



elyntegration

Grid Integrated Multi Megawatt High Pressure
Alkaline Electrolysers for Energy Applications

Demonstration a maximum 4 stacks
250 HP AWE.

DELIVERABLE 5.1.

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1 EXECUTIVE SUMMARY

In spite of its high maturity, the technology of High Pressure Alkaline Water Electrolysis (HP AWE) should be further improved to meet the technical and economical requirements of a variety of energy services which will be increasingly needed in a world dominated by intermittent renewable sources.

Within the ELYntegration project, WP5 is focused in the demonstration of the industrial prototype 250 HP AWE under high dynamic profiles coupled to a RE system. This report summarizes briefly the tests done and the installations where they have been carried out. Specific test results and operation conditions have gathered in D5.2.



2 OBJECTIVES

The main objective in this document is to summarize briefly the tests done and the installations where they have been carried out. Specific test results and operation conditions have gathered in D5.2.



3 DESCRIPTION OF WORK

Elyntegration consortium has had two different test benches located at FHA and IHT facilities in order to test different stacks at market size.

The specific test results and analysis are included in D5.2. “Analysis operational results 250 HP AWE: Performance specification and possible deviations”.

3.1 FHA test bench

Industrial scale test bench is sized to provide a maximum power of 250 kW, though within testing period it has finally been reached 150 kW. The test bench is designed to work at pressures up to 33 barg and temperature of 95°C. The test bench can work under variable load conditions, applying load profiles similar to grid services provision.

In the frame of the project, the stacks have been tested at different pressure levels, load conditions at steady conditions and load profiles simulating grid services provision. In Table 1 are shown the different stacks with industrial scale that have been tested in Elyntegration framework at FHA site.

Table 1. Stacks tested in ELYntegration Project.

Stack 1	Commercial Membranes + standard electrodes. C&CS validation
Stack 2	Novel VITO membranes + standard electrodes
Stack 3	Commercial stack

In Figure 1 and Figure 2 is shown the test bench located at FHA facilities.



Figure 1. Stack (FHA facilities)



Figure 2. Test bench (FHA facilities)



3.2 IHT test bench

Test bench erected at IHT facilities is able to work up to power sizes around 100 kW. It is composed also by stacks with market size dimension, to be operated up to 30 barg and 95°C.

During Elyntegration project, different stacks with modified configurations of novel cell assemblies have been tested. A total of 5 different cell assemblies have been analysed, being the most promising configuration, which has been tested deeply, exploring the full operation window at different pressure and load levels.

The tests have been carried out in different phases between April-May 2018 and the end of the project (May 2019).

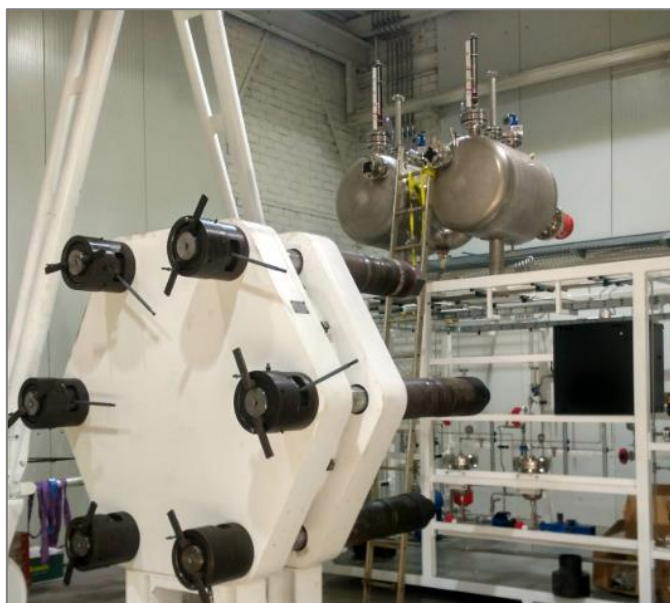


Figure 3. IHT test bench facilities in Elyntegration project

3.3 Tests performed

Different tests are performed changing the intensity set point from 7.5% to 100% of the I_{max} allowed, with pressures of 4, 15 and 30 bar. Moreover, in stack 3 at FHA site were tested the power profiles from two harmonised protocols, aligned with QualyGridS project (G.A. No 735485): FCR and aFRR protocols.

