A Demonstration Project

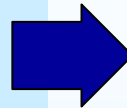


Project Execution in two phases

RCS intensive phase

Development/Construction Phase (0-24 m)

- Develop and construct modern multi-energy service stations
- Design & construct H₂ infrastructure: transport lines, production unit, compression & distribution equipment
- Integrate H₂ in service stations
- Assure overall safety
- Obtain certification
- Prepare test procedures



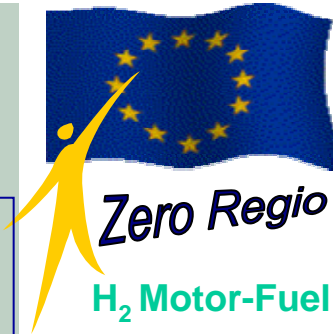
Demonstration Phase (25- 60 m)

- Acquire fleets at both sites
- Organise personnel training
- Perform field tests
- Acquire data on infrastructure & FCV's
- Analyse & evaluate data on energy, performance and emissions
- Analyse/evaluate socio-economic aspects
- Disseminate & exploit project results

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Fuel Cell Car Fleets



DC ClassA F-Cell in Rhein-Main



Fiat Panda in Lombardia



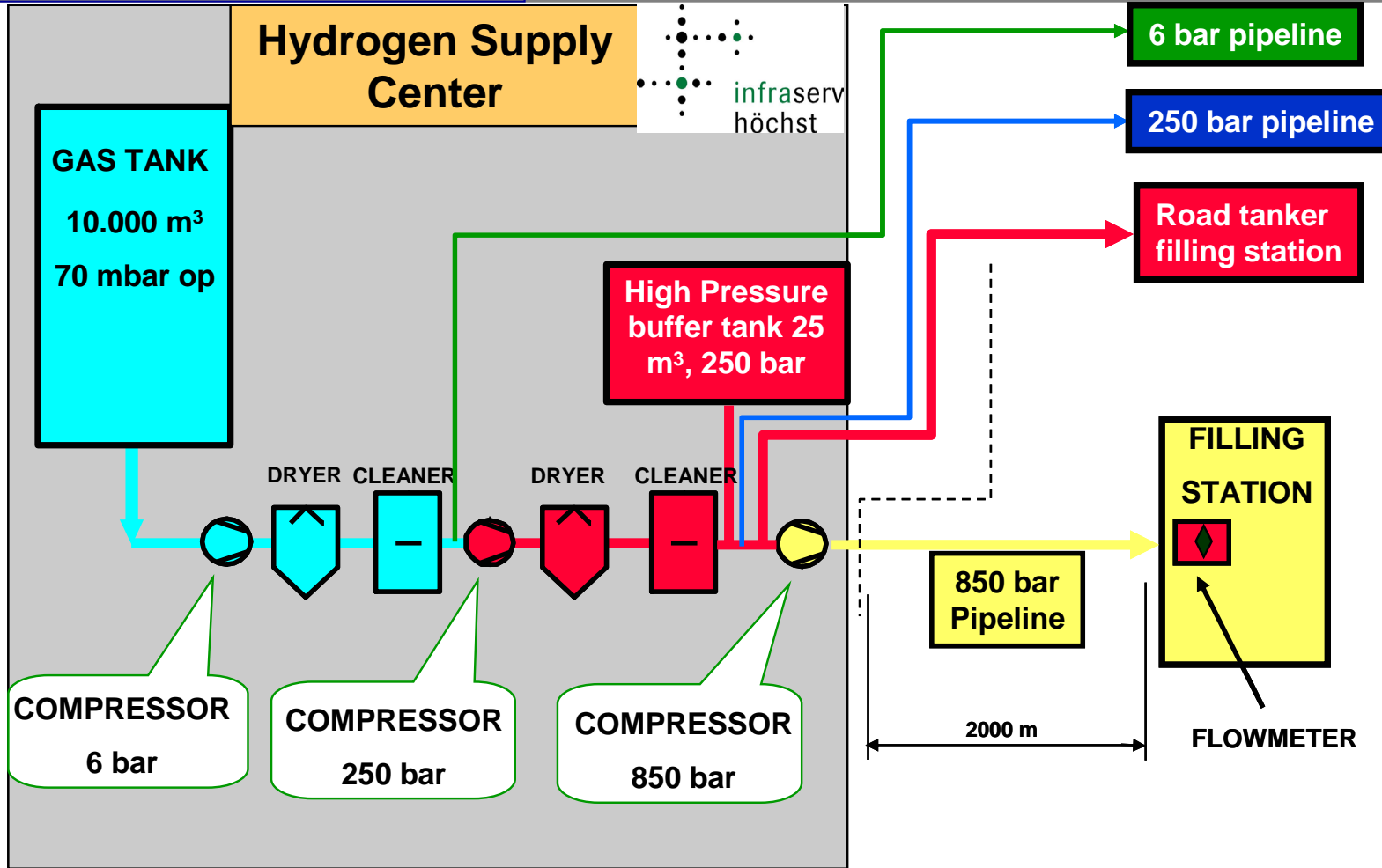
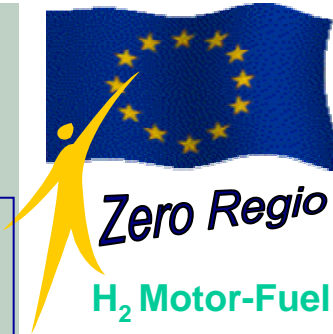
5 cars, ca. 150 car months (in phase 2) 3 cars, ca.110 car months

A Demonstration Project for Fuel Cell passenger cars

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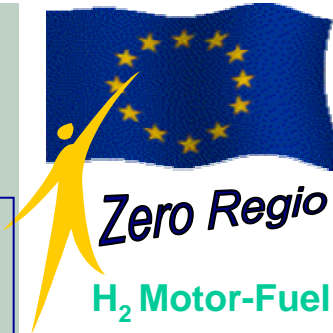
H2 Transport Line, Höchst



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RCS & Safety Needs

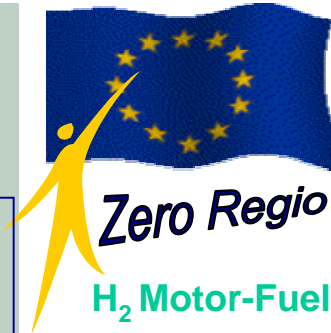


- HP (850 bar) H₂ Transportline 2 km. Long (compare w. Gap Analysis)
 - Hydrogen embrittlement
 - Leakage detection
 - Siting of pipeline (under/over ground) in industrial area
 - Gas quality standards (Hg, moisture, oil traces at high pressures)
- Hydrogen compression and refuelling infrastructure
 - Material f. valves (Bellow sealed ?)
 - On-site reforming of Methane
 - H₂ Integration in a multi-fuel public service station
 - Canopy and dispenser design
 - Safety distances, ventilation (in and outside the filler point)
- FC - car fleets at the two demonstration sites
 - Large differences in homologation practices for prototypes

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Project View on RCS



- On certain subjects too much information (not always relevant) available e.g. pipeline transport mostly at low pressures
- Over 160 requirements reg. refuelling stations reported in EIHP
- EIHP2 covers a few themes
- No efficient way to get what the project needs
- IG-RCS can contribute
- How do we avoid duplication – learn from other projects (CUTE, CEP)
- Do we have access to all the relevant reports/results ?
- International cooperation on safety issues
- Harmonisation within EU – EIHP2 status ?
- Integration of regulating authorities from different countries

Thank You