IEA HIA

Harmony in International H2 collaboration -
IEA HIA 2009-2015 Strategic Plan, Current Program and
Highlights of Member Activities

Mr. Jan Jensen (ExCo Chairman)
Dr. Nikos Lymberopolous and Dr. Steven Pearce (ExCo. Vice Chairs)
Ms. Mary-Rose de Valladares (ExCo. Secretariat Manager)

LCES - 2011

October 20, 2011  Dalian, China
IEA HIA Presentation

- Introduction to International Energy Agency (IEA) Hydrogen Implementing Agreement (HIA)
- IEA-HIA 2009-2015 Strategic Plan
- The IEA HIA Portfolio - Current Program
- Highlights of Member Activities
Autonomous body within the Organization of Economic Cooperation and Development (OECD), founded in 1974 to carry out energy cooperation among member countries.
International Energy Agency
Created in 1974; 28 Member Countries
Autonomous agency linked with the OECD

Goals:
- energy security
- environmental protection
- economic growth

Activities:
- co-ordinates efforts to ensure energy security
- compiles energy statistics
- conducts policy analysis
- reviews energy policies & programs
- provides a framework for technology collaboration
IEA Hydrogen Implementing Agreement (HIA)

A collaborative research and development (R,D&D) program
Created in 1977 on a task-shared, “bottom-up” basis

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 to optimize environmental protection, improve energy security and promote economic development internationally while establishing the HIA as a premier global resource for expertise in hydrogen

Strategy
To facilitate, coordinate and maintain innovative research, development and demonstration (RD&D) activities through international cooperation and information exchange
IEA HIA Members - Executive Committee (October 2011)

Europe

- Denmark
  - Mr Jan Jensen
  - Dr Marc Steen
- Germany
  - Mr J.-F. Hake
- Italy
  - Mr Agostino Iacobazzi
- Spain
  - Mr A. Garcia-Conde
- The Netherlands
  - Mr Frank Denys
- Finland
  - Dr Heikki Kotila
- Greece
  - Dr Elli Varkaraki
- Lithuania
  - Dr R. Urbonas
- Sweden
  - Gustav Krantz
- Turkey
  - Dr Alper Sarioglan
- France
  - Mr Paul Lucchesse
- Iceland
  - Dr Agusta Loftsdottir
- Norway
  - Mr Trygve U. Riis
- Switzerland
  - Dr Stefan Oberholzer
- United Kingdom
  - Mr Ray Eaton

North America

- Canada
  - Mr Nick Beck
- United States
  - Dr Eric Miller

Asia - Pacific

- Japan
  - Dr T. Itomi
- Korea
  - Mr Kijune Kim
- Australia
  - Dr J. Wright
- New Zealand
  - Dr S. Pearce

Oceania

- New Zealand
  - Dr S. Pearce

23 Contracting Parties
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
14. Photoelectrolytic Production
15. Photobiological Production
16. H₂ from Carbon-containing mat.
17. Solid & Liquid Storage Materials
18. Integrated Systems – II
19. Hydrogen Safety
20. Hydrogen from Waterphotolysis

Current Portfolio

22. Fundamental & 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
26. Advanced Materials for H₂ from Waterphotolysis
27. Near-Market Routes to H₂ by co-utilization of biomass with fossil fuel
28. Large Scale Hydrogen Delivery Infrastructure
29. Distributed and Community H₂ (DISCO H₂)
30. Global Hydrogen Systems Analysis
31. Hydrogen Safety
2009 – 2015 Themes

Collaborative R, D & D that advances hydrogen Science and Technology
- Hydrogen Production
- Hydrogen Storage
- Integrated Hydrogen Systems
- Hydrogen integration in existing infrastructure

Analysis that Positions Hydrogen for
- Technical progress and optimization
- Market preparation and deployment
- Support in political decision-making

Hydrogen Understanding, Awareness and Acceptance that foster technology diffusion and commercialization
- Information Dissemination
- Safety
- Outreach
END USE SECTORS/ MARKETS & APPLICATIONS

de Valladares

PORTABLES
- Cell phones
- Laptops
- PDAs
- Home Appliances

STORAGE
- Trucks
- Buses
- Maritime

TRANSPORTATION
- Trains

STATIONARY APPLICATIONS
- Forklifts
- Toys
- Tools
- Auxiliary Power Units
- CHP & Micro CHP
- Back-up Power
- UPS