An example from the data viewer may be seen in Figure 4 (FCR test). Intensity values (y-axis) are hidden due to confidentiality clause.

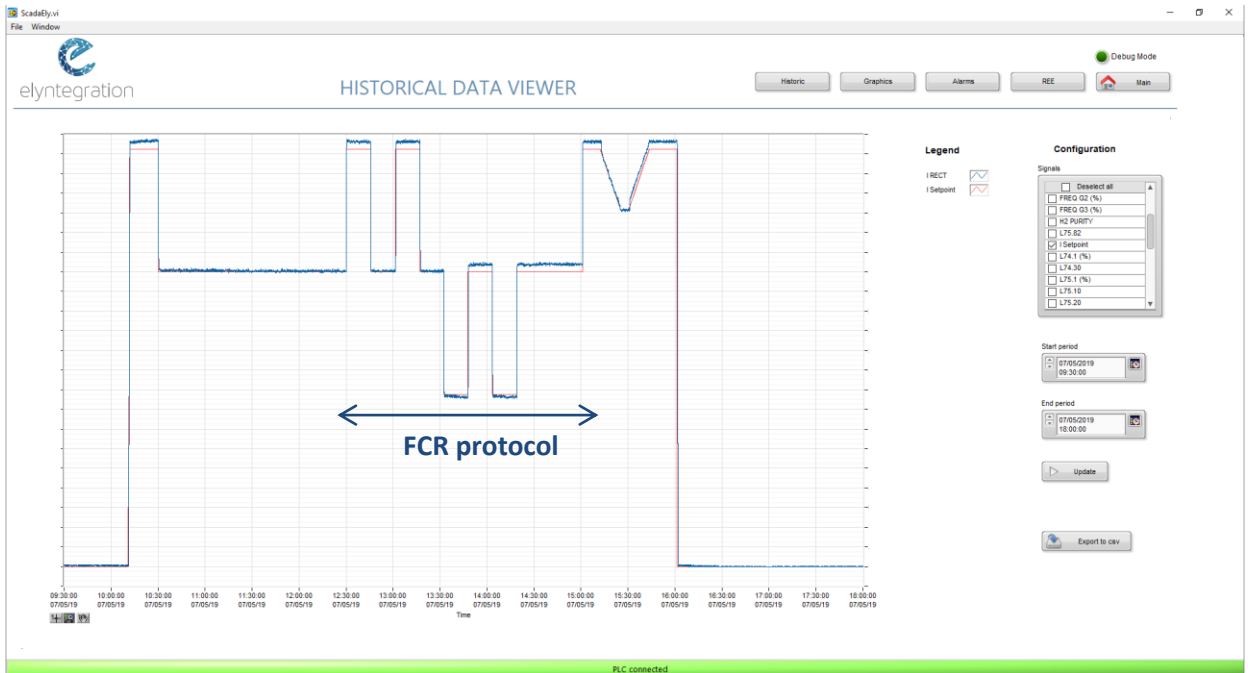


Figure 4. Data Viewer Stack 3_GridServices_FCR profile



4 CONCLUSIONS

Task 5.1 in Elyntegration project has been dedicated to the testing of different stacks at market size with novel developments carried out during the project.

Stacks have been tested with commercial components, novel membranes developed by VITO and novel cell assemblies.

Testing period have been carried out in different phases from October 2017 to May 2019 at FHA test bench site and from May 2018 to May 2019 at IHT test bench site.

Specific results and analysis will be included in deliverable 5.2.