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H2FUTURE
Green Hydrogen

Deliverable D7.3

Expected scenarios and target KPIs for the seven use cases to be addressed during the demonstrations

v1.0

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1.0	2020-10-25	S. Engleder, C. Harris	Initial draft
2.0	2020-12-20	S. Engleder	Add comments / changes from M. Weeda and T. Zagler

Executive Summary

Work Package 7 (WP7) of the H2FUTURE project has the objectives:

- to validate the proper integration of the PEM electrolyser into the infrastructure at the industrial site
- to commission the pilot plant according to the target value of the KPIs that can be measured during commissioning in relation with the seven use cases
- to obtain pre-qualification of the electrolyser system for providing primary, secondary and tertiary reserve power to the Austrian Transmission System Operator APG

Work Package 7 (WP7) of the H2FUTURE is subdivided into the following parts:

WP7.1 – Integration of the electrolyser unit within the pilot plant site (VOESTALPINE)

WP7.2 – Commissioning of the electrolyser pilot plant (Siemens)

WP7.3 – Final validation of the experimental scenarios needed to cover the use cases and associated target KPIs (VOESTALPINE)

This document is linked to WP 7.3 and highlights any changes made to the original use-case scenarios or KPIs which may been necessary due to operational experience gained during the commissioning, or for technical reasons resulting from a difference in plant operational performance compared to the expected performance during the design phases.

As described below, in almost all cases, the use-cases have either already been executed as intended or will be executed as described in the original use-case description. Several use-cases required very minor changes. Likewise, the majority of the KPIs previously defined remain valid, with several KPIs being removed or modified based upon the experience gained through early operation and their expected relevance.

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1 Introduction

1.1 The H2FUTURE Project

As part of the H2FUTURE project a 6 MW polymer electrolyte membrane (PEM) electrolysis system will be installed at a steelworks in Linz, Austria. After the pilot plant has been commissioned, the electrolyser will be 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 making timely use of power price opportunities and providing grid services (i.e. ancillary services) in order to attract additional revenue.

1.2 Scope of the Document

This document, deliverable D7.3 gives an overview about the commissioning tests (use case 1-5), and discusses any adaptions, which were required to these cases due either to the actual plant design and/or operation experience gained during the early commissioning phase. Likewise this report reviews the previously defined KPIs and describes any of the necessary changes to the KPIs based on actual operating experience.

These final KPIs will form the basis for the evaluation of the various operating scenarios in WP 8 and the evaluation of the energy and emission data, which are used for the life cycle and techno-economic analysis, performed in WP 9.

The document is organized in the following sections:

Description of the commissioning tests: A review of the various commissioning tests and use-cases is provided. When already available, a short review of the use-case results are provided and any changes to the use-case compared to the original use-case defined WP 2 is presented.

Links to KPIs: Work package 2 defined various KPIs and PIs which should be used to evaluate the performance during the various use-cases and quasi-commercial operation, as well as to support the techno-economic analysis to be performed as part of WP9. The section of the report reviews the KPIs that were defined and indicates if changes to the KPIs were required due to the early experience gained during plant operation.

1.3 Notations, Abbreviations and Acronyms

I/O	Input /output level
RTU	Remote Terminal Unit
SCADA	Supervisory Control and Data Acquisition
LEMS	Leistungs- und Energiemanagementsystem (SCADA voestalpine)
EAF	Electric arc furnace
LAF	Ladle arc furnace

Table 1: Acronyms list

2 Description of the commissioning tests

The use cases described below are formally part of WP 8, and in accordance with the grant agreement, the results and analysis of the various use cases will be described as part of the deliverables WP 8. A brief overview of the use-cases is still provided in this report, as it necessary in order to highlight any deviations or changes to the use-case concept.

An overview of the various use cases is provided below, along with the relevant operational times during which the use case was run.

Table 2: Overview of the Executed Use-Cases

Use-case	Usecase description	Processed by	processed	
			from	to
1	Stress test	Siemens	23.03.2020 08:00 18.06.2020 09:00 10.07.2020 21:00 22.07.2020 14:56 28.08.2020 14:00 07.10.2020 09:15	04.04.2020 10:00 22.06.2020 05:00 13.07.2020 09:00 22.07.2020 19:18 31.08.2020 09:25 14.10.2020 12:30
2	Continuous operation 24/7 part 1	Siemens	12.03.2020 08:00 04.04.2020 10:00 26.06.2020 09:00 25.9.2020. 10:00	23.03.2020 08:00 19.05.2020 20:00 10.07.2020 18:00 29.9.2020 16:00
3	Prequalification of the electrolyser system to access the reserve power markets	VERBUND	13.07.2020 11:00 23.07.2020 13:00 30.09.2020 20:00	21.07.2020 00:00 17.08.2020 07:00 05.10.2020 10:00
4	Integration into a future Low Carbon Steel Plant UC4.1. compensation of electric arc furnace UC4.2: compensation of ladle arc furnace No. 4	voestalpine	17.08.2020 15:00 31.08.2020 10:00	28.08.2020 10:00 14.09.2020, 10:00
5	Integration in a current Steel Plant	voestalpine	14.09.2020 10:00	25.09.2020 10:00
6	facility operations to obtain revenues from power price opportunities	VERBUND	15.10.2020	in progress
7	Continuous operation 24/7 part 2	Siemens	Not progressed yet	Not progressed yet

Table 3: usecase 1-5

2.1 Control system design

In order to carry out the use cases, the system had to be controlled and operated by various project partners. No significant changes to the control concept were required following installation and commissioning of the plant. Control, monitoring and operation of the plant by the various users were possible as intended during the engineering phase of the project. Therefore, no adaptations to the use-cases, due to the control system design or limitations were required.

Figure 1 provides an overview of the controls system, along with how/who controlled the plant during the various use-cases.

