IEA Hydrogen Implementing Agreement (HIA)

International Collaboration in Hydrogen R&D

State of the Art and future plans

Hydrogen and Fuel Cell based energy systems Workshop,
Vienna, April 1, 2004,

By

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HIA Strategic Framework

VISION **A hydrogen future based on a clean sustainable energy supply of global proportions that plays a key role in all sectors of the economy**

MISSION **To accelerate hydrogen implementation and widespread utilization**

STRATEGY **To facilitate, coordinate and maintain innovative research, development and demonstration activities through international cooperation and information exchange**

Hydrogen Implementing Agreement (HIA)

- A unique leader in collaborative hydrogen R, D&D on a truly global basis
- Premier global resource for technical expertise in hydrogen R, D&D with a 25 year operating history, 18 annexes and significant accomplishments to its credit

HIA Member Countries


Canada
Mr. N.R. Beck


European Commission
Mr. Jean-Bernard Veyret


Japan
Mr. Koji Nakui


Italy
Mr. Agostino Iacobazzi


Iceland
Ms. Helga Tulinius


Lithuania
Dr. Jurgis Vilemas


The Netherlands
Dr. Henk Barten


France
Dr. Paul Lucchese


Norway
Mr. Trygve Riis


Spain
Dr. Antonio G. Garcia-C


Sweden
Mr. Lars Vallander


Switzerland
Dr. Gerhard Schriber

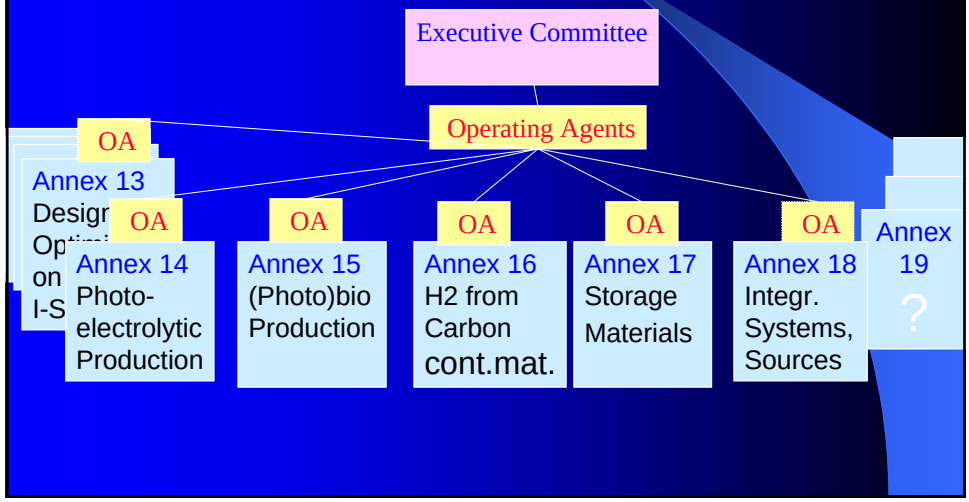

United Kingdom
Mr. Ray Eaton


United States
Mr. Neil P. Rossmeissl


Denmark
Mr. Jan K. Jensen

Singapore, Finland, New Zealand, Korea, Australia, Hungary, Austria, Germany,

Current HIA Activities



HIA activities

Annexes as of 1977

1. **Thermochemical production**
2. **HT reactors**
3. **Potential future markets**
4. **Electrolytic production**
5. **Solid Oxid water electrolysis**
6. **Photocatalytic water electrolysis**
7. **Storage, Conversion and Safety**
8. **Techn. Econ. Assessment of H_2**
9. **Hydrogen production**
10. **Photoproduction of Hydrogen**
11. **Integrated Systems**
12. **MeH for H_2 storage**
13. **Design and Optimization of IS**
14. **Photoelectrolytic Production**
15. **(Photo)biological Production**
16. **H_2 from C Containing Mat'ls**
17. **S and L State Storage Mat'ls**
18. **Integrated Systems, Hydrogen** Sources

Task 13 Integrated Systems Accomplishments

- Now completed, continued in Task 18
- 27 component models were developed to model production, storage, distribution and utilization
- Models used to assess several integrated systems in two key applications
- Ten international demonstrations evaluated and compared as case studies in system performance measurement as well as safety, regulatory and public acceptance

Task 14 Photoelectrolytic Production Accomplishments

- A continuation of Task 10 which included a *Photoproduction of Hydrogen* sub-task
- Net solar-to-hydrogen conversion efficiency of 16% achieved using tandem photo-electrochemical (PEC) cell
- Promising advances in material science for PEC
- Favorable economics with H_2 production from wastewater

Task 15 Photobiological Production: Accomplishments

- A continuation of Task 10 which included a *Photobiological* subtask
- Various process-development-scale photo bioreactor systems now being tested
- Comprehensive database established on hydrogen-producing microorganisms
- Hydrogen production from a green algae demonstrated
- Sponsorship/collaboration on world's leading BioHydrogen Symposia and R&D programs

Task 16 Hydrogen from Carbon Containing Materials: Accomplishments

- Completed concept study of large-scale integrated hydrogen production project for power production with decarbonization
- Engaged in follow-on feasibility study
- Reports: Comprehensive Status and R&D challenges on H_2 production from biomass complete; Resource, technology and market analysis for biomass feedstock underway
- Review of small-scale stationary reformers for H_2 production from fossil fuels with CUTE update

