H2FUTURE
Green Hydrogen

Deliverable D5.2

Validated Monitoring System

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Table of Contents

Document Information 2
Table of Contents 3
Table of Figures 3
1 Introduction 4
1.1 The H2FUTURE Project 4
1.2 Scope of the Document 4
2 Validation of the Monitoring System 5
3 Conclusion 8

Table of Figures

Figure 1: Operation data collection 5
Figure 2: Data visualisation service (Grafana) 6

1 Introduction

1.1 The H2FUTURE Project

As part of the H2FUTURE project, a 6 MW polymer electrolyte membrane (PEM) electrolyser will be installed at voestalpine site in Linz, Austria. After the pilot plant has been commissioned, the electrolyser is operated for a 26-month demonstration period, which is split into five pilot tests and quasi-commercial operation. The aim of the demonstration is to show that the PEM electrolyser is able to produce green hydrogen from renewable electricity while using timely power price opportunities and to provide grid services (i.e. ancillary services) in order to attract additional revenue.

Subsequently, replicability of the experimental results on a larger scale in EU28 for the steel industry and other hydrogen-intensive industries is studied during the project. Finally, policy and regulatory recommendations are made in order to facilitate deployment in the steel and fertilizer industry, with low CO_2 hydrogen streams also being provided by electrolysing units using renewable electricity.

H2FUTURE is deployed by the following project partners: VERBUND, voestalpine, Siemens, APG, K1 MET and TNO.

1.2 Scope of the Document

Work Package 5 (WP5) of the H2FUTURE project has the objective to develop the building blocks for the link of the electrolyser system with power and energy markets (WP5.1). Further on, the data gathering and monitoring system able to calculate the KPIs will be setup (WP5.2) and the simulation and calculation IT tools will be upgraded to include electrolyser systems for resource optimisation and scheduling of the electrolyser for the various energy and power markets.

This document, deliverable D5.2, details the IT system for the local field data collection in view of calculating the KPIs of the electrolyser system. The KPIs of the project H2FUTURE were defined within the deliverables D2.1 to D2.7, which describe the different use cases of the electrolyser system within the pilot tests and quasi-commercial operation. Deliverable D2.8 summarizes and structures the KPIs of the project.

2 Validation of the Monitoring System

The target of WP5.2 – “IT system for the local field data collection in view of calculating the plant KPIs” – is to deploy a field data collection system / data warehouse to measure all relevant data with regard to the operation of the electrolyser system and supporting environment including grid values.

Therefore, data concerning the electrolysis operating performance has to be collected in field and provided to the research partners for further analysis. Besides data on the electrolysis this also includes data on grid service calls, cooling water consumption and energy consumption of various supporting installations. In total, this amounts to approximately 100 data points, which are transferred to the process control system (PCS) of the Siemens electrolyser by voestalpine.

Different methods for data collection have been examined and the following solution is implemented, which is also shown in Figure 1:

1. The Siemens PCS contains an internal database, where all relevant data points are stored, and creates daily text files (CSV) with the collected data points. These exported text files are stored on the local hard disk. In this way, Siemens provides all the necessary operating data for calculating the KPIs or their evaluations.
2. VERBUND connects manually via CRSP (VPN with dual authentication, own operator login) daily / weekly and copies the text files (for example via Remote Desktop)
3. VERBUND imports the text files into the data warehouse

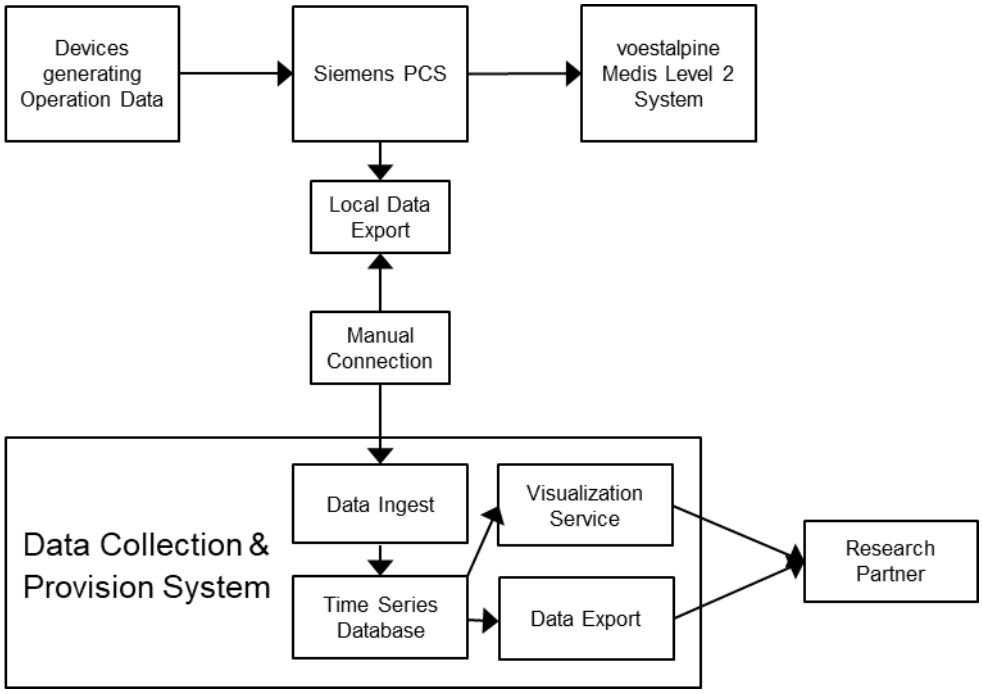

Figure 1: Operation data collection

The data provision service stores the collected data in a time series database, which is optimized for timestamp-indexed data, both in terms of storage space and access speed. The provision service will distribute the data to research partners and allows a data visualization via a web interface.

Figure 2 shows the data visualisation service of the data warehouse (Grafana - https://grafana.com/grafana/). It offers the possibility to show, to select and to export data for different timeframes.

Figure 2: Data visualisation service (Grafana)

After the commissioning of the electrolyser system, the collection of operational data from the Siemens PCS according to Figure 1 was successfully tested. In order to validate the functionality of the data warehouse, the CSV file created by the Siemens PCS with real operational data was imported in the time series database of the data warehouse by VERBUND.

Figure 2 depicts various data of the electrolyser from November the 12th 2019 – as an example the string voltages and currents, oxygen generation and power consumption of the auxiliary systems. The oxygen production of the electrolyser on this day can be seen in Figure 3 (enlargement of graph in Figure 2).

Figure 3: Data visualisation service – example of O2-production

Additionally, the imported data was analysed and plausibility checks were implemented. For each data point a valid range can be defined for the plausibility checks.

The data collection and provision system is running and operational data will be added on a regular basis.

3 Conclusion

As part of the H2FUTURE project a 6 MW PEM electrolysis power plant is being installed at a steelworks in Linz, Austria, and operated for a 26-month demonstration period, which is split into five pilot tests and quasi-commercial operation.

In order to facilitate the evaluation and analysis of the various (Key) Performance Indicators of the pilot tests and quasi-commercial operation a data collection and provisioning system was setup by VERBUND. The local field data will be exported from the Siemens PCS at voestalpine and imported to the data warehouse on a regular basis.

Grafana is used for the visualization of and access to the data. For the validation of the system, a first bunch of real operational data was imported to the data warehouse in November 2019.

With the start of the pilot tests and the following quasi-commercial operation of the electrolyser system, the operational data will be imported on a regular basis to the data warehouse in order to be able to process and analyse the project's KPIs.