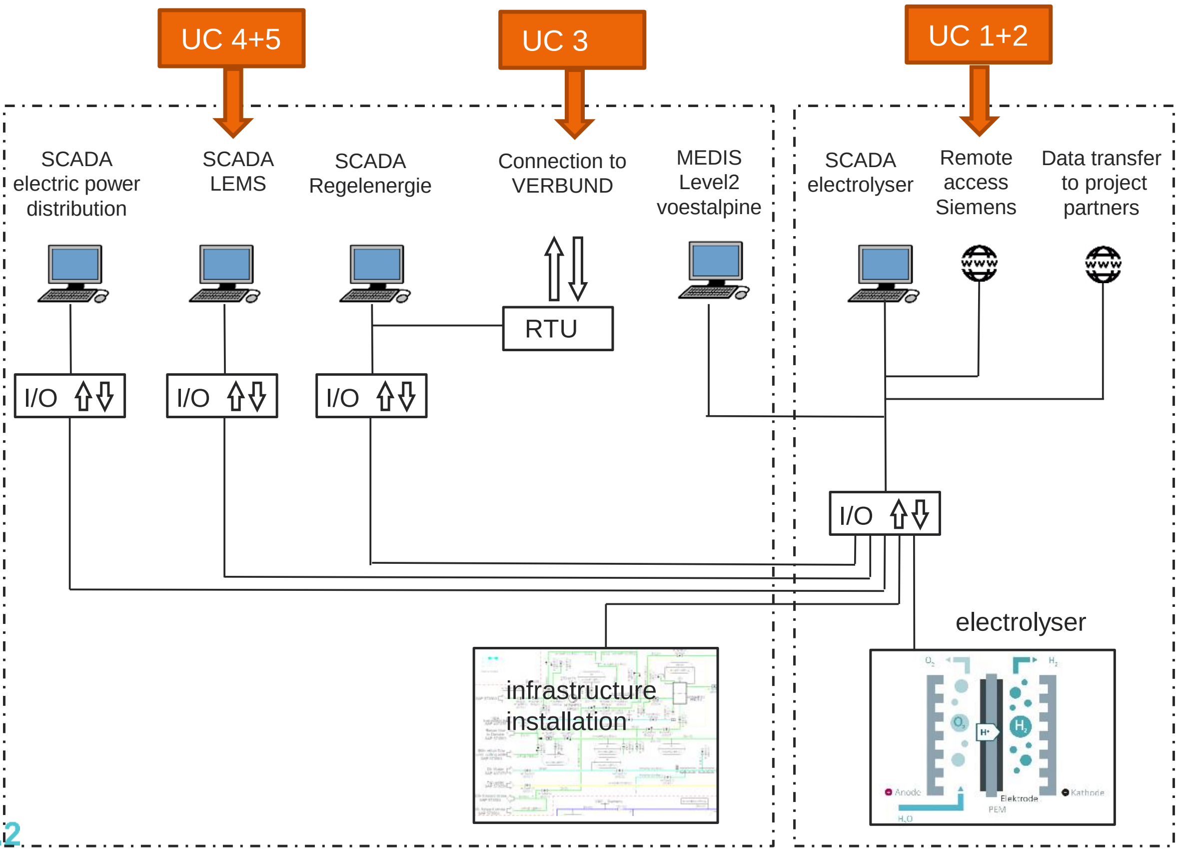

Figure 1: Overview control systems of electrolyser

2.2 Review of use case1-5

As mentioned above, the various use-cases were defined as part of WP 2, and the actual execution of the use-case is part of the WP 8 activities. The following section describes each use case briefly and highlights any changes compared to the original definition, which were/will be required, due either to equipment limitations/changes compared to the original design, or due to operating experience gained during the commissioning phase.

At the time of writing this report, all of the use-cases have been completed and therefore some highlights from the results are used to help support the review

2.2.1 Use case 1: stress test

According to WP2, the use case 1 is a pilot test addressing the behaviour of the system during start and stop sequences and under partial and full load operational conditions. The use case forms the baseline for all following pilot tests.

According to WP 2, the analysis of the use-case (in WP 8) should include:

- the interactions and interplay of each of the single subsystems as an integrated plant
- power consumption of the electrolyser system and its auxiliaries in hot and cold stand-by mode with analysis of the start-up time from these energy saving states to operation at full electrical load.
- the effect of full load and part load situations on the local grid. The effect on the power factor and harmonic distortions are examined in detail under various load situations

These tests were carried out by ramping up and down the electric power of the electrolyser from the minimal electric power to the nominal electric power of the electrolyser. This was done several times during the commissioning of the plant. Figure 2 shows a typical profile during such a stress test.

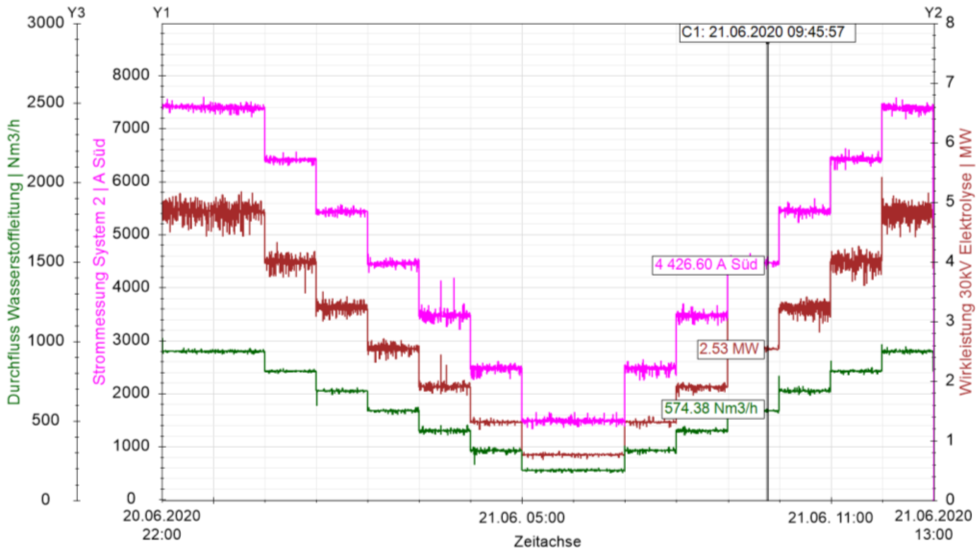

Figure 2: graph of usecase 1 sequence (electric power, DC-Current , Hydrogen production rate)

The use case 1 was executed as originally described in WP 2, and no modifications to the use-case were necessary.

2.2.2 Use case 2: Continuous operation 24/7

According to WP2, the use case 2 considers the continuous operation 24/7 and monitoring of the electrolyser with maximized hydrogen production to determine potential degradation or power limitations.