SPECIAL/ NICHE
- Refueling Stations
- CHP & Micro CHP
- Maritime
- Home Appliances
- Toys
- Tools

STORAGE
- Trucks
- Buses
- Maritime

TRANSPORTATION
- Trains
Theme: Collaborative R,D&D

Portfolio: HYDROGEN PRODUCTION
Task 21: BioInspired H2
May 1999-May 2013 (recently extended)
OA: Dr. Michael Seibert

Task 23: Small-Scale Reformers for On-Site H2 Supply
December 2006 - December 2011
OA: Dr. Ingrid Schjølberg of Sintef

Task 24: Wind Energy and H2 Integration
December 2006-December 2011
OAs: Dr. Luis Correas - Ismael Aso (Hidrógeno Aragón)

Task 25: High Temperature Processes for H2 Production
May 2007 - May 2011
OA: Dr. François Le Naour

Task 26: Advanced Materials for Waterphotolysis of H2
May 2008 - May 2011
OA: Dr. Eric Miller of DOE

Task 27: Near-Market Routes to H2 by Co-Utilization of Biomass as a Renewable Energy Source with Fossil Fuel
2008 - 2011
OAs: Dr. Jan-Erik Hanssen and Ms. Elif Caglayan

Main components of a small scale reformer

PORTFOLIO H2 PRODUCTION
Task 21: BioInspired Hydrogen (BioH2)

2010-2013

- Evolved from Task 15 and predecessor Task 21
  - May 1999-July 2005 (completed)
  - 2005-2010 - BioHydrogen

- Includes five Subtasks:
  - Subtask A - Bio-inspired Systems
  - Subtask B - Dark BioH2 Fermentation Systems
  - Subtask C - Basic Studies of Light-driven BioH2 Production
  - Subtask D - Biological Electrochemical Systems
  - Subtask E - Overall Analysis

OA: Dr. Mike Seibert

LCES-2011 in Dalian, China
Task 23: Small-Scale Reformers for On-Site H2 Supply

December 2006 - December 2011

- Development of reformer technologies and distributed on-site reformer based H2 supply systems
- Contributing to norms for small scale reformers & fast-tracking deployment
- Three Subtasks:
  - Harmonized Industrialization
  - Sustainability and Renewable Sources
  - Market Studies

OA: Dr. Ingrid Schjølberg of Sintef
Task 24: Wind Energy and H2 Integration

December 2006-December 2011

- **Mid-term R&D for entire wind to hydrogen production chain**

- **Four Subtasks:**
  - **Subtask A** - State of the Art
  - **Subtask B** - Improvements and System Integration
  - **Subtask C** - Business Concept Development
  - **Subtask D** - Applications with Emphasis on wind energy management

- **Setting the stage for large-scale use of renewable wind energy for H2 production**

- **Aims for full wind and H2 integration via storage and electrical conversion**

**OAs: Dr. Luis Correas - Ismael Aso (Hidrógeno Aragón)**
Task 25: High Temperature Processes for H2 Production

May 2007 – May 2010

- Will Support production of massive quantities of zero-emission H2 through use of high temperature processes (> 500 °C) coupled with nuclear and solar heat sources
- Three process families: thermochromical cycles, steam electrolysis and innovative water splitting
- Four Subtasks:
  - State of the Art
  - Methodology approach of HTPs
  - HTP R&D and future industrial development
  - Information Dissemination
- Produced Summary Sheets on high temp processes in general and detailed versions

OA: Dr. Francois Le Naour of CEA
Task 26: Advanced Materials for Waterphotolysis of H2

May 2008 – May 2011

- **Aim:** Photoelectrochemical (PEC) materials that enable net solar-to-hydrogen conversion efficiency of 10% in PEC water-splitting
- **Areas of Investigation:**
  - Materials “Theory” R&D
  - Materials “Synthesis” R&D
  - Materials “Analysis”
  - “Information Coordination/ Database” Development

OA: Dr Eric Miller of DOE
Task 27: Near-Market Routes to H₂ by Co-Utilization of Biomass as a Renewable Energy Source with Fossil Fuel

2008 – 2011
Objective: To advance the development of H₂ production based on renewable sources (biomass) in the marketplace

4 Subtasks:
- **Subtask A** - Co-gasification of biomass with fossil fuels
- **Subtask B** - Hydrogen market facilitation based on distributed processing of biomass to new tradable intermediates
- **Subtask C** - Near term stand-alone biomass gasification
- **Subtask D** - Roadmap – development and verification

OAs: Dr Jan-Erik Hanssen and Ms. Elif Caglayan

Source: Shell
Theme: Collaborative R,D&D

Portfolio: HYDROGEN STORAGE
Task 22: Fundamental and Applied Hydrogen Storage Materials Development

December 2006-November 2012 (recently extended)

- **3 Targets:**
  - Reversible or regenerative storage media
  - Fundamental & engineering understanding
  - Storage materials for stationary apps.

