Assessment of the legal aspects for the deployment of a megawatt size alkaline electrolyser – ELYGRID project

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1. Overall objectives

ELYGRID project aims at contributing to the reduction of the total cost of hydrogen produced via electrolysis couple to Renewable Energy Sources, mainly wind turbines, and focusing on mega watt size electrolysers (from 0,5 MW and up). The objectives are to improve the efficiency related to complete system by 20 % and to reduce costs by 25%. The work will be structured in 3 different parts, namely: cells improvements, power electronics and balance of plant (BOP). Two scalable prototype electrolysers will be tested in facilities which allow feeding with renewable energies (photovoltaic and wind).

2. Motivation

-Need for new clean energy technologies.

-Interest in hydrogen production by means of renewable energy sources.

-New developments are necessary to match renewable electricity production with its intermittent nature.

- No available technology developed for partial load or intermittent operations within that range of electrolysis power (3-4 MW).

-Current technologies must be redesigned to achieve higher efficiencies and to be reliable, robust and competitive with capacity factors lower than 25 %.

-Total investment reduction cost of 25 % (BOP cost reduction 5 %, stack cost reduction 20 %).

IHT Electrolyser – FHA facilities (10 Nm^3/h H_2)

3. Hydrogen safety - ELYGRID

3.1 Safety analysis

In order to identify technical improvements related to Balance of Plant (BOP), a Hazard and Operability study (HAZOP) of the existing FHA alkaline electrolyser has been done.

Project: ALKALINE WATER ELECTROLYSER					**Page:** 16
Node description: H_2 cooler					**Date:**
					Node: E-1
Operating mode: normal operation					
GUIDE WORD	**DEVIATION**	**CAUSE**	**CONSEQUENCE**	**SAFEGUARD**	**RECOMMENDATION**
NO	No H_2 flow	H2.HV.05 closed P14.10 fault H2.HV.06 closed Q102.20 fault H2.HV.08 closed	Fire or explosion. Damage due to sudden expansion of the pressurized fluid. Injury, if vessel fragmentation occurs.	Safety valve N2.RV.06. Pressure control valve P14.10. Pressurized stop mode	
HIGH	High temperature	WCG.HV.01 closed L57.10 fault WCG.HVR.04 closed	No H_2O condensation in D-4. High dew point of H_2 stream	T alarm on T58.1. Flow indicator WCG.FI.05. Purity alarm on H_2O in H_2 analyzer	

Example of the HAZOP study done of the alkaline electrolyser at FHA

3.2 Regulations, Codes and Standards (RCS)

In order to introduce a new product, great efforts have been made to collect and structure of relevant existing RCS along the product life cycle, including:

European Directives

94/9/EC, 99/92 EC (ATEX) and harmonised standards

97/23/EC (PED) and harmonised standards

2004/108/EC (EMC) and harmonised standards

2006/42/EC (MD) and harmonised standards

2006/95/EC (LVD) and harmonised standards

ISO standards

ISO 14687-1:1999 and ISO 14687-2:2012

ISO 15916:2004

ISO 22734-1:2008

Additionally, compliance analysis of applied RCS to alkaline electrolysis must be done.

In the last year of the Elygrid project, it is expected to identificate the need for adaptation of existing RCS to the new electrolyser design.

Project overview

- Aragon Hydrogen Foundation FHA, Industrie Haute Technology S.A. IHT, Eidgenössische Materialprüfungs – und Forschungsanstalt EMPA, HELION, Forschungszentrum Juelich GmbH JÜLICH, Vlaamse Instel ling voor Technologisch Onderzoek N.V. VITO, Lapesa Grupo Empresarial LAPESA, Instrumentación y Componentes S.A. INYCOM, Ingeteam Power Technology S.A. INGETEAM, Commisariat à l´Energie Ato mique et aux Energies Alternatives CEA
- Duration: 11/11 to 10/14
- The research leading to these results has received funding from the European Union´s Seventh Framework Programme (FP7/2007-2013) for the Fuel Cells and Hydrogen Joint Technology Initiative under grant agreement nº 278824

Project: ELYGRID Funded by: New Energy World

Grant nº 278824

Coordinator: