

THE EUROPEAN INDUSTRY GROUPING FOR A FUEL CELLS AND HYDROGEN JOINT TECHNOLOGY INITIATIVE



**NEW-IG General Assembly
9 & 10'th NOV 2010**



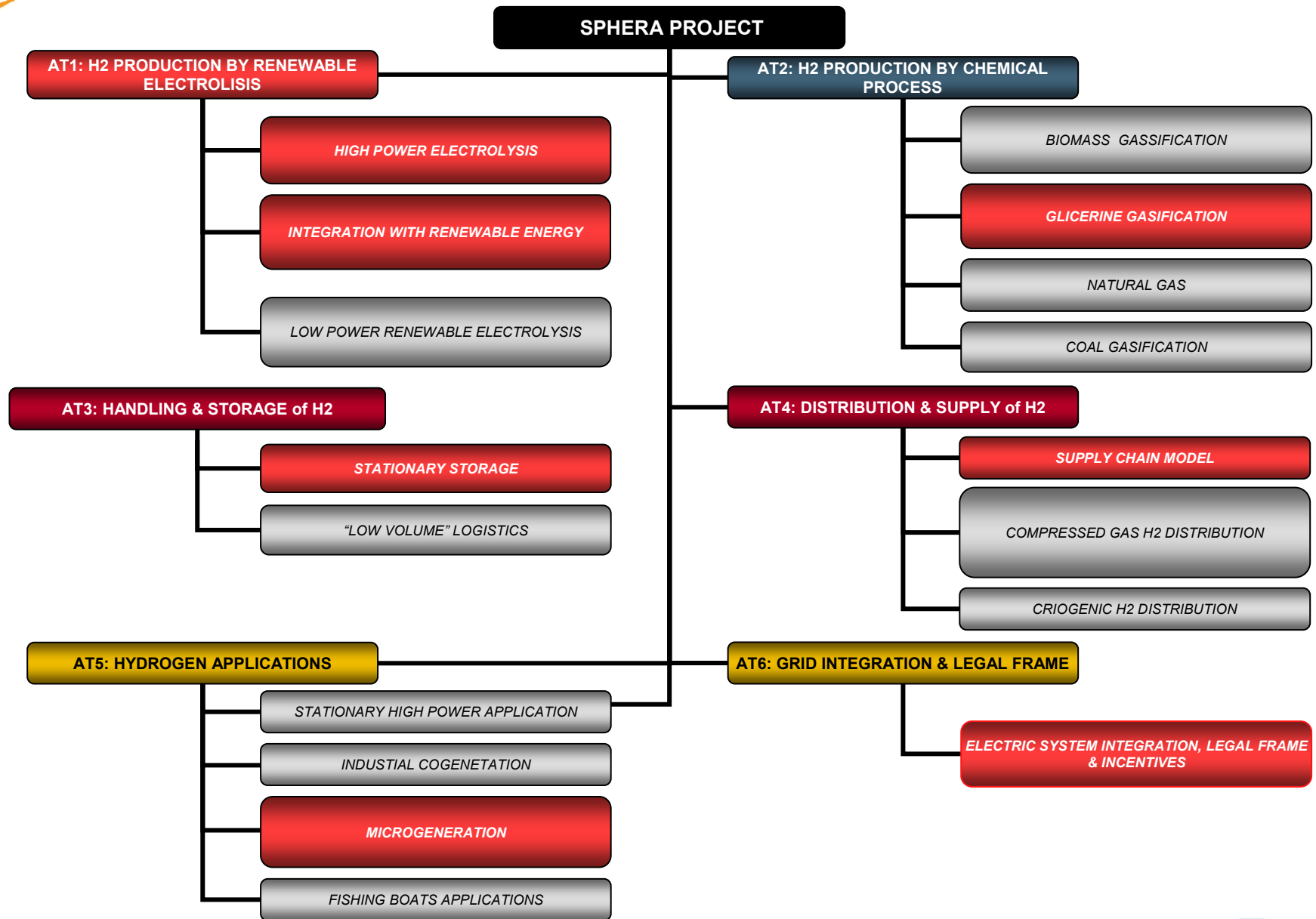
SPHERA Project
By **Eugenio GUEL BENZU**
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Soluciones para la **P**roducción de **H**idrógeno **E**nergético y **R**econversión **A**sociada

- Project within the **CENIT** program of Spanish Ministry of Industry, Trade & Tourism.
- **Founded & Managed** by CDTI (**C**entro para el **D**esarrollo **T**ecnológico **I**ndustrial).