- **20 HIA countries, 53 projects:** World’s largest collaboration on H2 storage
  - **Project types:** experimental, engineering, theoretical, safety
  - **Classes of Materials:** Reversible metal hydrides, Regenerative hydrogen storage materials, Chemical hydrides, Nanoporous materials, Rechargeable organic liquids and solids
  - Gordon Conference style meetings ultimate forum for expert cooperation; 450+ publications/articles; 450+ presentations up to December 2008
  - **17 patents from predecessor Task 17** (June 2001-May 2006)

OA: Dr. Bjørn C. Hauback of IFE
Theme: Collaborative R,D&D

Portfolio: INTEGRATED H₂ SYSTEMS
Task 18: Integrated Systems Evaluation
January 2004 – December 2009 (recently completed)
OA: Dr. Susan Schoenung
(Longitude 122 West, Inc., USA)

Task 23: Small-Scale Reformers for On-Site H2 Supply
December 2006 - December 2011
OA: Dr. Ingrid Schjølberg of Sintef

Task 29: Distributed and Community Hydrogen
December 2010 - December 2013 (recently approval)
OA: Dr. Federico Villatico

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

- Development of reformer technologies and distributed on-site reformer based H₂ supply systems
- Contributing to norms & fast-tracking deployment
- Three Subtasks:
  - Harmonized Industrialization
  - Sustainability and Renewable Sources
  - Market Studies

OA: Dr. Ingrid Schjølberg of Sintef
Task 29: Distributed and Community Hydrogen (DISCO H₂)

December 2010 – December 2013

Objective: to develop replicable energy community models for H₂ energy technologies

- **Three Community Types:**
  - Urban
  - Rural and Island
  - Industrial distributed H₂ applications

- **Five Subtasks:**
  - Management
  - Analysis and Selection
  - Model Concept Development
  - Model Concept Replicability
  - Dissemination

OA: Dr Federico Villatico

LCES-2011 in Dalian, China
**Theme:**
Collaborative R,D&D

**Portfolio:**
H₂ INTEGRATION IN EXISTING INFRASTRUCTURE
Task 23: Small-Scale Reformers for On-Site H2 Supply

December 2006 - December 2011

OA: Dr. Ingrid Schjølberg of Sintef

Task 28: Large Scale H2 Delivery Infrastructure

May 2010 - April 2013

OA: Dr. Marcel Weeda

Large Scale Hydrogen Delivery Infrastructure

Production → Transport → Distribution → End-use

Liquefaction
Storage
Trucks
Pipelines

Fueling stations
Local grids

H₂ INTEGRATION IN EXISTING INFRASTRUCTURE

Portfolio
Task 28: Large-Scale Hydrogen Delivery Infrastructure

2011 - 2013

- Improve understanding of infrastructure for H2 delivery focusing on transport and delivery
- Develop common knowledge base on concepts and components
- Improve understanding of analysis tools and identify knowledge gaps
- Three Subtasks:
  - Scenarios – H2 demand projections and roll-out strategies
  - Hydrogen Refueling Station Concepts (HRS)
  - Analysis Delivery Routes

OA: Dr. Marcel Weeda of ECN

Large-Scale Hydrogen Delivery Infrastructure

Production ➔ Transport ➔ Distribution ➔ End-use

Liquefaction
Storage
Trucks
Pipelines

Fuelling stations
Local grids
Theme:
Analysis that Positions Hydrogen

Portfolios:
TECHNICAL, MARKET, AND SUPPORT FOR POLITICAL DECISION-MAKING
Task 30: Global Analysis of Hydrogen Systems

May 2010-June 2013

- **Goal:**
  - Preparation of authoritative and balanced analysis that informs policymakers and stakeholders

