

**Proposal for a IPHE workshop on**  
*« Hydrogen as a storage medium for Renewables »*

**Status of the project**

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# Preliminary considerations

## *1- Energy storage more and more important in High % Renewables*



International  
Renewable  
Energy  
Storage  
Conference

# IRES

## *2- Hydrogen has unique specificities:*

*Flexibility/Multiple uses possible*

*Covers all Energy/power range*



## Flexibility/Multi-uses of Hydrogen

- Green Electricity-to H<sub>2</sub>- to Electricity with FC, Turbines, Gas engine
- Green Electricity-to H<sub>2</sub>- to FC for mobility
- Green Electricity-to H<sub>2</sub>- for Industry: existing and emerging applications
- Green Electricity-to H<sub>2</sub>- to liquid fuel processes: biofuels and synfuels
- Green Electricity-to H<sub>2</sub>- to gas mixture : Natural gas, biogas Grid for cogeneration, mobility, Heat ...



## Goal of the workshop:

### *Introducing Hydrogen in the game of Renewables storage*

- Inform the Attendance all the potential benefits/interests of hydrogen solutions compared to alternatives technologies
- Show unique new business possibilities due to flexibility of H<sub>2</sub>
- Show existing demonstration & experiments, preliminary business cases, identified or emerging markets
- Identify technologies weaknesses, lack of economic tools, regulations, incentives, policy framework
- Build and convey an action plan/Recommendations for policy makers
- Identify new international collaboration ways



## Attendance:

50% « H2 world », 50 % outside

- Gouvernement policy makers: IPHE and non IPHE countries
- International organizations: WCRE, IEA, IRENA
- Energy utilities
- Electric and gas grid operator & Grid regulators/Managers
- Renewables energy operators
- Funding organizations
- Economic experts in Energy



# Workshop

- Emphasis on Policy aspects
- Stress out economics and environmental aspects (Round cycle efficiency...)
- State of the art presentation for technology portfolio of storage and key technologies
- Presentations balanced between Hydrogen project and General Renewables framework
- Must include links with others international organization, projects, non IPHE members
- Include a focus on international cooperation with non IPHE members
  - Proposal for a special session between IPHE countries and Mena countries
    - Key regions for energy, strategic aspects, recent evolutions
    - May be easier to find funding for workshop organization



# Framework

- Round tables to discuss key points and exchange
- Interactive learning, building relationship, new business opportunities
- Some conclusions actions plan to be drawn/ Follow up
- 2 days workshop/ 5-6 sessions including round tables
- Order of magnitude: 150-200 attendees
- Need of a global facilitator



## Tentative Structure

### 1. IPHE introduction

### 2. Economics/market demand for Renewables storage technologies

- Scenarios with high % Renewables Scenarios, how much energy storage needed, Possibilities given by intermittency at large scale
- Energy storage integrated at generation level or Grid/transmission level
- State of the art of storage technologies
- Basics economic of energy storage: price volatility, market conditions
- Policy framework, Status of public incentives/regulations

### 3. Role and specificity of hydrogen energy systems

- Technology overview, technical challenges, decentralized/centralized systems, hydrogen infrastructure needed
- Economic and environmental Impact of a hydrogen based system
- **Business/demonstration cases Hydrogen from renewables**
  - Industry, , synfuels, Electricity to electricity: Island/ remote off-grid weak grid community, Coupling/mixing with natural gas biogas, Oxygen Chloro Hydrogen applications
  - Mobility, Coupling renewables and Hydrogen infrastructure, underground storage system





## 4. Overcoming Hydrogen technologies challenges transform Hydrogen flexibility into attractive business opportunities:

- Assessing economics of Hydrogen system; business model/Benefits: increase of sales electricity, increase of hydrogen sales, supply hydrogen cars?
- Economics tools needed for complex arbitrage and optimisation to maximise the value of the energy storage system, market conditions
- Point of view of funds, VC, clean techs investors, banks, financial institutions
- Point of view of grid regulator/ Grid company (electricity and gas)
- What type of legal/market incentives and regulatory framework

## 5. What type of international collaboration ?

- IPHE towards WCRE, IRENA, IEA Unido Nato..
- Link with other thematic organization: CCS,
- Focus on Mena countries and non –IPHE countries

## 6. Towards a new Emerging paradigm: Smart Energy Grid and Hydrogen as a bridge between fossils and renewables/electricity and gas