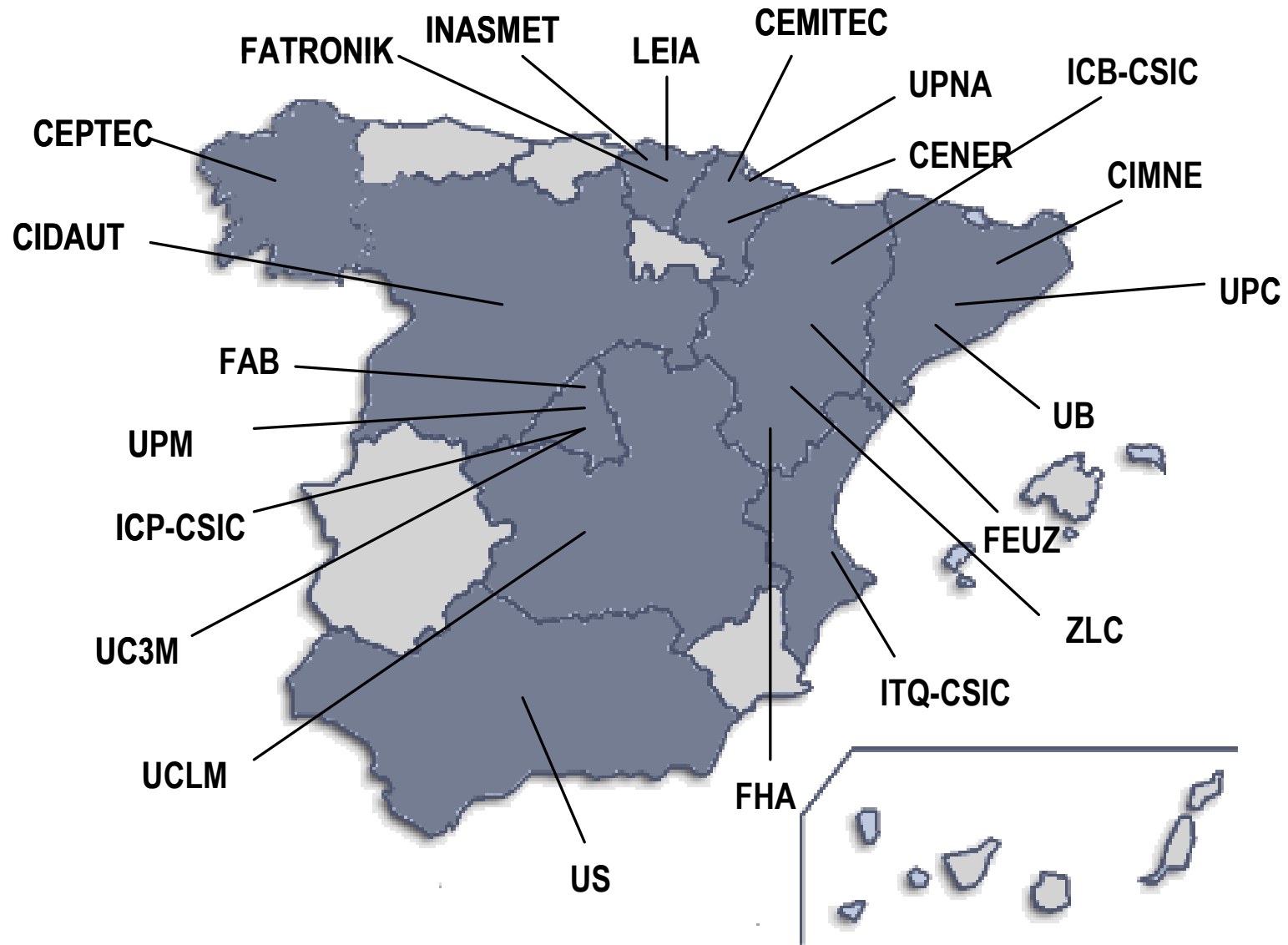


- **4 years** (2007 – 2010) & **31 MM €** budget project.
- **Applied Research** Project.
- **Focused on Hydrogen Production** but cooping with the all Hydrogen chain.
- **Leaded** by 



