Going Forward with Global Collaboration:
IEA HIA Strategic Plan for the Next Five Years
2009-2014

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WHTC 2009
August 2009  New Delhi, India
IEA HIA Presentation

- **IEA HIA Fundamentals**

- **Overview of IEA HIA Portfolio Activities and Accomplishments:**
  - Collaborative R,D&D - *Production focus*
  - Analysis that Positions Hydrogen
  - Hydrogen Awareness, Understanding and Acceptance

- **Investment Benefits and Value Proposition**
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 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
2009 - 2014 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 fosters technology diffusion and commercialization

- Information Dissemination
- Safety
- Outreach

WHIC 2009 New Delhi, India August 2009
Theme:
Collaborative R&D&D

Portfolio:
HYDROGEN PRODUCTION
Task 16: Hydrogen from Carbon Containing Materials

April 2002 – December 2005 (completed)

- **State of the Art Reports for all three subtasks:**
  - **Subtask A** - Large Scale Integrated H₂ Production for Power Generation / Precombustion Decarbonization
  - **Subtask B** - Prospects for H₂ from Biomass
  - **Subtask C** - Small-Scale Reformers for Stationary H₂ with Minimum CO₂ Emissions

- **Substantial industry participation** - HIA Benchmark
- **Two Successors tasks** - Task 23 and Task 27

OA: Elisabet Fjermestad-Hagen (Norsk Hydro, Norway)
Task 21: BioHydrogen

October 2005-October 2010

- Evolved from Task 15
  May 1999-July 2005 (completed)
  R&D Progress toward development of H₂ production by microalgae

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

  Achieved better genomic understanding of H₂ producing strict anaerobes

OA: Dr. Jun Miyake
Task 23: Small-Scale Reformers for On-Site H₂ Supply

December 2006-December 2011—recently extended

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

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

December 2006 - December 2009

- **Mid-term R&D for entire wind to hydrogen production chain**
- **Four Subtasks:**
  1. Subtask A - State of the Art
  2. Subtask B - Improvements and System Integration
  3. Subtask C - Business Concept Dev.
  4. 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 and Mr. Fernando Carpintero
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: 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: Ms. Sabine Poitou of CEA
Task 26: Advanced Materials for Waterphotolysis of H$_2$

May 2008 – May 2011


- Aim: Photoelectrochemical (PEC) materials that enable net solar-to-hydrogen conversion efficiency of 10% in PEC water-splitting.

- 4 Subtasks:
  1) Materials “Theory” R&D
  2) Materials “Synthesis” R&D
  3) Materials “Characterization” R&D
  4) “Information Coordination/Database” Development

OA: Dr Eric Miller of Hawaii Natural Energy Institute, University of Hawaii, Manoa
Task 27: Near-Market Routes to H2 by Co-Utilization of Biomass as a Renewable Energy Source with Fossil Fuel

2008 - 2011

- Co-gasification of biomass with fossil fuels
- Hydrogen market facilitation based on distributed processing of biomass to new tradable intermediates
- Near term stand-alone biomass gasification
- 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
  - 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 IET
Theme:

Collaborative R&D&D

Portfolio:

INTEGRATED SYSTEMS
Task 18: Integrated Systems Evaluation

January 2004 – December 2009

- Phase 1 - Subtasks A and B. Phase 2 includes Subtask C.
- Subtask A Phase 1 - World’s best address for information and analysis on H₂ and integrated systems: [http://iea-hia-annex18.sharedpointsite.net/Public/default.aspx](http://iea-hia-annex18.sharedpointsite.net/Public/default.aspx)
- Subtask B Phase 1 - Modeling & existing analysis tools evaluate H₂ projects. **H₂ Demonstration Projects Development** covers state of the art
- Subtask C Phase 2 - Synthesis and Learning to bridge Subtask A and B experience and provide lessons learned, benchmark assessments and trend analysis

OA: Dr Susan Schoenung (Longitude 122 West, Inc, USA)
Task 23: Small-Scale Reformers for On-Site $H_2$ Supply

December 2006-December 2011 recently extended

- Development of reformer technologies and distributed on-site reformer based $H_2$ supply systems
- Contributing to norms & fast-tracking deployment
- Three Subtasks:
  1) Harmonized Industrialization
  2) Sustainability and Renewable Sources
  3) Market Studies

OA: Dr. Ingrid Schjølberg of Sintef
Theme:
Collaborative R,D&D

Portfolio:
H$_2$ INTEGRATION IN EXISTING FRASTRUCTURE
Task 23: Small-Scale Reformers for On-Site H₂ Supply

December 2006-December 2010

- 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 Schjølberg of Sintef
Task in Definition

Large Scale Hydrogen Infrastructure and Mass Storage

Coming soon!
Theme: Analysis that Positions Hydrogen

Portfolio: TECHNICAL, MARKET AND SUPPORT FOR POLITICAL DECISION-MAKING
Theme:
Hydrogen Awareness, Understanding and Acceptance

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

Portfolio:
SAFETY
Task 19: Safety

October 2004 – December 2009

Survey of Quantitative Risk Assessment (QRA) methodologies and testing methodologies

Testing and Experimental Program: will evaluate the effects of equipment, product and/or system failures under a range of real-life scenarios, environments or mitigation measures

Targeted information packages for stakeholder groups such as: permitting officials, insurance providers, system developers, manufacturers, early adopters

OA: William Hoagland (W. Hoagland & Associates, USA)
HYDROGEN IMPLEMENTING AGREEMENT

Theme:
Hydrogen Awareness, Understanding and Acceptance

Portfolio:
OUTREACH
Outreach

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 2009

Media Engagement

- Released 25th Anniversary Report at **National Press Club** in Washington, D.C.
- 12 Press Releases
- Letters to the Editor

IEA HIA Chair Trygve Riis

Dr. Gary Sandrock
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 . . .

www.ieahia.org

. . . A premier global resource for technical expertise in Hydrogen RD&D

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