

HYDROGEN IMPLEMENTING AGREEMENT

The IEA HIA: R,D&D to Supply Hydrogen Energy For a Changing World

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WHEC 2008
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AN IMPLEMENTING AGREEMENT OF THE INTERNATIONAL ENERGY AGENCY



IEA HIA Presentation

- IEA HIA Fundamentals
- Overview of IEA HIA Portfolio
 - Science and Technology
 - Market Environment
 - Outreach Program
- IEA HIA Value Proposition



Hydrogen Implementing Agreement (HIA)

A collaborative research and development (R&D) program

Created in 1977 on a task-shared, "bottom-up" basis

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 (RD&D) activities through international cooperation and information exchange

Annex / Task

Basic unit of organization; Next level is sub-task;
Operating Agent manages Annex; Experts do work

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IEA HIA Members



Canada
Mr Nick Beck (Chairman)



European Commission
Dr Stathis Peteves



Japan
Dr Yoshiteru Sato



Italy
Mr Agostino Iacobazzi



Iceland
Dr Agusta Loftsdottir



Lithuania
Dr Jurgis Vilemas



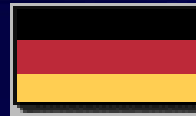
The Netherlands
Mr Frank Denys



France
Dr Paul Lucchese



Australia
Dr John Wright



Germany
Mr J.-F. Hake



Greece
Dr Eli Varkaraki



Turkey
Dr Alper Sarioglan



Korea Mr Kijune Kim



New Zealand Dr Steven Pearce

IEA HIA June 2008

Norway
Ms Line Amlund Hagen



Spain
Dr Antonio Garcia-Condé



Sweden
Dr Lars Vallander



Switzerland
Dr Andreas Gut



United Kingdom
Dr Ray Eaton



United States
Dr Carole Read



Denmark
Mr Jan Jensen



Finland
Dr Heikki Kotila



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IEA HIA Goals

Science & Technology Goal

Advancement of Science via Pre-Commercial Collaborative RD&D

- Hydrogen Production
- Hydrogen Storage
- Hydrogen Systems

Market Environment Goal

Assessment of Market Environment,
including Non-Energy Sector

- Non-Energy and Industrial Processes
- Foundation for Codes & Standard
- Infrastructure

Outreach Program Goal

Increasing Knowledge and
Comfort with Hydrogen

- Membership and Participation
- Information Dissemination
- Synchronization worldwide

IEA HIA Tasks Since 1977

1. Thermochemical Production
 2. High-Temperature Reactors
 3. Potential Future Markets
 4. Electrolytic Production
 5. Solid Oxide Water Electrolysis
 6. Photocatalytic Water Electrolysis
 7. Storage, Conversion and Safety
 8. Techno-Economic Assessment
 9. Hydrogen Production
 10. Photoproduction of Hydrogen
 11. Integrated Systems
 12. Metal-Hydride for H₂ Storage
 13. Design and Optimization of Integrated Systems
 14. Photoelectrolytic Production
 15. Photobiological Production
 16. H₂ from Carbon-Containing Materials
 17. Solid & Liquid State Storage Materials
- Current Portfolio**
18. Integrated Systems - II
 19. Hydrogen Safety
 20. Hydrogen from Waterphotolysis
 21. BioHydrogen
 22. Fundamental and Applied H₂ Storage Materials Development
 23. Small-Scale Reformers for On-Site H₂ Supply (SSR for H₂)
 24. Wind Energy and H₂ Integration
 25. High Temperature Processes for H₂ Production

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Current Tasks by Focus Area

Science and Technology

Production

- 20. Hydrogen from Waterphotolysis
- 21. BioHydrogen
- 23. Small-Scale Reformers for On-Site H₂ Supply (SSR for H₂)
- 24. Wind Energy and H₂ Integration
- 25. High Temperature Processes for H₂ Production

Storage

- 22. Fundamental and Applied H₂ Storage Materials Development

Market Environment

Analysis, Safety and Economics

- 18. Integrated Systems Evaluation
- 19. Safety



Science and Technology HYDROGEN PRODUCTION

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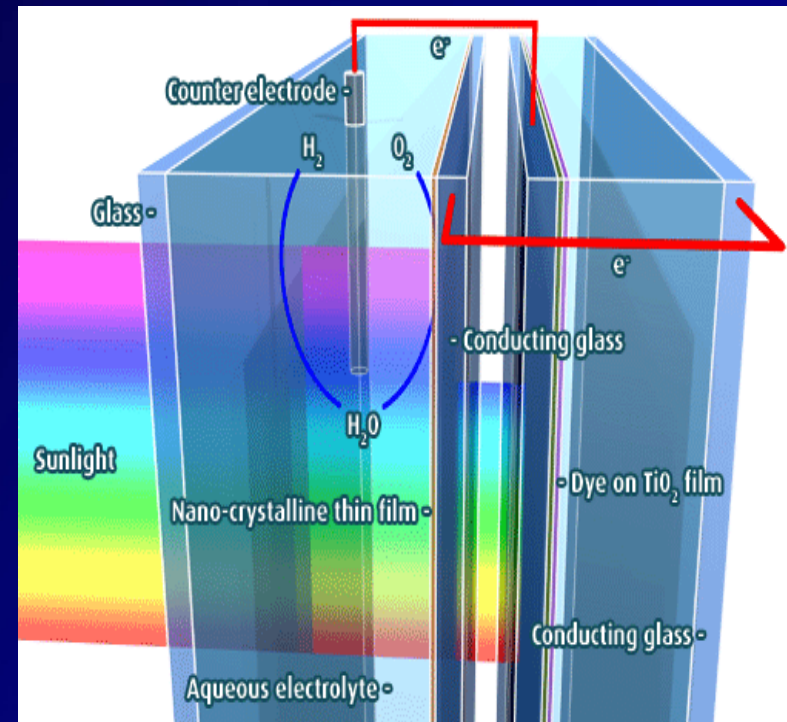
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Task 20: Hydrogen from Waterphotolysis

October 2004 – June 2008 (closing)

- ❑ Continuation and expansion of Task-14 (up to 14 countries and 37 research groups)
- ❑ Aim: Net solar-to-hydrogen conversion efficiency of 10%
- ❑ Objectives: Intensification of international collaboration, advancement of PEC materials science, development of engineering solutions, demonstration of leading concepts, promotion of photolysis of water

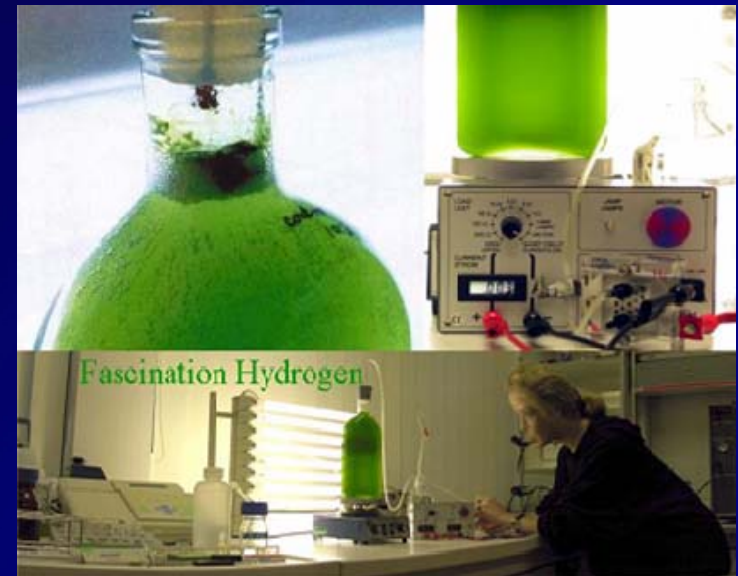


OA: Dr Andreas Luzzi (University of Applied Sciences Rapperswil, Switzerland)

Task 21: BioHydrogen

October 2005-October 2008

- Evolved from Task 15
- Includes four areas of investigation:
 - Hydrogen dark fermentations
 - Photobiological hydrogen production systems
 - Bio-inspired systems
 - Overall analysis



OA: Dr. Jun Miyake

Task 23: Small-Scale Reformers for On-Site H₂ Supply

December 2006-December 2009

- ❑ Development of reformer technologies and distributed on-site reformer based H₂ supply systems
- ❑ Three Subtasks:
 - 1) Harmonized Industrialization
 - 2) Sustainability and Renewable Sources
 - 3) Market Studies



OA: Dr. Ingrid Schjøberg of Sintef

Task 24: Wind Energy and H2 Integration

December 2006-December 2009

- ❑ **Mid-term R&D for entire wind to hydrogen production chain**
- ❑ **Subtask A** – State of the Art
- ❑ **Subtask B** – Needed Improvements and System Integration
- ❑ **Subtask C** - Business Concept Development
- ❑ **Subtask D** - Applications with Emphasis on wind energy management



OAs: Dr. Luis Correias and Mr. Fernando Carpintero

Task 25: High Temperature Processes for H₂ Production

May 2007

- ❑ Will Support production of massive quantities of zero-emission H₂ through use of high temperature processes ($> 500\text{ }^{\circ}\text{C}$) coupled with nuclear and solar heat sources
- ❑ **Three process families:** thermochemical cycles: steam electrolysis: and innovative water splitting
- ❑ **Four Subtasks:**
 - ❑ **Subtask A** – State of the Art
 - ❑ **Subtask B** – Methodology approach of HTPs
 - ❑ **Subtask C** – HTP R&D and future industrial development
 - ❑ **Subtask D** – Information Dissemination



OA: Mr. Gilles Rodriguez of CEA

Science and Technology

HYDROGEN STORAGE

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