This test shows the continuous operation of the electrolyser system. The deviations of the AC power (measured at the 30kV power supply are due to the fluctuating 30kV voltage (quite common in industrial power supply systems)

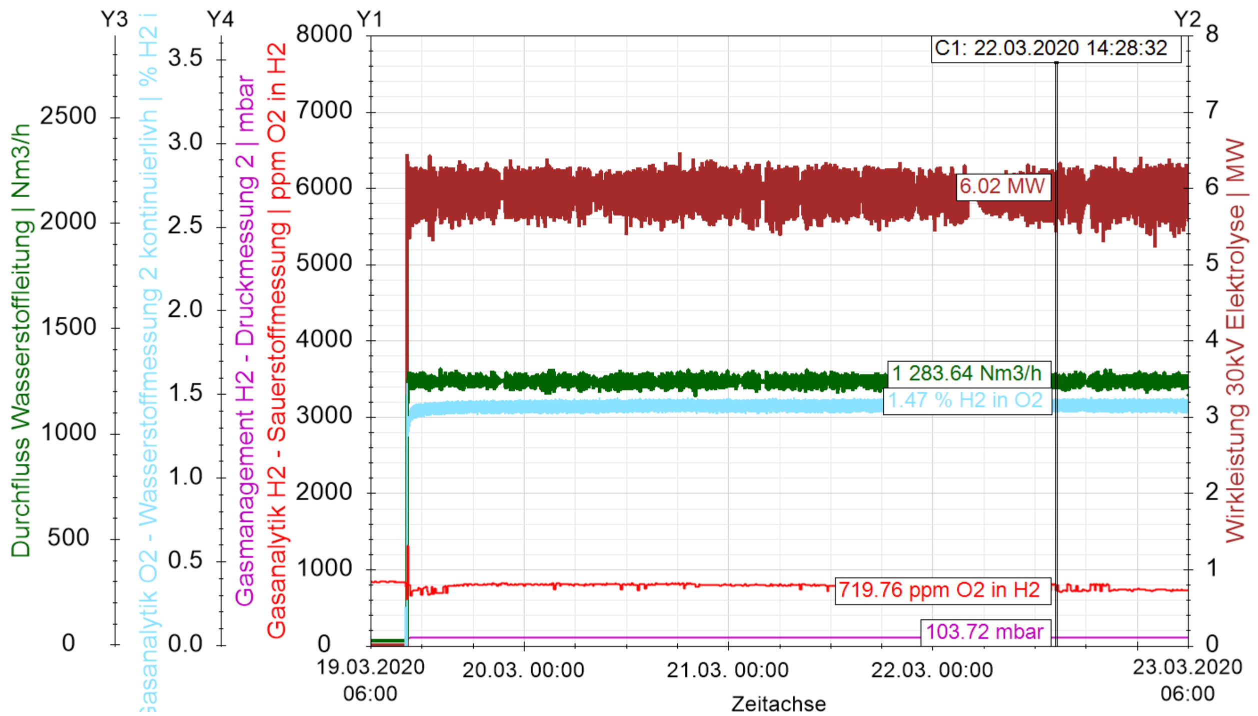

Figure 3: graph of use case 2 sequence (electric power, DC-current , Hydrogen production rate, $\%H_2$ in O_2)

The Use-Case 2 was executed as originally described in WP 2, and no modifications to the use-case were necessary.

2.2.3 Use case 3: Prequalification of the electrolyser system to access the reserve power markets

According to WP2, the aim of use case 3 is to determine if the electrolyser is flexible and fast enough for primary control provision (FCR, Frequency Containment Reserve), secondary control provision (aFRR, automatic Frequency Restoration Reserve) and tertiary provision control (mFRR, manual Frequency Restoration Reserve). For the opportunity to participate on the reserve power market segment a pre-qualification process has to be passed. This process is prescribed by TSO (Austrian Power Grid) and checked by an additional independent external party (principal of four eyes; Technical University of Graz)

The figure below shows the results from the prequalification test of the electrolyser for to prove reaction time as well as linearity of activation of the plant

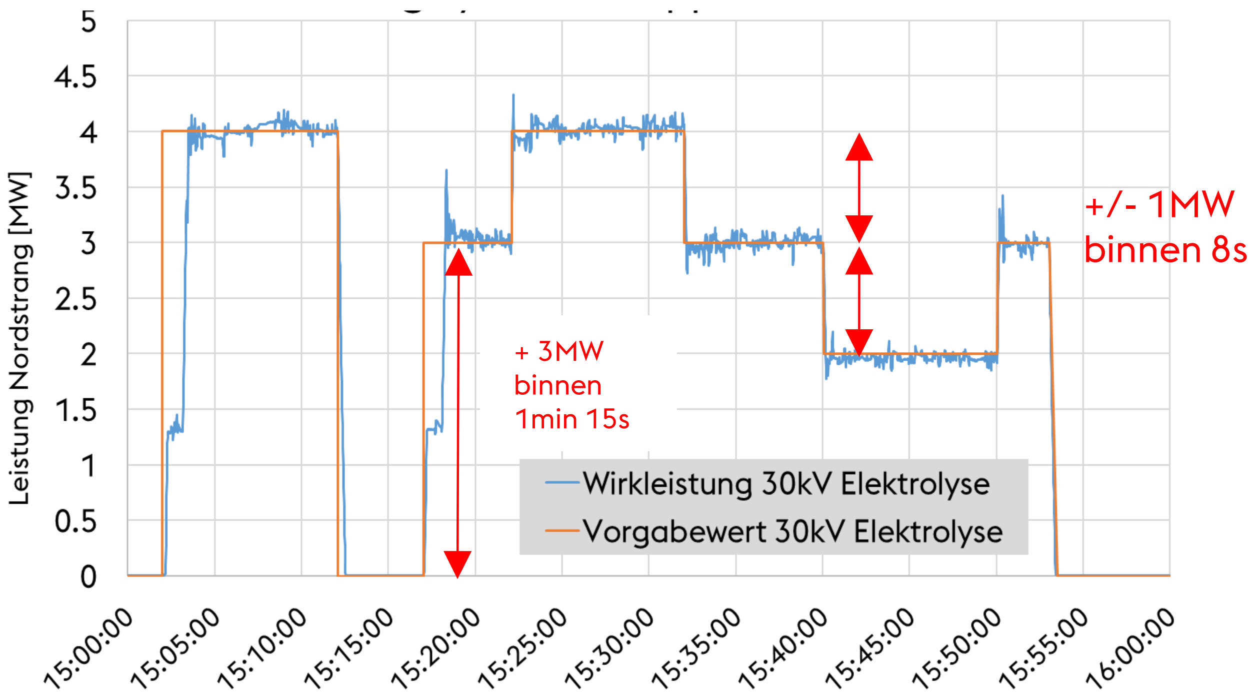

Figure 4: graph of prequalification test (“Doppelhöckerfahrt”) with one row (P_{nom}= 3 MW, maximum power= 4 MW) of the electrolyser system (AC power in MW)

