Power-to-Hydrogen and Hydrogen-to-X:
System Analysis of the techno-economic, legal and regulatory conditions:

A new task of the IEA Hydrogen Implementing Agreement

Paul Lucchese, Alain Le Duigou, Christine Mansilla
CEA

WHEC 2016, Zaragoza, Spain
Context

• Increasing demand for energy in the world
• Increasing renewable share in the energy mix, especially in the electricity mix
• Greenhouse gas constraints and CO₂ reduction in the energy sector
• Local pollution issues
• Deregulation in the energy system, allowing new challengers to enter the market
• Energy security issues
• Needs for decentralised systems, and local production

Power-to-Hydrogen & Hydrogen-to-X: Key pathways towards an environment-friendly smart energy system?
The focus of the new IEA HIA Task 38
The “Power-to-hydrogen” concept means that hydrogen is produced via electrolysis supplied with low-carbon and/or low-cost electricity. 

*Electricity supply* can be either:
- On-Grid
- Off-grid
- or hybrid systems

With particular attention devoted to:
- Provision of services to the grid
- Characterization of hydrogen relevance for energy storage

“Hydrogen-to-X” implies that the hydrogen supply concerns a large portfolio of applications:
- Transport: hydrogen for fuel cells
- “Green” gas (either through methanation or not)
- Industry (refinery, steel, ammonia, synfuels, etc.)
- Re-electrification (towards the power grid or for remote areas)
Objectives of the Task 38

- To provide a comprehensive understanding of the various **technical and economic** pathways for power-to-hydrogen applications in diverse situations

- To provide a comprehensive assessment of **existing legal frameworks**

- To provide business developers and policy makers with **general guidelines and recommendations** that enhance hydrogen system deployment in energy markets

*The overarching objective will be to develop hydrogen visibility as a key energy carrier / chemical intermediate for a sustainable and smart energy system, within a 2 or 3 horizon time frame: 2020, 2030 and 2050, for example.*
Four years / two phases

1/ • **General survey of existing studies** on techno-economic and business cases, existing legal frameworks and macro-economic impacts, including demo/deployment projects

2/ • **Detailed specific case studies**, based on detailed targets defined during the first phase, together with elaboration of legal and regulatory conditions, policy measures, and general guidelines for business developers and policy makers as well as public and private financial mechanisms and actors
Inside Task 38: Structure and Task Forces

<table>
<thead>
<tr>
<th>Subtasks</th>
<th>Task Forces</th>
<th>Interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Mapping and Review/analysis of existing demo projects</td>
<td>Methodology (screening sheets)</td>
<td>with other projects and initiatives (RETD, ...)</td>
</tr>
<tr>
<td>3A Review/analysis of the existing economic studies on PtH &amp; HtX</td>
<td>Definitions</td>
<td>tasks (36, others), IEA, institutions (EASE, IPHE, NOW, ...)</td>
</tr>
<tr>
<td>3B Review of the different existing legal frameworks, policy measures</td>
<td>Services to the grid</td>
<td>CEN/CENELEC</td>
</tr>
<tr>
<td>4 Systemic approach and macro-economic impact analysis</td>
<td>Data</td>
<td></td>
</tr>
<tr>
<td>5 Specific case studies</td>
<td>Electrolyzer data</td>
<td></td>
</tr>
</tbody>
</table>

**Survey of the state of the art**

**Detailed case studies**

Common basis for a common work
Task 38 partners

Today:
46 participants from 29 organisations are involved in the Task, representing 14 countries

Tomorrow:
Different actions are in progress to further widen the geographical scope of the partners, with a special focus on Asia and emerging countries
As a conclusion: (some) first achievements

• Kick-off meeting in Paris in January: 30 attendees

• Start of the work of the subtasks:
  e.g. for ST3A: over 200 documents gathered, first methodology proposed

... and this presentation!
Interested to join us?