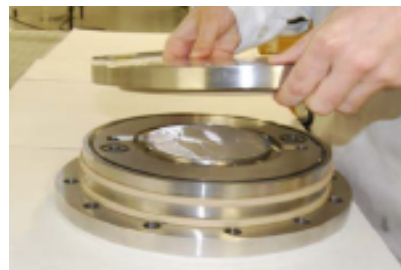
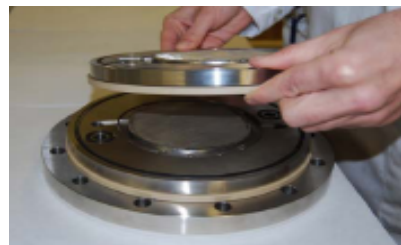
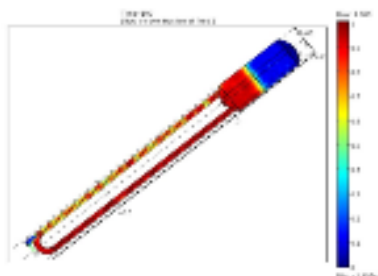
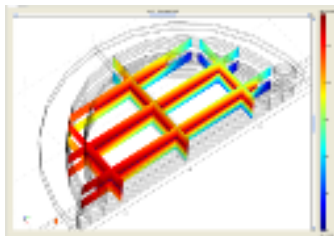
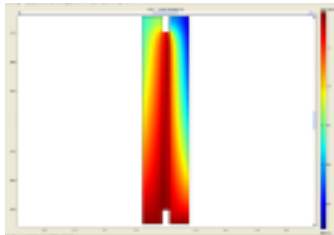
PROJECT CONSORTIUM (Industrial Partners)



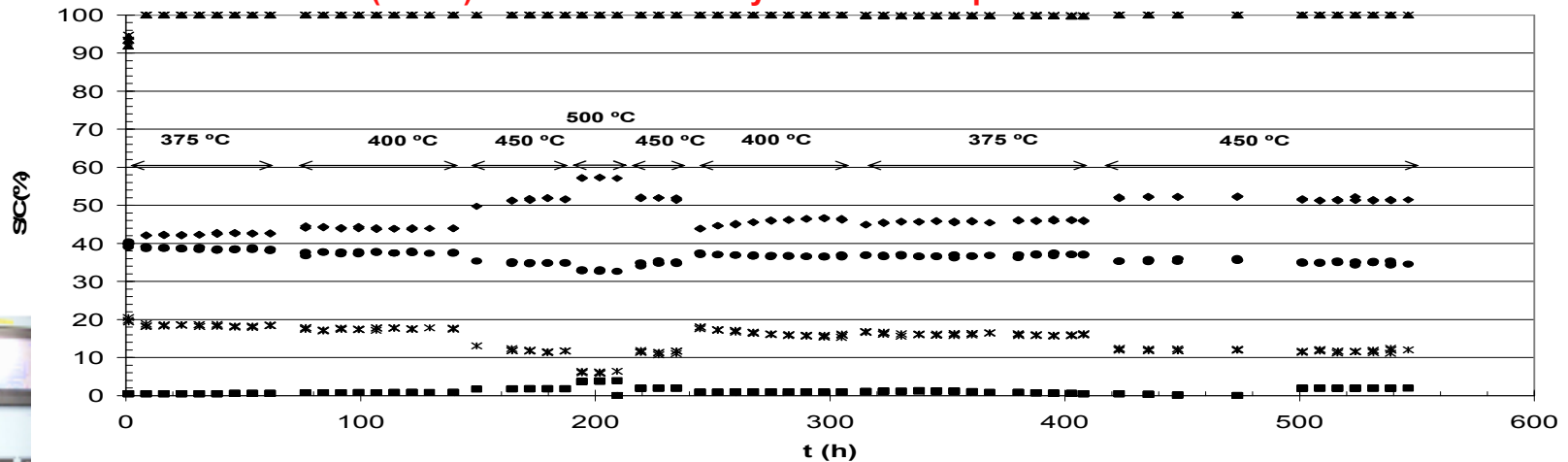


PROJECT RESULTS: A1:Alkaline Electrolyser for R.E.S.

