



## Hydrogen - A Competitive Energy Storage Medium To Enable the Large Scale Integration of Renewable Energies

Seville, 15-16 November 2012

### High Energy DENSity Mg-based metal hydrides storage system (EDen)

#### Overall Objectives

Four main themes have led to the development of this proposal:

- Delivering continuous energy (to buildings, small dwellings, micro-communities), by integrating intermittent thermal and electrical power sources with hydrogen energy storage systems.
- Mitigating the problem related to intermittent energy delivery to the grid and peak power demand. Delivering electrical energy to the grid above about 4% of the overall energy share (electrical) is likely to require modification of the grid itself. Higher storage capacity at the local level reduces the need to expand the grid.
- Providing safe, reliable and high density energy storage for domestic applications. Hydrogen has problems of safety (high pressure tanks) and energy density (405 Wh/l at 150 Bars) while Mg-based metal hydrides can configure as a safe material and technology, with higher energy density (>2.000 Wh/l);
- Provide the market with a viable complete system for hydrogen storage that will compete with the storage system available.

**EDen is focused on developing an integrated energy buffering system between a SOFC and a solid H<sub>2</sub> storage**

#### Technical Barriers and Targets

The main barrier to the wide use of the Magnesium based materials in hydrogen storage system is represented by two limitations: the working temperature of about 300°C and the high heat of reaction, around 10Wh/g. This limitation are intrinsic with the material, can not be solved but mitigated, by recovering the waste heat, or exploited, by integrating the storage system with an high temperature fuel cell.

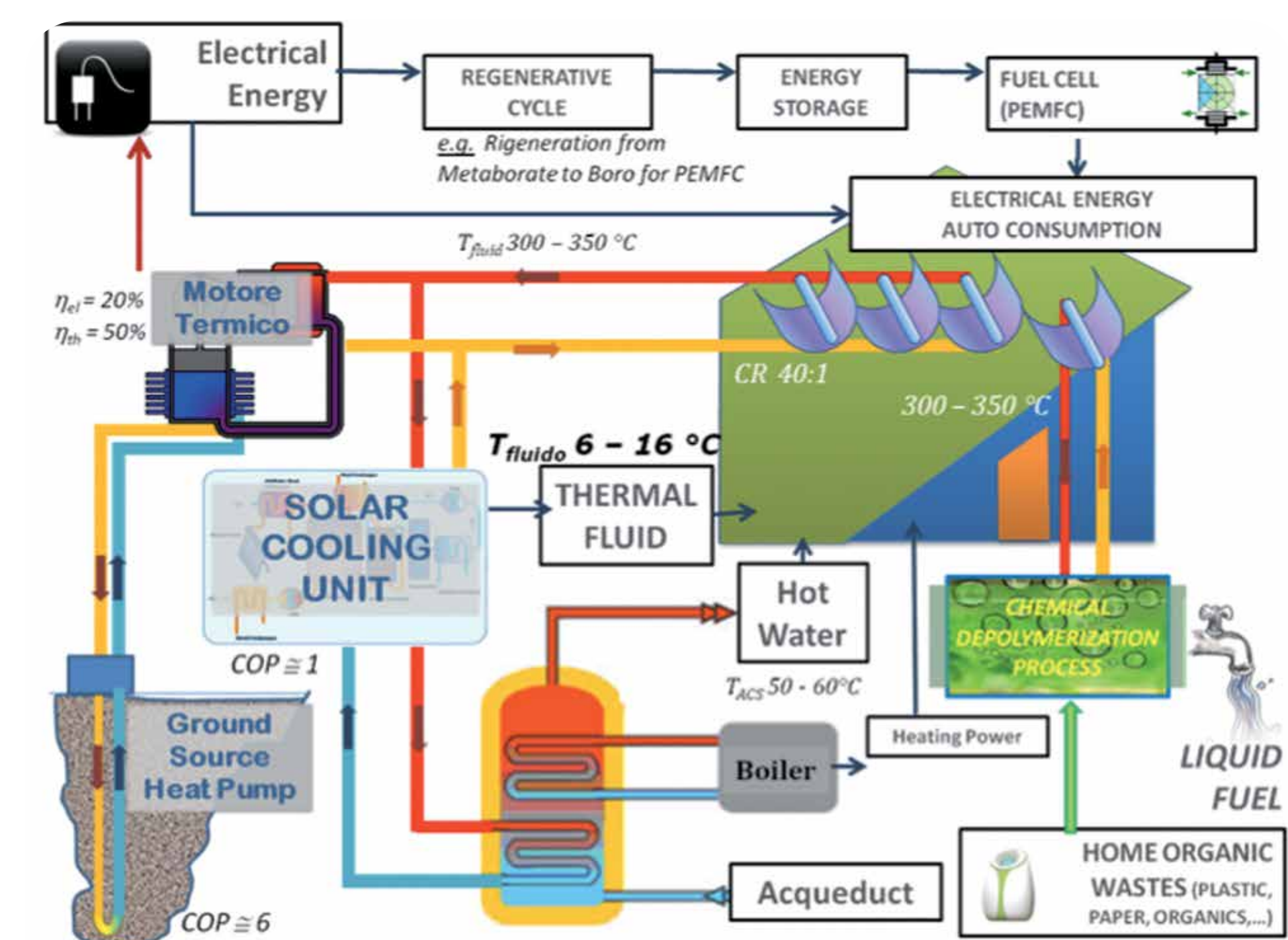
Other technical limitation would be solved and regards improvements of the absorption/desorption kinetic, of the mechanical stiffness and a optimized thermal exchange.