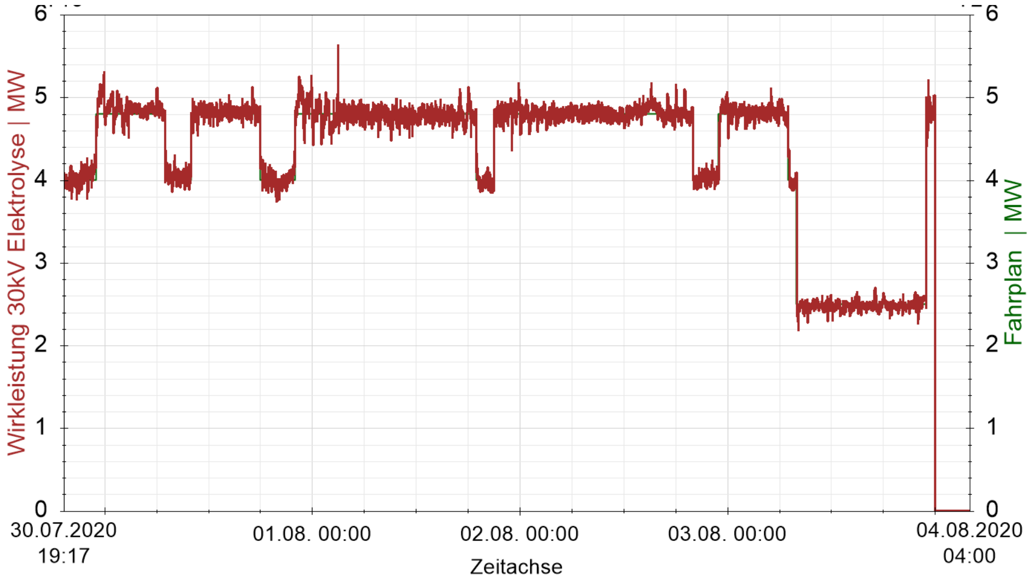

Figure 5: graph of primary control reserve operation (AC power in MW)

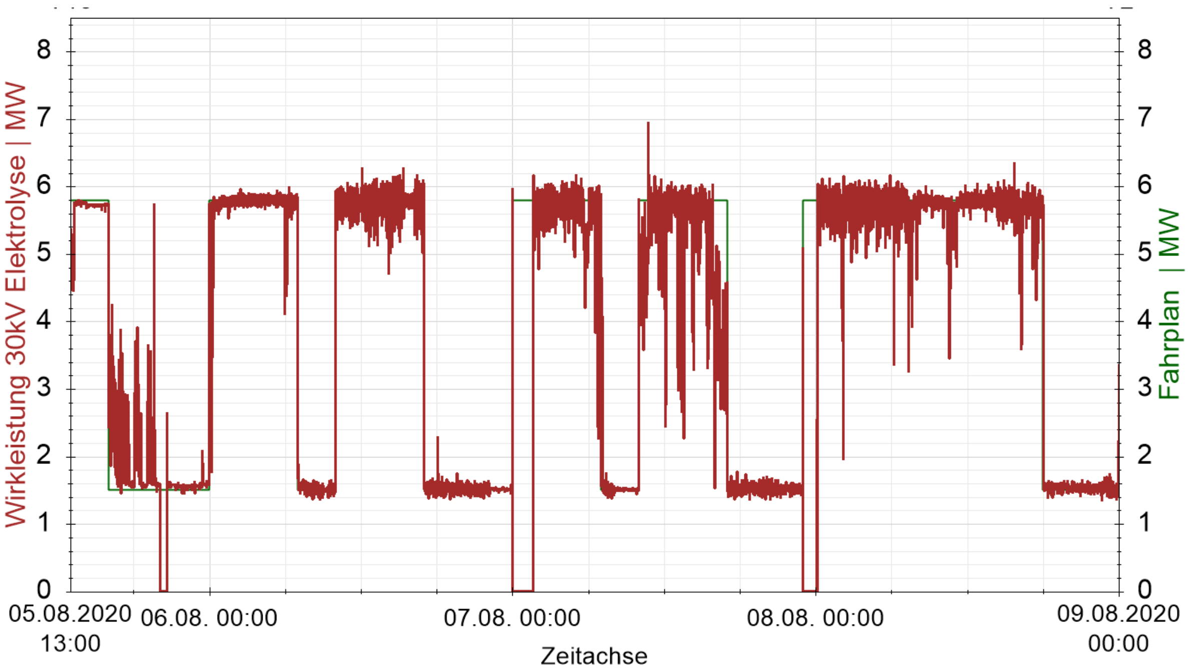

Figure 6: graph of secondary control reserve operation (AC power in MW)

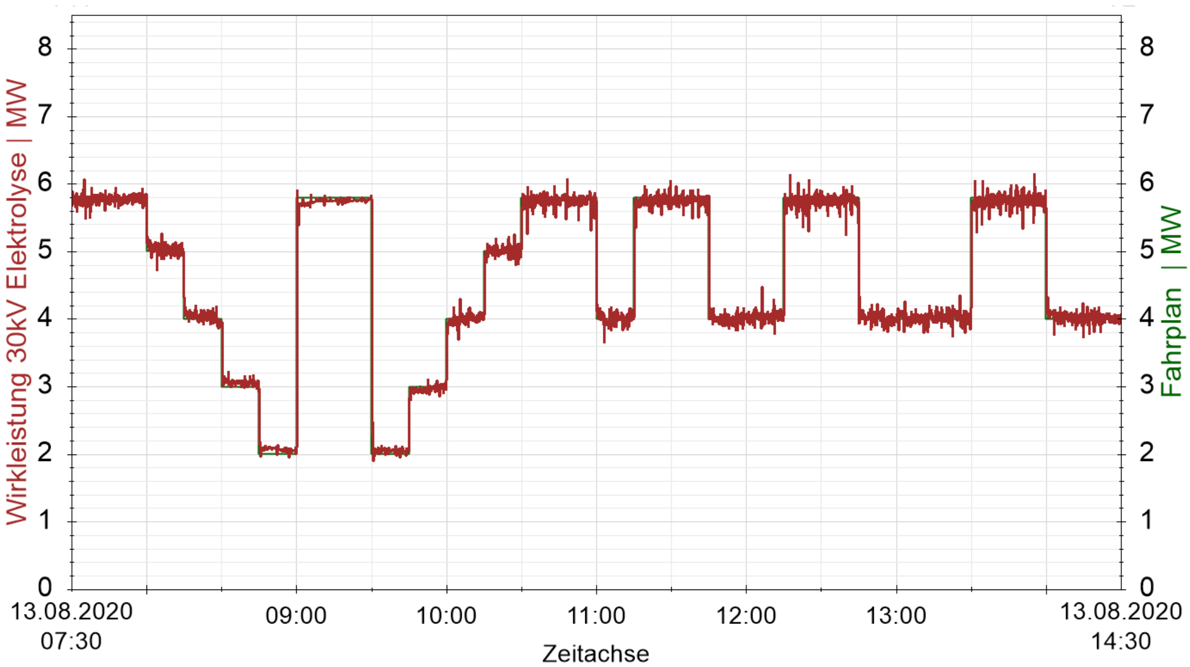

Figure 7: graph of tertiary control reserve operation (AC power in MW)

Use case 3 was executed as originally described in WP 2, and no modifications to the use-case were necessary.

2.2.4 Use case 4: Integration into a future Low Carbon Steel Plant

According to WP2, the purpose of use case 4 is to allow for a technical validation of the electrolyser plant to respond to typical demand profiles of electric arc furnaces and ladle arc furnaces.

This test was subdivided into two scenarios:

1. The electrolyser had to run an inverse power consumption of an electric arc furnace (EAF). The power of the EAF was created as a synthetic curve. This signal was calculated an sent as default value to the electrolyser system (new values every 30 sec)
2. The electrolyser had to run an inverse power consumption of an existing ladle arc furnace (LAF No.4 of voestalpine). The power of the LAF was measured in the network control system of voestalpine. The calculated inverse signal was sent as default value to the electrolyser system (new values every 30 sec)
3. The figures below show several of the typical results obtained from the use cases.

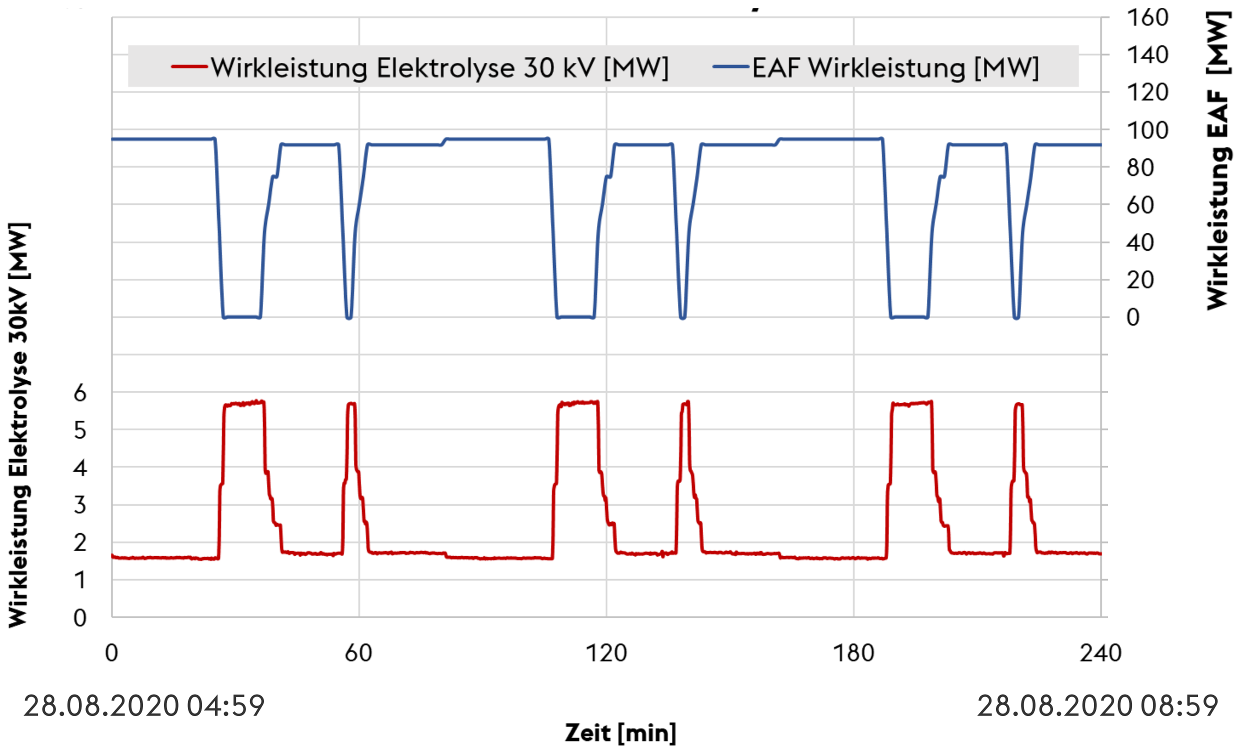

Figure 8: graph of synthetic power of an EAF and measured AC power of the electrolyser

Figure 9: graph of measured power of LAF No.4 and the AC power of the electrolyser

In general, the use-case 4 was performed as outlined in the original WP2 deliverable. The synthetic power profile was changed slightly compared to that defined in WP2, to reflect the minimum operating power constraint of the system as determined during the commissioning of the plant.

Figure 9 shows the measured power of the LAF in a 6 second resolution. For the internal calculation of the AC power of the electrolyser, an average value of 30 seconds was applied. The electrolyser system was able to fulfill dynamic requirements for the use-case 4.

2.2.5 Use case 5: Integration in a current steel plant

According to WP2, the focus of use case 5 is to provide a technical validation of the electrolyser pilot plant to smooth the deviations of the electrical power demand of the steel plant from the public 110kV grid, also depending on the predicted demand.

This test demonstrated the compensation of the electric power demand of the steel plant of voestalpine by the electrolyser system. This was done with online measured power values of the electric demand of voestalpine. The figure below shows typical results from the use-case.