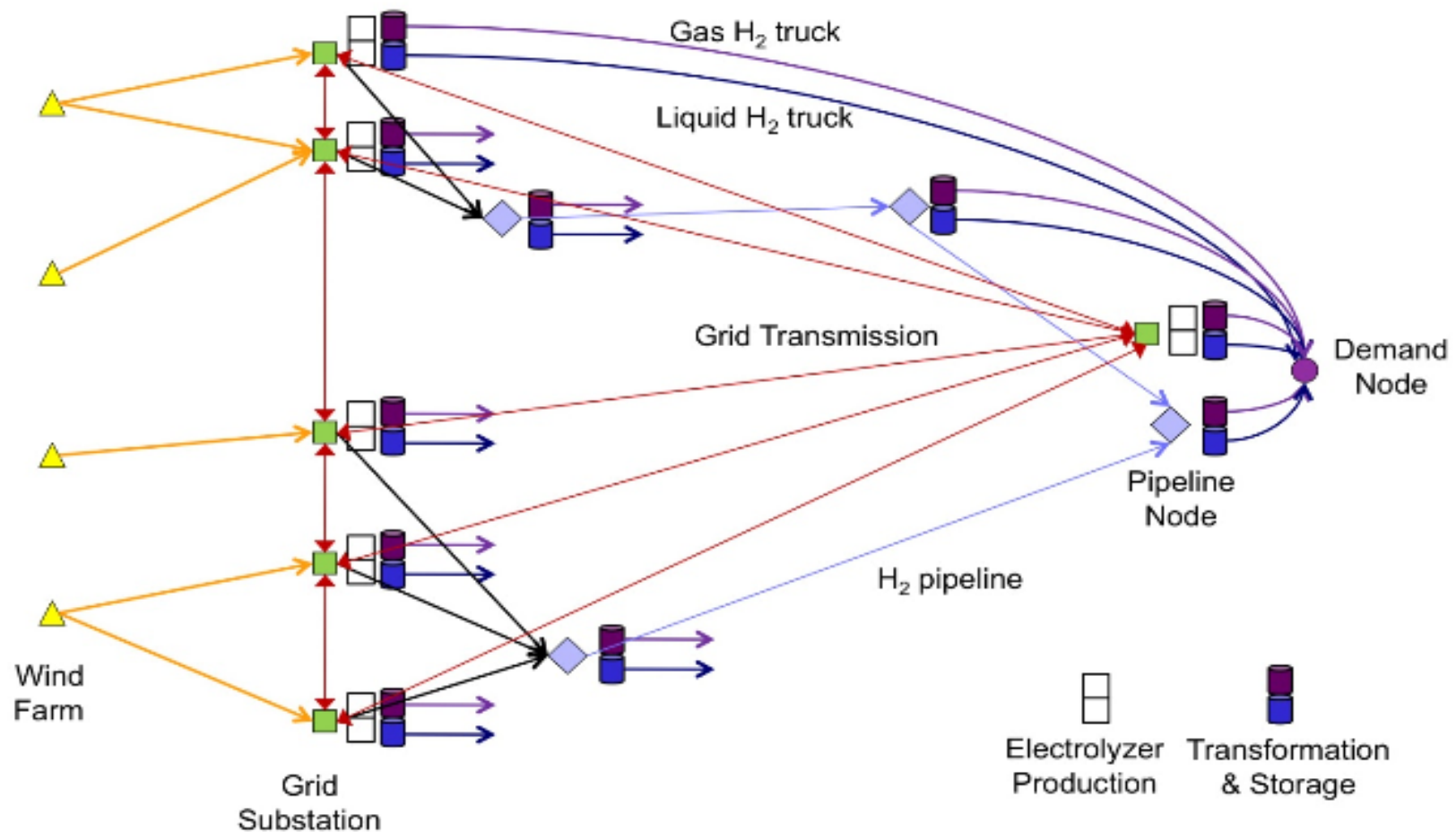
- Fluid dynamic, Thermal & Functional Cell & Stack Models (COMSOL)
- New Electrode & nanotechnology based membranes.
- 10 Nm³ stack prototype, and experimental BoP.
- New Power Supply concept for RES application.
- Electrolyzer-Grid Integration WO patent application.