#### Technical accomplishments

The key advantage of EDen solution for solid state hydrogen storage are:

- Magnesium based material produced by High Energy Ball Milling
- Enhance the kinetics of the material by controlled adding the catalyzer

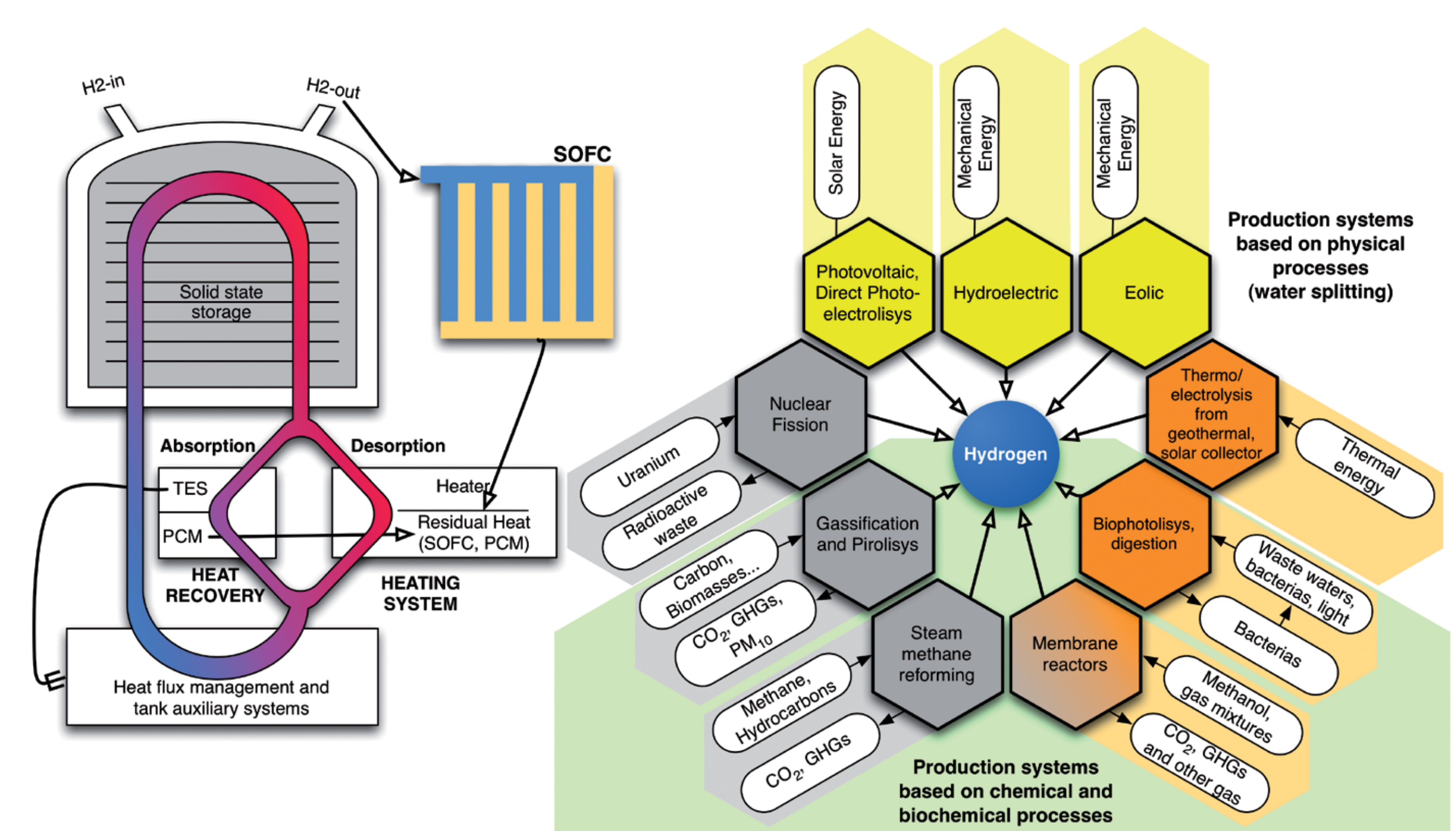
- Compact the storing material adding a binding phase that do not hinder the kinetics
- Recover the heat produced during hydrogen absorption by TES
- Symbiosis of the storage system with a SOFC for the heat management



Representation of EDen energy vision on +energy buildings

#### Future Work

The project is started in October 2012, in three year the targets will be accomplished and the technology transfer to the interested companies will start. All the public information will be upload to the project website.



The block diagram for the proposed EDen technology

#### Project Overview

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- MBN nanomaterialia - MATRES srl - Cidete Ingenieros SL - PANCO Universidad de la Laguna
- From 10/12 to 09/15
- www.h2eden.eu