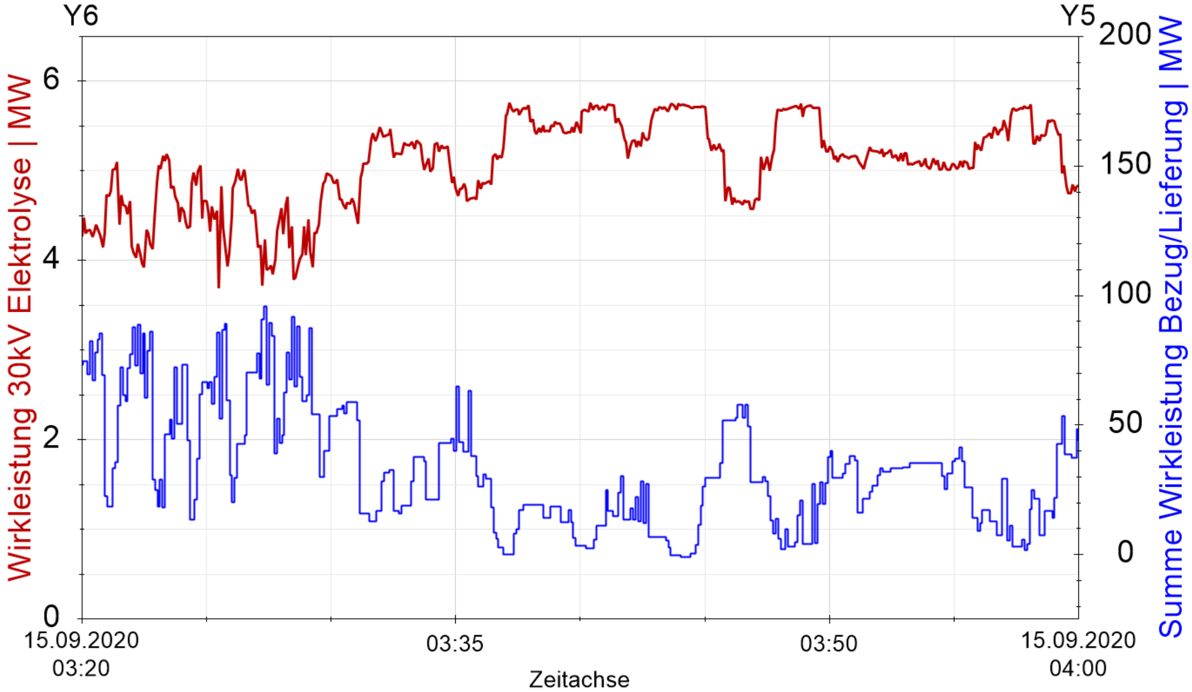

Figure 10: graph of measured power of the electric power demand of voestalpine and the AC power of the electrolyser

Use case 5 was executed as outlined in WP2 and no major deviations from the original scope were required. As mentioned in WP2, the nominal power of the installed electrolyser is very much smaller than the total power of the steel plant which is consumed from the grid. For this reason, the calculated power / set point of the electrolyser has to be accordingly scaled to the nominal power of the electrolyser (i.e. 6 MW). The scaling factor was set based on the operating data obtained during early commissioning of the facility.

2.2.6 Use case 6: facility operations to obtain revenues from power price opportunities

As described in WP2, the intent of the quasi-commerical operation is to quantify key performance indicators (KPIs) related to the economic feasibility of the electrolyser in a commercial operation. The aim is to show that the PEM electrolyser is able to use timely power price opportunities (in order to provide affordable hydrogen for current uses of the steel making processes), and to attract extra revenues from grid services.

At the time of writing this report this use-case is currently being run. To date, no major changes to the use-case scenario have required due to technical reasons, or due to experiences gained from early plant operation.

Information related to the allowable operating power levels, ramp-up time etc and general operating characteristics of the plant which were obtained during commissioning and operation of the plant during use-cases have been used, as originally intended, as parameters in the optimisation model to determine when the plant should participate in the market, and at what power levels/ranges.

2.2.7 Use case 7: Continuous operation 24/7 part 2

According to WP 2, the intent of Use-Case 7 is to allow for a final technical evaluation of the electrolyser. This test involves an assessment of the reliability and availability of the facility, of its operational capabilities and any evolution from the key performance indicators of the facility as determined in the previous operation modes (e.g. electrical energy input and electric efficiency, system efficiency, expected lifetime, performance, start-up time, etc.).

At the time of writing this report, Use Case 7 has not been completed, as it is scheduled for near the end of the project. At the current time, no changes to the planned use-case, due to technical issues or plant operating experience are expected.

3 Link to KPIs

The previous section reviewed and discussed any changes, which were made to the use-cases, which could have been required due to differences in actual versus expected plant operation, or additional experience gained through operation.

Additionally, there are various KPIs which were defined for the project. Following commissioning, these KPIs have also been reviewed to see if changes to their definition were required, or the KPI should be removed, because either it is not relevant, or it is not possible to calculate.

The list of the original KPIs as defined in Deliverable 2.8 - KPIs to monitor the Demonstrations and perform the Exploitation Tasks. The list of KPIs is shown below.

KPIs which have either been adjusted or removed are highlighted by color in the table below, and the reasons for their removal or adjustment are described in the subsequent sections.

KPIs that have to be adjusted or deleted based on experience from the use cases are marked .

KPI is deleted
KPI has to be adjusted

KPI ID	Indicator	Unit	FCH2JU indicator	Use case number
TD 1	Nominal H_2 weight capacity	kg/day	Y	
TD 2	Nominal H_2 volume capacity	Nm^3/h	Y	
TD 3	Nominal power	kW	Y	
TD 4	Maximum overload capacity	%	Y	
TD 5	System minimum power	%	Y	
TD 6	Stack nominal power	kW	Y	
TD 7	Electrolyser footprint	m^2	Y	
TD 8	Electrolyser volume	m^3	Y	
TD 9	Rated system lifetime	h	Y	
TD 10	Rated stack lifetime	h	Y	
TD 11	Hydrogen purity	%	Y	
TD 12	Power converter	List values: [AC/DC, DC/DC...]	Y	
TD 13	Operating pressure	Bar(g)	Y	
TD 14	Operating temperature	°C	Y	
TD 15	Input voltage on system level	V	Y	
TD 16	Power usage (energy consumption) of the electrolysis plant in cold standby	kWh/h	N	1
TD 17	Power usage (energy consumption) of the electrolysis plant in hot standby	kWh/h	Y	1
TD 18	Power usage (energy consumption) of auxiliary equipment in hot standby	kWh/h	N	
TD 19	Power usage of the auxiliary equipment at nominal capacity	kWh/h	Y	
TD 20	Rated stack electrical efficiency (HHV, DC current)	%	Y	
TD 21	Rated system electrical efficiency (HHV, AC current)	%	Y	
ED 1	CAPEX - electrolyser	€/kW		