## Key speakers and participants

- Chair or director of WCRE/IRENA/IEA
- IEA WEO ETP scenarii experts
- Collaboration with IEA/ Hydrogen implementing agreement for technical background
- Renewables Energy scenarios makers
- From Hydrogen community
  - Experiments from Germany: Enertrag(H2Biogas), wind H2 for refuelling station
  - Remote area, Island : a lot of experiments in the world

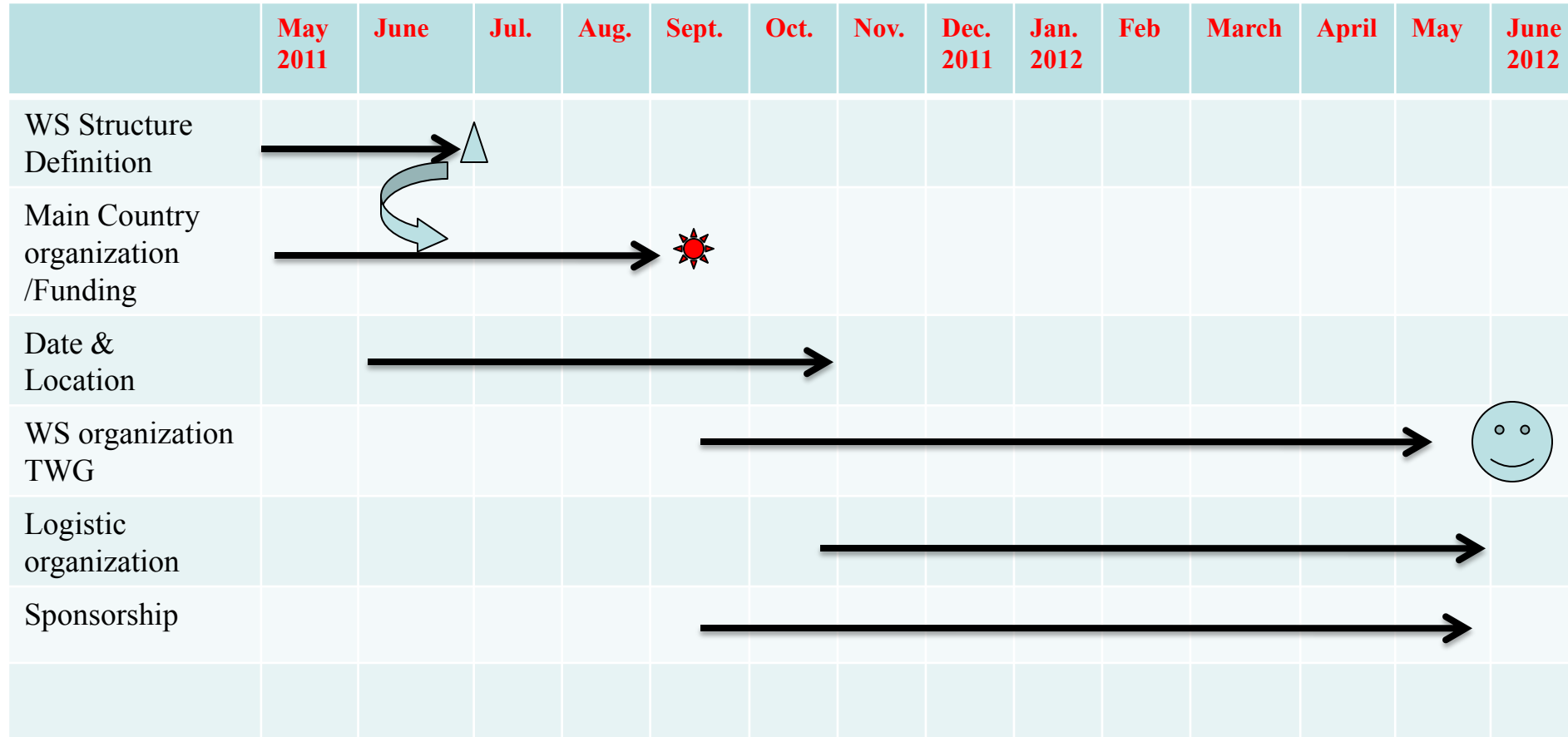


# Possible organization/ Financing: to be defined

*Best date: 2<sup>nd</sup> quarter 2012*