- **3 Subtasks:**
  - **Subtask A:** detailed analyses of H₂ resources worldwide
  - **Subtask B:** database development and update of Prospects for Hydrogen and Fuel Cells
  - **Subtask C:** coordination with IEA analysts

Co-OAs: Mr. Jochen Linssen and Dr. Susan Schoenung
Theme:
Hydrogen Awareness, Understanding and Acceptance

Portfolio:
SAFETY
Task 31: Safety

November 2010 – October 2013

Four subtasks laying foundation for codes & standards:

- Physical Effects Knowledge Gaps
- Storage Systems & Materials
- Early Markets Risks and Hazards
- Knowledge Analysis Dissemination & Use

OA: William Hoagland (W. Hoagland & Associates, USA)
Theme:
Hydrogen Awareness, Understanding and Acceptance

Portfolio:
INFORMATION DISSEMINATION
Theme:
Hydrogen Awareness, Understanding and Acceptance

Portfolio:
OUTREACH
Outreach 2004 - 2009

Conference/Meeting/Event Strategy
- 12 internal IEA presentations
- 40 external ExCo presentations
- 8 Conference Exhibits
- >1,015 task presentations
- >1,153 task publications
- 33 patents

Public Relations
- Creation and inaugural award of HIA Individual Prize for technical excellence in H2 R&D and harmony in international cooperation; Project Prize in 2010

Media Engagement
- Released 25th Anniversary Report at National Press Club in Washington, D.C.

Former IEA HIA Chair Trygve Riis

Dr. Gary Sandrock
Outreach 2009 – 2015 as of mid-2011

Conference/Meeting/Event Strategy
- 13 internal IEA presentations
- 14 external ExCo presentations
- 3 Conference exhibits

Public Relations – IEA HIA Prizes
Bestowed for technical excellence in R,D&D and Harmony in international cooperation
- Inaugural Project Prizes awarded in 2010
- Individual Prize 2011

Government/Media Relations
- IEA HIA Congressional briefings in U.S. Senate – 2009 and 2010

Dr. James M. Ohi
2011 IEA HIA Prize

Fundamental R&D
Project Prize
Task 22-H25
IEA HIA Project Prize

**Fundamental Safety Testing and Analysis of H2 Storage Materials and Systems (H-25)**, a project of Task 22, Fundamental and Applied H2 Storage Materials Development

- 4 country (Canada, Germany, Japan, USA) collaboration
- Project Leader: Dr. Don Anton

**H2ER (Infraestructura Tecnológica del Hidrógeno y Energías Renovables)**

“Green Hydrogen from Wind and Solar Mobile Applications”, a project of Task 24, Wind Energy and Hydrogen Integration

- Developed by Fundación para el Desarrollo de Nuevas Tecnologías del Hidrógeno en Aragón
Highlights

OTHER IEA HIA MEMBER PROGRAMS AND INITIATIVES
Member Program and Initiatives Highlights

News from the Opening Ceremony at WHEC
16 May 2010

JAPAN and GERMANY sign Memorandum of Understanding (MOU) on future collaboration
Highlights - Japan

JHFC Registered Vehicles: Total 60 units (FY 2007)
- TOYOTA FCV
- NISSAN X-TRAIL FCV
- FCVs 43 units
- HONDA FCX
- MAZDA RX-8 hydrogen
- Hydrogen ICVs 12 units
- TOYOTA HINO FCV-BUS
- GM HydroGen3
- FHiller A-Class F-Cell
- SUZUKI MR wagon FCV
- BOSIE Hydrogen 7
- FC-Bus 5 units

JHFC Hydrogen Stations: Total 12 stations (FY 2007)
- Osaka 1
- Kansai region 2 stations
- Chubu region 1 station
- Centrair Airport (Central Japan International Airport)
- Kasumigaseki
- Sagamihara
- Asahi (Yokohama)
- Kawasaki
- Daikoku (Yokohama)
- Senju
- Fun
- Kirishima
- Kimitsu liquid H2 production facility

http://www.jhfc.jp/e/data/pdf/brochures_stake.pdf

Fuel cell residential cogeneration system-Ballard Power

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HOT Topic #2
- At September UN Summit on Climate Change, Japan announced it will aim to reduce emissions by 25% compared to 1990 levels.
- Japan & US agree to cooperate on Clean Energy Century Plan for clean energy technologies.