(Co-Ni)-Ru-K based Catalyst behavior & performances

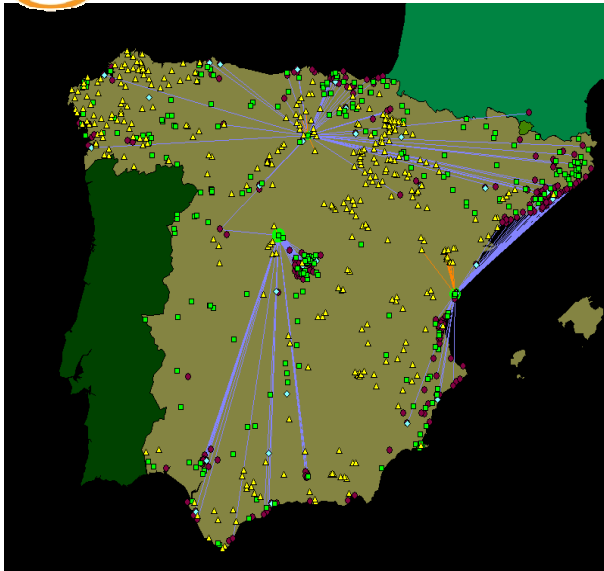


- Conversion of 100% of reactive Glycerin)
- From 56 to 63% of efficiency in H₂ production.
- Working Temperature range from 375 to 450 °C
- Less than 10% in CH₄ selectivity
- Self-regenerative.
- Based on No-noble metals.
- Efficient with industrial raw materials (bioethanol & glycerol).
- Working with air(no requiring pure oxygen).
- They also can be used efficiently in other alcohol reforming.
- Patent application : **PCT/ES2010/070034**

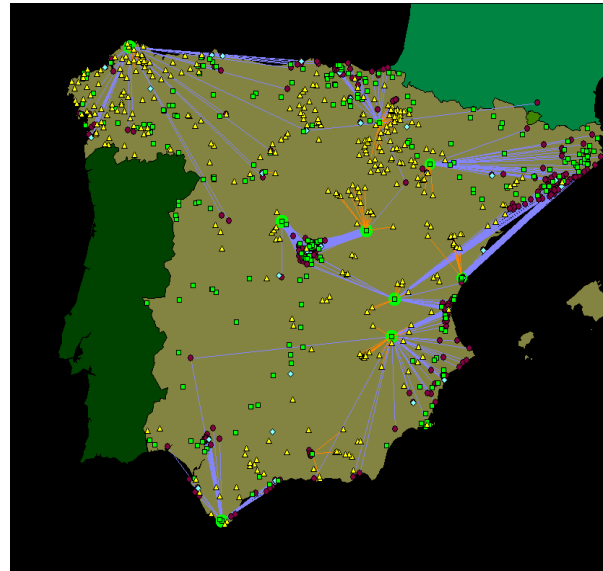


- **Technology**
 - H2A or Future
- **Electricity Supply**
 - Green: wind farm only (35%)
 - Gray: mix of wind farm and electric grid (95%)
- **Demand Market Penetration**
 - Phase 1: 5%
 - Phase 2: 20%
 - Phase 3: 60%
- **Weighting of Production Costs**
 - Full cost vs. scaled down cost (10%)
- **Supply Chain Designer (CAPS Logistics/Infor)**