Task 17 Storage: Accomplishments

- Extension of Task 12, *Metal Hydrides and Carbon for Hydrogen Storage*
- Global data base created http://hydpark/ca.sandia.gov
- R&D on catalyzed sodium aluminum hydrides led to identification of hydride capable of 4% wt reversible H_2 storage with 120 C desorption temp.
- Joint R&D on 14 metal hydride, 12 combined hydride/carbon projects, 6 carbon

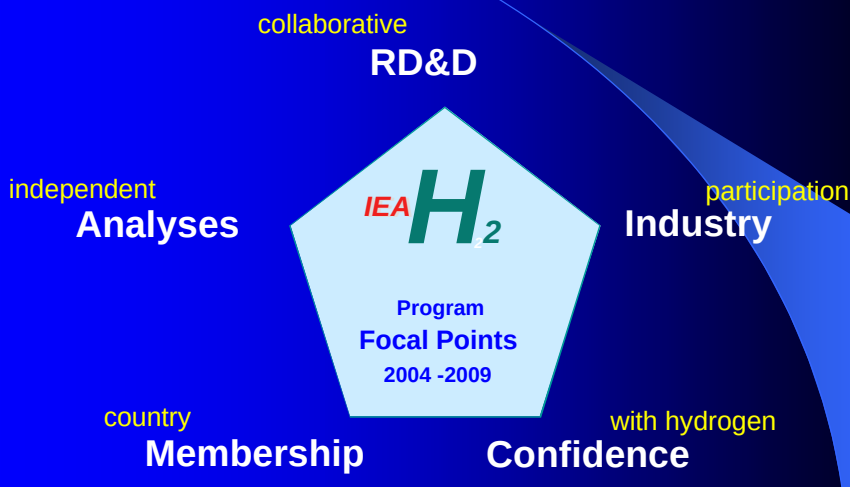
Task 18 Integrated Systems

- Emerged from the successful Task 13
- Approved – official activity begins January 1, 2004.
- Two subtasks
  - Subtask A - a discrete database activity that can accommodate input, including case studies, from different sources
  - Subtask B – project evaluation and modeling of ongoing demonstration projects

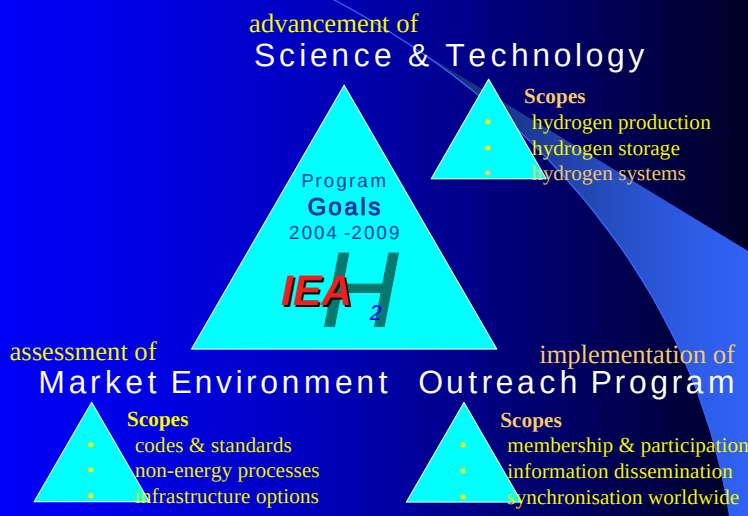
HIA – Working principles

- Main focus on task shared activities
- Cost sharing with GHG in task 16 a)
- Ex.Co. Meetings 2 times a year
- Task experts meetings normally 2 times a year, open to task participants only. Good participation.
- Observers are allowed at Ex.Co. 2 times, also as experts
- Common fund of 5000 USD. We will suggest an increase, unevenly distributed, need more resources
- Plans for including industry as sponsors

HIA 5 year plan 2004-2009



Goals & Scope of 5-year HIA program



HIA 5 year plan Overview

- **Fundamental R&D**
- **Task 16 to 2005, continue H_2 from C-mat.**
- **Task 17 to 2006, focus on onboard storage**
- **Task 15, start 3-5 year Photobiohydrogen**
- **Task 14: New, broader photoelectrolytic task**

- **System analysis & Market research**
- **Task 18 3-5 years, LCA, database of demo, systems, resources etc.**
- **Task on non-energy use**
- **Codes and standards**
- **Task on infrastructure for stationary**

HIA 5 year plan Overview cont.

- **Information/ dissemination**
  - **Enhance Internet capabilities**
  - **E-Publishing**
  - **Info presentation at conferences**
  - **Operate H_2 expert office**
  - **Educational materials**
- **Growth/Support (Members, industry)**
  - **Soliciting new potential members**
  - **Expand collaboration with IEA IA's, HCG, IPHE**
  - **Gain industry partners**

Management of Selected HIA Portfolio Issues

- **New safety task agreed, planning phase**
- **"*Where will the H_2 come from*", in preparation (Annex 18)**
- **Industry participation strategy, planning phase**
- **New activity on codes and standards proposed and under consideration**
- **High-temperature electrolysis/electrolyzer efficiency activity proposed and under consideration**
- **Assessment of compressed gas/liquid H_2 under consideration**
- **Internal and external communication and liaison**
- **www.eere.energy.gov/hydrogenandfuelcells/hydrogen/iea**

The HIA Future in Summary

- **Dedicated to collaborative pursuit of innovative, longer-term pre-competitive R,D&D**
- **Committed to analysis and outreach in support of R,D&D**
- **Welcoming liaison with other groups**

Please join us!

The HIA looks forward to working with you!

Thank you!