# Next steps/Possible Schedule





Thank you for your attention

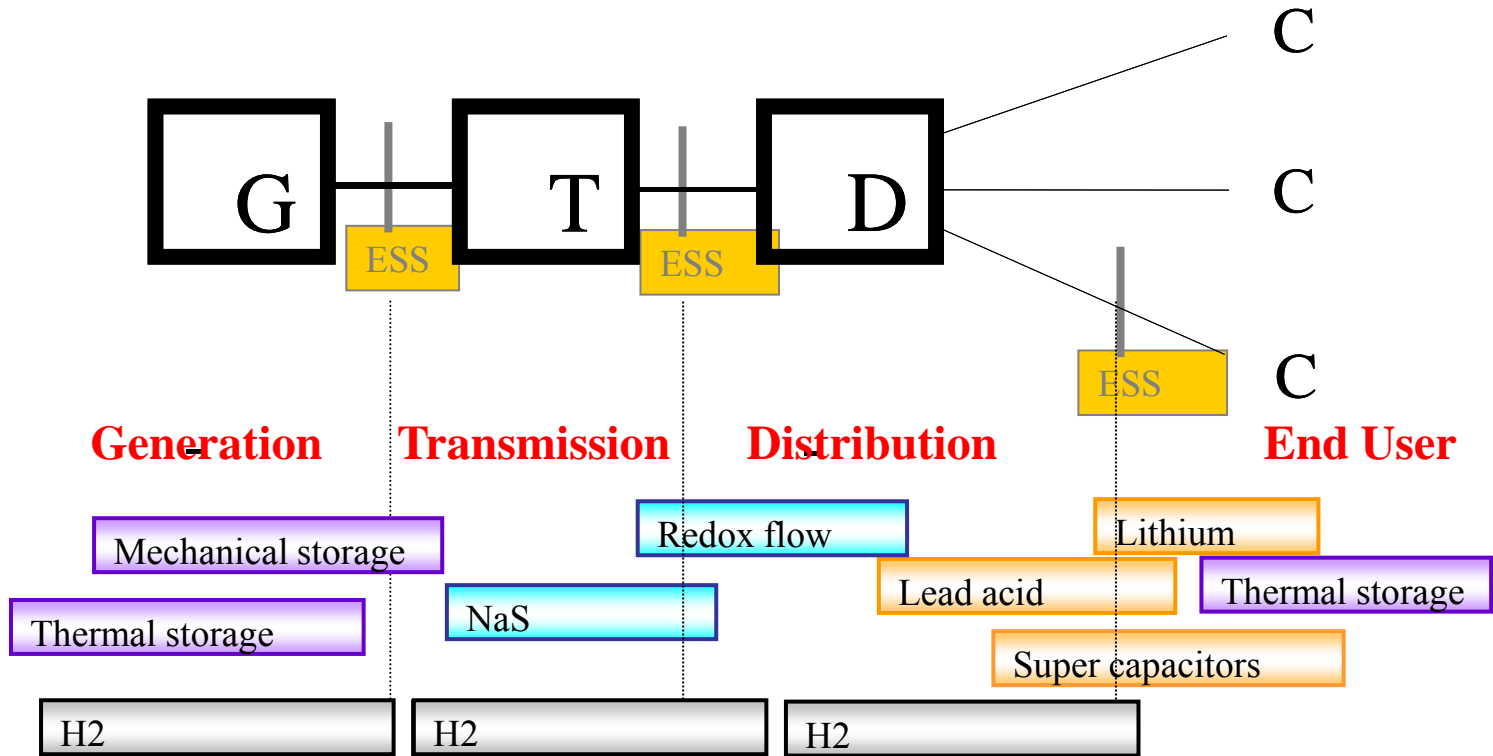




- Comments and remarks to this proposal
  - During SC meeting
  - Post meeting comments (delay 1 month)
  - Approval final structure Deadline : end of June
- Specific Comments on proposal to include a session for non-IPHE members especially Mena countries
- Comments/remarks on connecting with other international organization/IEA
- Re confirm/Re define TWG (Temporary Working group) to participate actively on the organization of IPHE workshop



