INTERNATIONAL PARTNERSHIP FOR HYDROGEN AND FUEL CELLS IN THE ECONOMY

IPHE Country Update June 2020: Brazil

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Covered Period	June, 2019 – June, 2020

1. New Initiatives, Programs, and Policies on Hydrogen and Fuel Cells

Led by the Ministry of Science, Technology and Innovation (MCTI) and the Brazilian Hydrogen Association (ABH2), discussions are being held with different stakeholders in Brazil with the objective of considering the insertion of hydrogen energy in the Brazilian Energy Matrix, involving: the Ministry of Mines and Energy (MME) the Brazilian Electricity Regulatory Agency (Aneel) and the Brazilian Energy Research Office (EPE), academy, and industry representatives.

In June 2020, the Brazilian/German Industry and Commerce Association (AHK) started a project with GIZ and MME to prepare a study called Sector Mapping Hydrogen Brazil. The objective of this study is to identify the main stakeholders for a Brazilian Green Hydrogen Roadmap. In addition, the study will give a general vision about the main technologies for green hydrogen production and Power-to-X, and its status in Brazil.

2. Hydrogen and Fuel Cell R&D Update

Nothing new to report for this period.

3. Demonstration, Deployments, and Workforce Developments Update

3.1. Two demonstration projects related to R&D initiatives underway in Brazil are supported by a Federal Fund for R&D projects of the electrical energy sector. Both R&D projects were approved for implementation by ANEEL in 2016, under a public call for proposals of R&D projects oriented towards the development of large-scale renewable energy storage plants.

3.1.1. One includes a hydrogen-based energy storage plant, in which surplus hydroelectricity and solar PV electricity are converted into hydrogen by water electrolysis, and the stored hydrogen to be used during dry seasons and peak times. The hydrogen-based energy storage pilot plant includes a 20 Nm3/h PEM Electrolyser, a 600 Nm3 tank for hydrogen storage @ 25 bar, and a 100 kW Fuel Cell used to reconvert the hydrogen back to electricity.

The potential value added to the country interconnected power system, if large scale arrangements similar to these can be deployed, is a significant increase of use of energy volumes that are not currently available in periods and times when the real demand for electricity occurs. The total investment in this project is of about €8M. The Brazilian company BASE Sustainable Energy is implementing the project, together with a consortium contracted by the hydropower generation company CESP (Companhia

Energética de São Paulo), in the state of Sao Paulo, southeast region of the country.

3.1.2. The other project considers the potential for large-scale deployment of the hydro-solar synergy systems, in which the remaining areas around hydro dams, available after construction of the hydropower plants, are used for construction of solar plants, and even floating PV plants on the surface of the reservoirs, with both generation systems dispatched as an unique combined energy source. The hydrogen-based energy storage system in this configuration works to fill in the seasonal and hourly gaps in the transition from one to the other energy source in the optimization of both as part of an interconnected system. The hydrogen-based energy storage pilot plant includes a 50 Nm3/h Alkaline Electrolyser, a 900 Nm3 tank for hydrogen storage @ 27 bar, and a 300 kW Fuel Cell used to reconvert the hydrogen back to electricity.

In this demonstration project, the potential value added to the country interconnected power system is the large scaled hydro-solar synergy, mainly due to the fact that Brazil has a large interconnected system of hydroelectric plants, which interconnect five different hydrographic basins, and most of them are located in areas with a high incidence of solar radiation. Total investment in this project is about €11.9M. This project is implemented by BASE Sustainable Energy a Brazilian company, contracted by the Federal power generating company Furnas Centrais Elétricas S/A, in the middle west region of the country.

4. Events and Solicitations

In January 2020, the 3rd Biosphere World (BW EXPO 2020), a multidisciplinary event of technologies for sustainability of the environment, organized by SOBRATEMA (the Brazilian Association of Technology for Construction and Mining), included a new Curator Topic called “Energy Transformation – Hydrogen” joining the existing topics on Sustainable Agribusiness, Conservation of Water Resources, Sustainable Construction, Recycling, Waste to Energy, Valorization of Degraded Areas and Circular Economy.