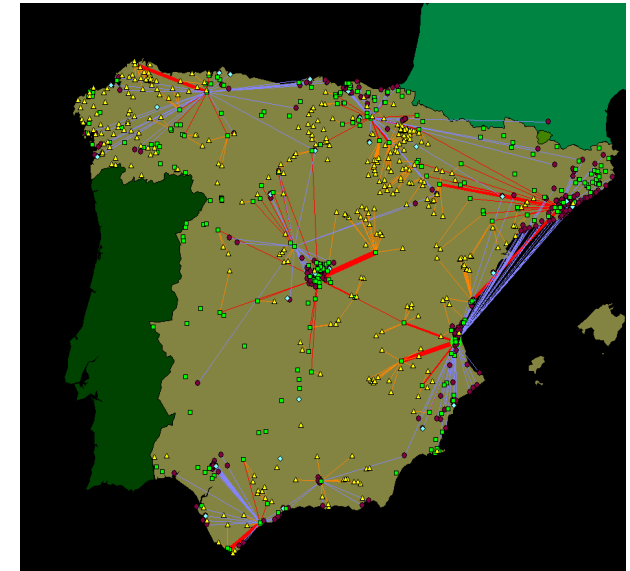




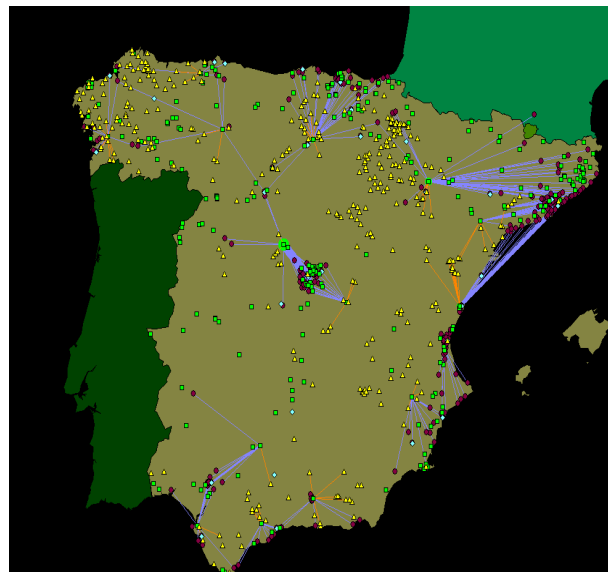
Green Phase 1 (5 %)



Green Phase 2 (10 %)



Gray Phase 3 (30 %)

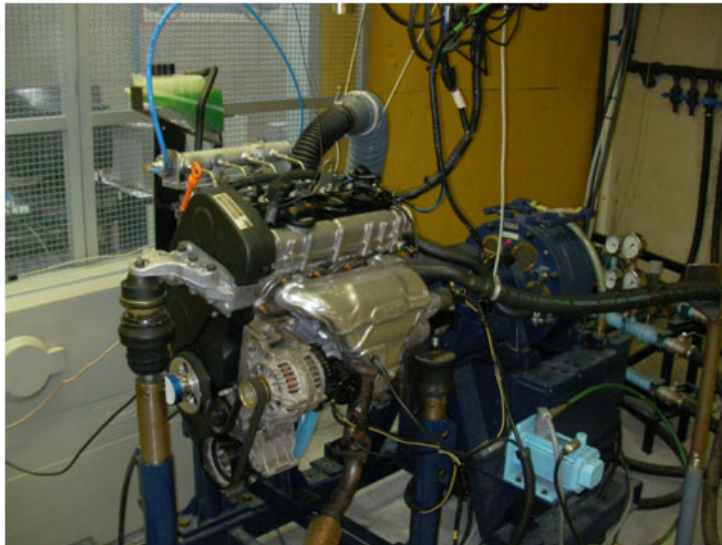


Green future Phase 2 (10 %)