HOT Topic #3
- Long-Distance (1,100 km - 637 miles) 3 vehicle Demo Drive
- 2 refuelings; total H2 – 28.2 kg; average fuel efficiency 118.4 km/kg

HOT Topic #4
- ~1000 unit demo stationary fuel cells for residential use launched in 2009

Targets, Policies, Funding
- FCV - commercialization starts in 2015
- Stationary FC - 20-100MW (2010); 2,500 MW (2030)
- 2010 budget ~18 billion Yen for H2, Fuel cells, demo, codes & standards, subsidy

Focus on Strategy & Innovation
NIP (National Innovation Program) 2007-2016

- Government, industry, science
- **1.4B € budget** (50% industry; 30% Ministries of Transport, Bldg & Urban Affairs – focus on demonstration; 20% Ministry of Economics – focus on R&D)

**Initiatives**

- Lighthouse projects & clusters
- Clean Energy Partnership II Berlin
- New H2 station in Hurth provides final link in 600 mile hydrogen highway (Munich to Amsterdam)
NOW GmbH (National Organization of H2 and Fuel Cells)

H2 Mobility - Industrial Alliance of several auto manufacturers and energy industry partners leads to MOU on build-up; two phase plan begins 2010

- **phase 1**: standardization and planning
- **phase 2**: roll out with serial production starting in 2015

MOU between NOW and NEDO - H2 and Fuel Cell commercialization (May 2010)

- info exchange, applications (stationary and transport) and infrastructure
- commercialization planning, project management, Policy and technology “trends”
Focus on Proven Pioneers

**Denmark**
- The nation that ignited the world’s modern wind turbine industry
- Now set to compete in fuel cells for export
- Hydrogen and electric vehicles exempt from taxation
- Hosted COP15 in 2009

**Korea**
- Now major automotive manufacturer, soon to include fuel cell vehicles
- Residential demo program - 1000 units
- FCV - commercialization strategy
- Fleet program
Focus on Strategy and Innovation

Canada

- largest per capita OECD H2 producer - 3 million tons annually
- program targets: H2 production, storage, fuel cells; safety, codes & standards
- Chair of ISO Technical Committee 197
- 20 fuel cell buses at Winter Olympics
- Ontario H2 Village in Toronto & remote sites

France

- 7 year R&D investment; 200M €; 20 partners
- R&D focus on nuclear hydrogen
- Voilà! EDF is promoting fuel cells in the press!
Focus on Strategy: Innovation & Targets

US

- **Major milestones and critical path technology goals:**
  - H2 produced from domestic resources for $2-3.00 per gallon gasoline equivalent
  - On-board H2 systems for light-duty vehicles with 300 mile range
  - PEM fuel cell technology: $30/kW; durability 5,000 hours of service = 150,000 ml/240,000 km
  - Stationary - 40,000 hours at $750/kW

- **11 patents in 2009; 21 others in progress**
- **1000 fuel cell systems** - mixture of uses
- **FY10 Budget** - $174M + $40M fuel cell deployment by 2012

- **Tax regime:** more favorable tax credits or grants in lieu of credit; manufacturing credit

Congratulations to DOE on 2010 AMR!
Additional Tracking of DOE Program Effectiveness

DOE is tracking commercial successes of technologies funded by the Hydrogen, Fuel Cells and Infrastructure Technologies Program.

Accelerating Commercialization:
An increasing number of HFCIT-funded technologies have been entering the market.

HFCIT-funded Technologies that are Commercially Available

PATENTS resulting from HFCIT-funded R&D:
118 patents reviewed:
- 60 fuel cell patents
- 37 hydrogen production/delivery patents
- 21 storage patents

Results will be documented in a report by PNNL:
Pathways to Commercial Success: Technologies and Products Supported by the Hydrogen, Fuel Cells and Infrastructure Technologies Program

LCES-2011 in Dalian, China

www1.eere.energy.gov/hydrogenandfuelcells/
Focus on Economics and Climate:
the European Engine of Change

Commission of the European Union

- **FCH Joint Technology Initiative (JTI)** established October 2008 as public-private partnership to produce “fit-for-use” hydrogen energy and fuel cell technologies

- **Lisbon Treaty** comes into force – energy now a shared competence among 27 member states

- **European Research and Innovative Action plan** now in preparation

Congratulations to 27 Member States on upcoming General Assembly in Brussels!
Focus on Strategy: Policy Priorities and R&D