In February 2020, the CENTRO UNIVERSITÁRIO FEI / Chemical Engineering Department, was the champion of the CHEM-E-CAR COMPETITION in the 2020 Brazil Student Regional Conference, organized by AIChE and Cimatec. The world competition might be held in the USA in November 2020. More details can be found at: https://www.aiche.org/chenected/2020/02/centro-universitario-senai-cimatec-student-chapter-hosts-first-brazil-student-regional-conference.

In April 2020, the SAE Brasil, an affiliate of the SAE International, with activities for disseminating knowledge and technology developments in Brazilian and international mobility, became partner of the BW EXPO 2020. SAE Brasil created a working group, “Mentoring in Technology and Innovation for the Mobility with Hydrogen”, and is organizing the “SAE Brazil & Ballard Student H2 Challenge” among universities and research institutions in Brazil. Ballard Power Systems from Canada, has donated 10 fuel cell stacks, technical support and online courses for the challenge, which will be to design and construct 10 small vehicles for the event.

5. Investments: Government and Collaborative Hydrogen and Fuel Cell Funding

Nothing new to report for this period.

6. Regulations, Codes & Standards, and Safety Update

Nothing new to report for this period.

Summary Country Update June 2020: Brazil

Transportation	Target Number	Current Status	Partnerships, Strategic Approach	Support Mechanism
Fuel Cell Vehicles[1]				
FC Bus		1 operational hybrid HFC bus		
Fuel Cell Trucks[2]				
Forklifts				
H_2 Refueling Stations	**Target Number**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
70 MPa On-Site Production				
70 MPa Delivered				
35 MPa On-Site Production		1 hydrogen production and refueling station.		

[1] Includes Fuel Cell Electric Vehicles with Range Extenders

[2] As above

35 MPa Delivered				
Stationary	**Target Number[3]**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
Small[4]				
Medium[5]				
Large[6]				
District Grid[7]				
Regional Grid[8]				
Telecom backup				
H_2 Production	**Target[9]**	**Current Status**	**Partnerships, Strategic Approach**	**Support Mechanism**
Fossil Fuels[10]				

[3] Targets can be units installed and/or total installed capacity in the size range indicated
[4] <5 kW (e.g., Residential Use)
[5] 5kW – 400 kW (e.g., Distributed Residential Use)
[6] 0.3MW – 10 MW (e.g., Industrial Use)
[7] 1MW – 30 MW (e.g., Grid Stability, Ancillary Services)
[8] 30MW plus (e.g., Grid Storage and Systems Management)
[9] Target can be by quantity (Nm^3, kg, t) and by percentage of total production; also, reference to efficiency capabilities can be a target
[10] Hydrogen produced by reforming processes

Water Electrolysis[11] (PEM, Alkaline, SOEC)		1 hydrogen production (water electrolysis) and refueling station		
By-product H_2				
Energy Storage from Renewables	**Target[12]**	**Current Status**	**Partnership, Strategic Approach**	**Support Mechanism**
Power to Power[13] Capacity	i. Pilot Hydrogen-based energy storage plant built to store 200 MWh/year. ii. Pilot Hydrogen-based energy storage plant built to store 730 MWh/year.	i. Pilot plant built, ongoing campaign of measures. ii. Pilot plant under construction. Scheduled for completion 3rd quarter of 2020.	i. ANEEL, CESP, BASE Sustainable Energy (BASE), USP, UNICAMP, UNESP, PV Solar, MFAP Consultoria. ii. ANEEL, FURNAS, BASE Sustainable Energy, Brandenburg Technology University, Technology and Innovation Institute of Goiás (SENAI), UNICAMP, UNESP.	i. Brazilian R&D Fund. Total investment 8 million Euros. ii. Brazilian R&D Fund. Total investment 11.9 million Euros.

[11] Please indicate if targets relate to a specific technology (PEM, Alkaline, SOEC)
[12] Can be expressed in MW of Installed Capacity to use the electricity from renewable energy generation, and Annual MWh of stored energy capacity
[13] Operator has an obligation to return the electricity stored through the use of hydrogen back to electricity

Power to Gas[14] Capacity				

[14] Operator has the opportunity to provide the stored energy in the form of hydrogen back to the energy system through multiple channels (e.g., merchant product, enriched natural gas, synthetic methane for transportation, heating, electricity)