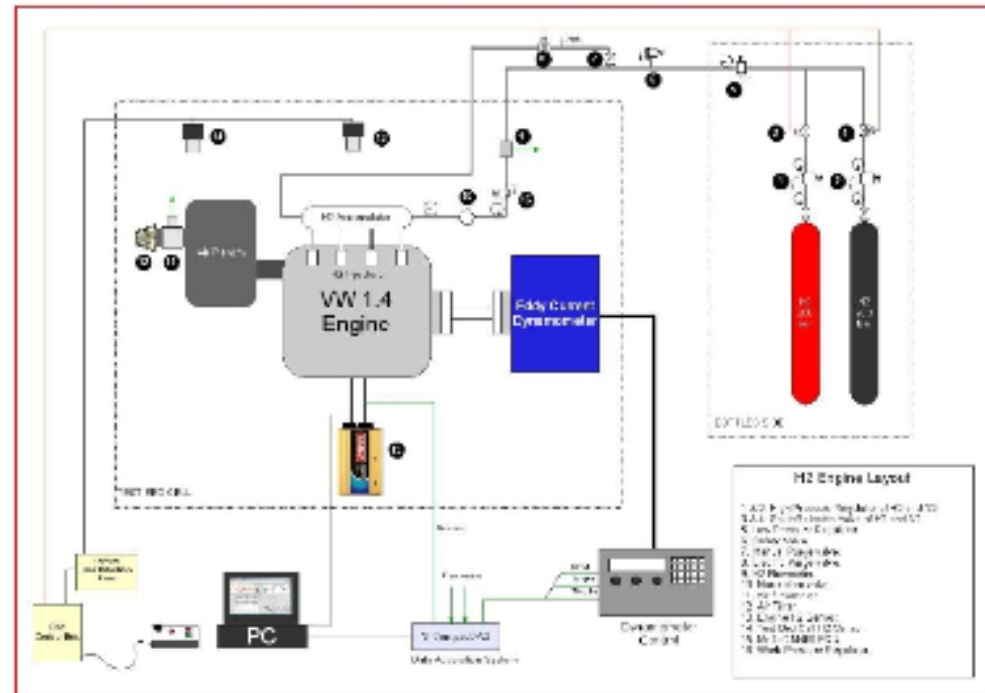


Gray future Phase 2 (10 %)

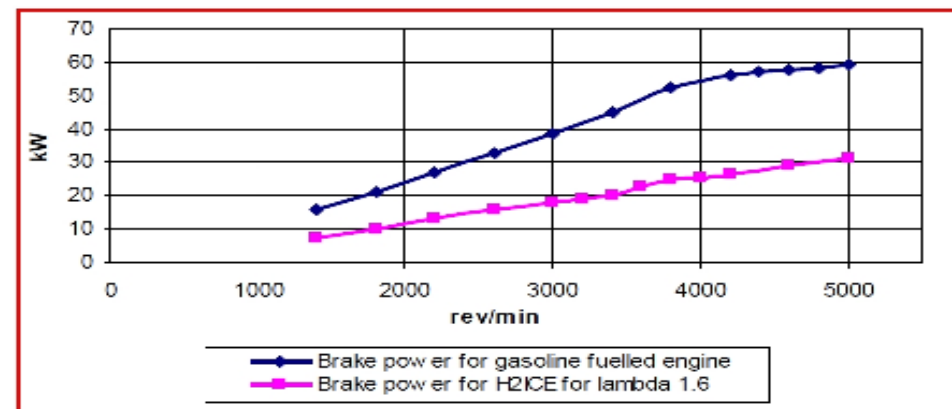
1.- Power & Electricity generation with I.C.E. fuelled with H₂