**Lithuania**
- 2006 creation of Lithuanian H2 & Fuel Cell Technology Platform
- Focus on Storage and Education

**Turkey**
- Renewable H2 an important alternative fuel
- Clean coal, catalysis and biomass
- Robust R&D regime
- Home base - UNIDO ICHET
Focus on Strategy, Innovation & Demonstration

**Switzerland**

- **Innovation in research** - SFOE (photoelectrochemical [PEC] watersplitting)
- **Innovation in products** - Swiss Innovation Promotion Agency (CTI)
  - Minibars on Swiss Railway trains (SBB) powered by PEM fuel cells with solid state metal hydride storage
  - 1st H2 street-cleaner - demo in Basel

**Finland**

- Moving toward demo - FinnHy
- National program at Tekes targets industry opportunities to create breakthrough fuel cell products
Focus on Strategy, Innovation & Demonstration

Spain
- Spanish Technology Platform for H2 and FC - 2005 launch
- Aggressive 2008-2012 Action Plan for energy efficiency
- Big player in wind energy
- Strong regional H2 investment

Italy
- 5 year national plan includes H2 & fuel cells
- Regional focus on Demos
- Industry 2015 - H2 and Fuel cell projects in sustainable mobility
Focus on Strategy, Innovation & Demonstration

Sweden
- One of world’s best addresses for BioHydrogen
- Fuel Cell & H2 - Joint Technology Initiative launched 2008

The Netherlands
- DutchHy launched 2009
- Emphasis on infrastructure

Iceland
- SMART-H2, SMARTH2 Boat (Sustainable Marine & Road Transport)
Focus on Strategy, Innovation & Demonstration

Greece

- Renewables and remote site projects for sustainability

Norway

- Storting to pursue long-term climate policy
- HyNor - multiple stations (route extends into Denmark and Sweden) and large vehicle fleet (H2 Prius, Think H2, Mazda)
Focus on Clean and Sustainable Energy

**Australia**
- **Emissions plan:** 5-25% reduction by 2020
- **Clean Energy funding:** $A652 M RE future fund; will expand to $A5.1B clean energy initiative

**New Zealand**
- **HOT NEWS:** pushing ahead with ETS (emissions trading scheme), which comes into effect July 1 with carbon price of NZ$12.50 CO₂e (equivalent CO₂) per tonne

**United Kingdom**
- **Named for commitment:** Department of Energy and Climate Change
Focus on Connection with the Developing World

UNIDO

- Represented by its project, UNIDO ICHET, whose mission is to demonstrate viable implementation of hydrogen energy
- Technologies and facilitate their widespread use in developing countries
- UNIDO-ICHET located in Istanbul, Turkey
- Funding Instruments: pre-feasibility, pilot, R&D
- Demonstration activities:
  - H2 3-wheelers, New Delhi, India
  - Bozca Hydrogen island, Turkey
  - Aitutaki, Cook Islands
  - FC-based UPS, Turkey
  - Fuel cell fork-lift, Turkey
  - Hydrogen FC boat, Turkey
- R&D - Test labs; Education; Conferences
Investment Benefits

Technology Development and Deployment Benefits
- Accelerated development and deployment
- Greater Project Scale
- Linking research, industry and policy
- Harmonized technical standards

Member Benefits
- Strengthened National R,D&D capabilities
- Reduction in R,D&D cost and duplication of effort (>700 persons level of effort in 2004-2009)
- Opportunity to participate in all IEA HIA tasks at modest cost
- Information sharing and networking at the ideal time for cooperation in the technology development cycle.

Positioning hydrogen technology and IEA HIA members for success and sustainability in the global economy
IEA HIA Value Proposition

**Provides a neutral international profile**
- Knowledgeable, reliable, unbiased
- Access to technical experts
- Global reach (government, academia, industry)

**Leverages resources**
- Focus includes science & technology, market analyses and outreach
- Portfolio includes shorter term and long-term, pre-competitive activities
- Careful intellectual property (IP) treatment
- Established network of researchers

**Offers assurance based on track record**
- Collaborative research tasks completed over 30 years
- Membership growing
International Energy Agency
Hydrogen Implementing Agreement . . .

A premier global resource for technical expertise in H₂ RD&D

For more information contact:
Mary-Rose de Valladares
mvalladares@ieahia.org
+1 301 634 7423

www.ieahia.org

Thank you very much!