ED 2	Electrolyser price	€	Y	
ED 3	CAPEX to deliver grid services	€/kW	N	
HD 1	Electricity origin	Select [Solar, Wind, Hydro-electric, Grid, Other]	Y	
AGO 1	Start date for reporting	dd-mm-yyyy	Y	
AGO 2	End date for reporting	dd-mm-yyyy	Y	
AGO 3	Hours of operation	h	Y	
AGO 4	Hours of operation - cumulative	h	Y	
AGO 5	Days of operation	Days	Y	
AGO 6	Days of operation - cumulative	Days	Y	
AGO 7	Quantity of hydrogen produced	t	Y	6
AGO 8	Quantity of hydrogen produced cumulative	t	N	
AGO 9	Electricity consumed	kWh	Y	
AGO 10	Electricity volume turnover on the day ahead market	MWh	N	6
AGO 11	Electricity volume turnover on the intraday market	MWh	N	6
AGO 12	Electricity consumed - cumulative	MWh	N	
TO 1	Time from cold start to nominal power	s	Y	
TO 2	Time from cold start to nominal capacity [Start-up time from cold standby to nominal capacity]	s	Y	1
TO 3	Start-up time from hot standby to minimum partial load	s	N	1
TO 4	Time from hot standby to nominal power	s	Y	
TO 5	Time from hot standby to nominal capacity [Start-up time from hot standby to nominal capacity]	s	Y	1
TO 6	Transient response time (ramping up)	s	Y	1
TO 7	Transient response time (ramping down)	s	N	1
TO 8	Maximum overload operation	%	Y	
TO 9	Maximum % power for 98% efficiency	%	Y	
TO 10	Minimum part-load operation	%	Y	
TO 11	Duration of planned maintenance	h/y	Y	
TO 12	Number of failures	#	N	
TO 13	Time-based availability of the electrolysis plant	%	Y	2, 6
TO 14	Time-based availability of the stack modules	%	N	2, 6
TO 15	Time-based availability of the system	%	N	2, 6
TO 16	Availability unplanned and planned	%	N	2, 6

TO 17	Production-based availability	%	N	2, 6
TO 18	Plant power limitation (time)	%	N	2, 6
TO 19	Plant power limitation (power)	%	N	2, 6
TO 20	Efficiency degradation or Voltage degradation rate	µV/h	Y	2, 6
TO 21	Efficiency degradation per 1000h or Voltage degradation rate per 1000h	%/1000h	Y	2, 6
TO 22	System efficiency degradation per 1000h	%/1000h	Y	
TO 23	Stack electrical efficiency with maximised hydrogen production	%	Y	2, 6
TO 24	Specific stack electrical input	kWh/kg	N	2, 6
TO 25	System electrical efficiency with maximised hydrogen production	%	Y	2, 6
TO 26	Electricity consumption for H_2 production [Specific system electrical input]	kWh/kg	Y	2, 6
TO 27	Plant electrical efficiency with maximised hydrogen production	%	N	2, 6
TO 28	Electricity consumption for H_2 production @ plant level [Specific plant electrical input]	kWh/kg	N	2, 6
TO 29	Electricity consumption for H_2 compression	kWh/kg	Y	
TO 30	Average hydrogen production	kg/h	N	2, 6
TO 31	Average oxygen production	kg/h	N	2, 6
TO 32	Power factor	./.	N	1
TO 33	Harmonic distortions	./.	N	1
TO 34	Stability	1/h	N	1
EO 1	Price/cost of electricity	€/MWh	Y	
EO 2	Average price of electricity consumption	€/MWh/y	Y	6
EO 3	Electricity cost	€/kg H_2	Y	
EO 4	OPEX - O&M costs	€/kg H_2	Y	
EO 5	Cost of hydrogen produced	€/kg H_2	Y	6
EO 6	End of life stack replacement	€/kW	N	
HO 1	Fraction of renewable energy input	%	Y	
HO 2	Number of safety incidents	#	Y	
HO 3	Carbon footprint of produced hydrogen	kg CO_2/ MJ H_2	N	all
HO 4	Number of emergency stops	Stops/ 100 hrs operation	N	all
SO 1	Load smoothing factor (steel making processes)		N	4, 5

GO 1	Error margin of activation	%	N	3
GO 2	Linear activation		N	3
GO 3a	Activation speed		N	3
GO 3b	Activation speed		N	3
GO 3c	Continuous Operation of activation		N	3
GO 4	Actual economic operating hours per year (ECOH)	h	N	6
GO 5	Economic feasible operating hours per year (ECFOH)	h	N	6
GO 6	Utilization of economic feasible operating hours	%	N	6
GO 7	Contracted hours of ancillary services	h	N	6
GO 8	Contracted hours of FCR	h	N	6
GO 9	Contracted hours of aFRR	h	N	6
GO 10	Contracted hours of mFRR	h	N	6
GO 11	Average provision of FCR	MW	N	6
GO 12	Average provision of aFRR	MW	N	6
GO 13	Average provision of mFRR	MW	N	6
GO 14	Overall margin in a year, after operating expenses	M€	N	6
GO 15	Ancillary services provision per year	MW	N	6
GO 16	Hedged quantities per year	MWh/ y	N	6
GO 17	External power limitation (time)	%	N	2, 6
GO 18	External power limitation (power)	%	N	2, 6

Table 4: List of KPI

The abbreviations of the KPI list are corresponding to the KPI description:

type of KPI	abbreviation
Technological performance indicators – descriptive	TD
Economic performance indicators - descriptive	ED
HSE performance indicator - descriptive	HD
Administrative data and general performance indicators	AGO
Technological performance indicators – operational	TO
Economic performance indicators – operational	EO
HSE performance indicators – operational	HO
Steel plant specific performance indicators	SO
Grid services performance indicators	GO

Table 5: List of KPI - abbreviations

3.1 Necessary adaption of KPI / PI according to use case phase

The following section describes the reason why KPIs / PIs were either modified or deleted. These are broken down by the relevant use case number. In the event the KPI is used in multiple use-cases, the modifications to the KPI / PI is only described in the first use-case it appears.

3.1.1 General Project KPIs

PI TO8 “Maximum overload operation” is defined as: “*Minimum % power (vs nominal power) allowing to operate the device while maintaining minimum of 98% of the maximum efficiency”* This leads to the situation, that as a reason of the used Electrolyser technology, the maximum efficiency will be found at about 0 MW of power. The highest efficiency within the possible spectre of operation (operation window) will be found at minimum loads. It’s easy to see, that this has nothing to do with “Maximum overload operation”.

PI TO9 “Maximum % power for 98% efficiency” is defined as: *“Maximum % power attained (vs nominal power) allowing to operate the device while maintaining minimum of 98% of the maximum efficiency”* and leads to the same problem as described for TO8.