VW 1.4 Engine adapted to H₂



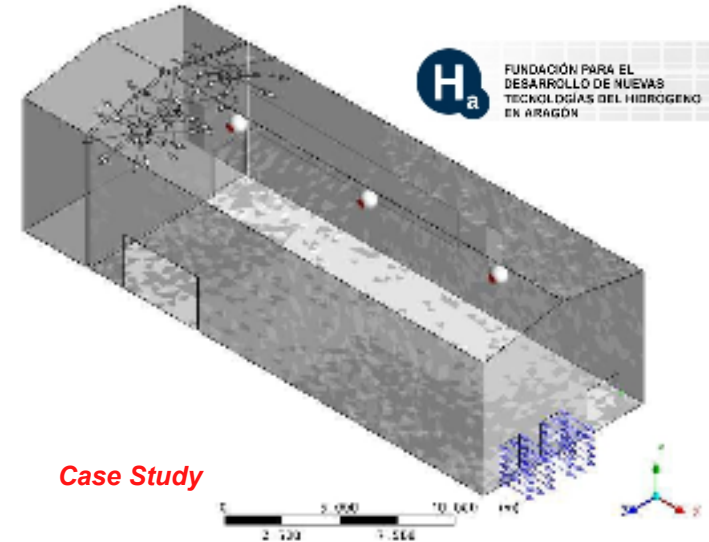
9 KVA Genset working on H₂



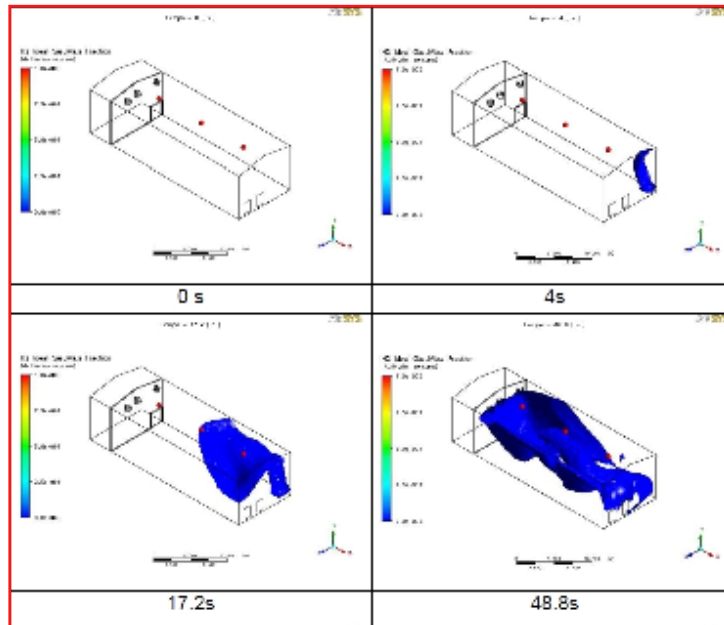
2.- HYDROGEN DIFFUSION MODELS



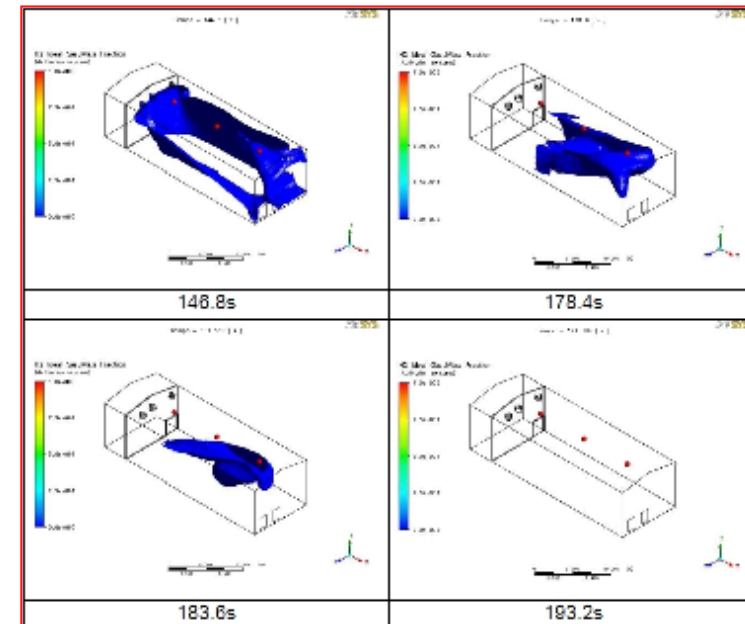
The Set-up



Case Study



The Results



PROJECT RESULTS: CONCLUSIONS

- **Very positive experience, working with a so large consortium of industrial partners and Research Institutions.**
- **The Goals of the project for Acciona Energía are achieved.**
- **The Foundations for a Alkaline Electrolysis Technology for RES are settled. Now we are starting the “2º phase”, basically with the same Research partners.**
- **A very interesting “Model & Methodology” for Hydrogen Diffusion Simulation was developed and is available for real case studies.**
- **Hydrogen “Combustion” has been also addressed, either in CFD modeling and real environment.**

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THANKS for your attention

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