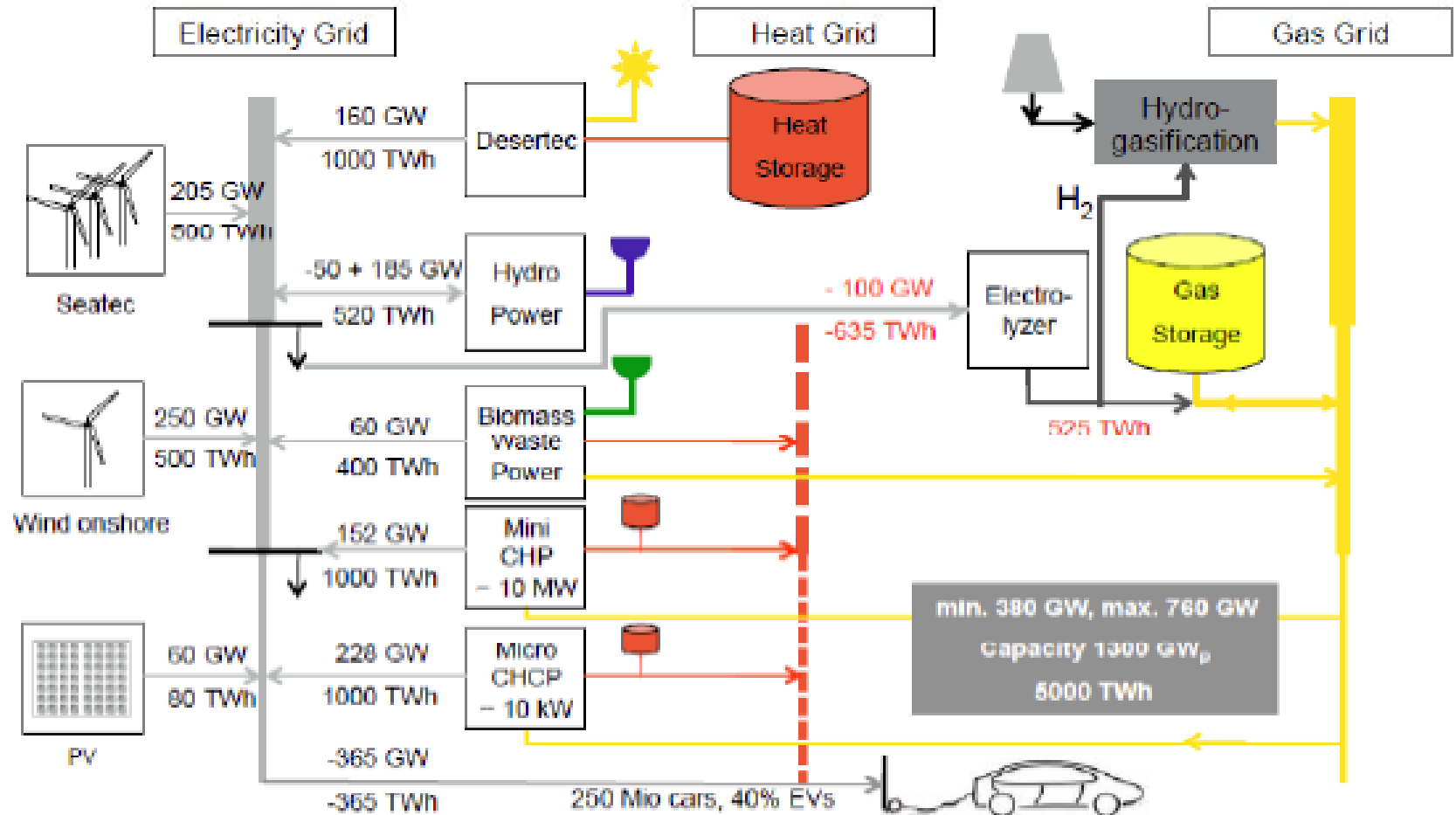
## Energy storage integration: grid extension or power generation extension ? Hydrogen covers the whole chain



- Wide range of applications: load leveling, grid supply, current quality...
- Few seconds to several hours, Very low targeted total costs: 0.05€/kWh



## Future electrical grid – ultra large capacity REN Installed capacity (GW) and energy supply (TWh)







- EON RWE GDF Suez EDF Vattenfall Endesa Gas Natural China
- ABB Siemens Saft NEC Statkraft Panasonic
- IBM Google
- Dong Energy Vestas
- RTE Elia group
- Iberdrola Chian
- DOE EC
- WCRE IRENA IEA EASE
- Frost Sullivan, Brattle group