PI HO1 “Fraction of renewable energy input” Determination for calculation of this PI has to be made

3.1.2 Use-Case 1

The KPI TO33 “harmonic distortion” should measure the harmonic current distortions (THD_I, averaged over a **60s** measuring period)

The installed measuring system can only provide data of the harmonic distortion in 10 minutes average values. These values will then be used for the KPI calculation

3.1.3 Use-Case 2

No changes in KPIs

3.1.4 Use-Case 3

No changes in KPIs

3.1.5 Use-Case 4

The KPI SO1 “Load smoothing factor (steel making processes)” should show the deviations from target to actual AC power of the electrolyser within the time span of 2 weeks (duration of use-cases 4+5). The deviations should be calculated in intervals of 30 seconds, 1 minute, 5 minutes, 15 minute and 1 hour.

$$DEV_{Sum\_30s} = \frac{1}{403200} * \sum_{1}^{403200} \left| \frac{P_{mittel-electrolyser\_30s} - P_{mittel-x\_30s}}{P_{mittel-x\_30s}} \right|$$

$$DEV_{Sum\_1min} = \frac{1}{20160} * \sum_{1}^{20160} \left| \frac{P_{mittel-electrolyser\_1min} - P_{mittel-x\_1min}}{P_{mittel-x\_1min}} \right|$$

$$DEV_{Sum\_5min} = \frac{1}{4032} * \sum_{1}^{4032} \left| \frac{P_{mittel-electrolyser_{5min}} - P_{mittel-x\_5min}}{P_{mittel-x\_5min}} \right|$$

$$DEV_{Sum\_15min} = \frac{1}{1344} * \sum_{1}^{1344} \left| \frac{P_{mittel-electrolyser\_15min} - P_{mittel-x\_15min}}{P_{mittel-x\_15min}} \right|$$

$$DEV_{Sum\_1h} = \frac{1}{336} * \sum_{1}^{336} \left| \frac{P_{mittel-electrolyser\_1h} - P_{mittel-x\_1h}}{P_{mittel-x\_1h}} \right|$$

Due to the minimum resolution of the network process control system of 6 seconds for data visualizing and the fact, that the calculation and output of the target values from the network process control system to the electrolyser was done in a 30 seconds resolution, no deviations could be calculated using the above formulas

Also the elctrolyser reacts very quickly to changes of the default AC power, so that the calculation of the KPI with the given resolutions does not make sense.

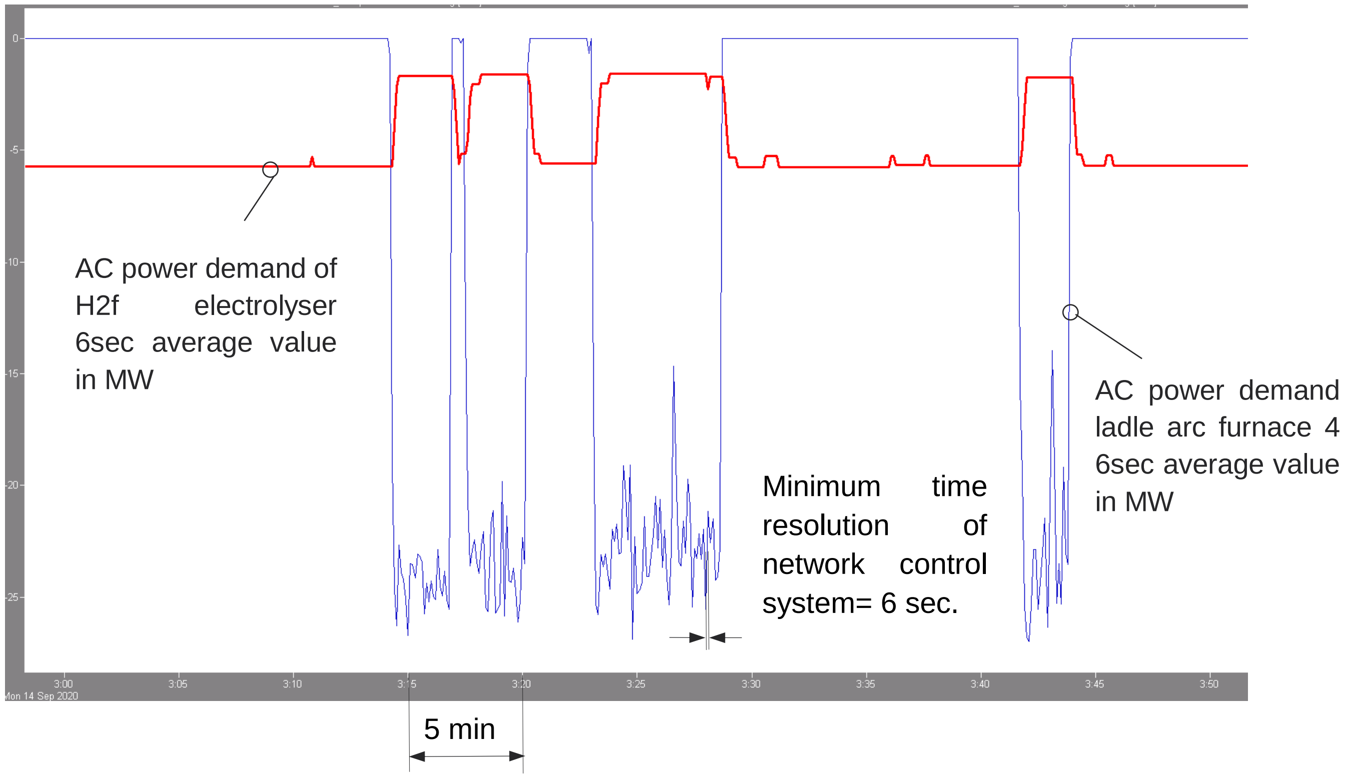

Figure 11: Detail of UC4.2

3.1.6 Use-Case 5

No changes in KPIs

3.1.7 Quasi-Commercial Operation

PI GO16 "Hedged quantities per year" will be 0 or not calculated.

4 References

4.1 Project Documents of H2FUTURE

- D2.1 Specifications of Pilot Test 1 / Use Case 1
- D2.2 Specifications of Pilot Test 2 / Use Case 2
- D2.3 Specifications of Pilot Test 3 / Use Case 3
- D2.4 Specifications of Pilot Test 4 / Use Case 4
- D2.5 Specifications of Pilot Test 5 / Use Case 5
- D2.6 Specifications of quasi-commercial Operation
- D2.7 Specifications of Final Tests
- Deliverable D2.8: "KPIs to monitor the Demonstrations and perform the Exploitation Tasks", 2020
- Grant Agreement