Test records of Smart Grid Hub
Version 1.0

Deliverable D5.5

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EXECUTIVE SUMMARY

For Interflex's Demonstrator in Germany the Smart Grid Hub (SGH) is the key component to carry out the field testing and to enable the innovative Use Cases Interflex has committed to.

The SGH is being developed jointly by experts from the beneficiary as well as subcontractors. As an IT-Solution for future Smart Grids it integrates with existing grid control SCADA and the national Smart Meter Framework in Germany. This report describes the testing strategies and procedures for lab and acceptance tests of the newly developed SGH.

To account for delays in the Smart Meter framework that lie beyond the influence of Interflex, the project team has devised a staggered approach to lab and acceptance testing. Thusly allowing for timely tests without having to deviate from the target architecture.

The testing activities consist of 5 testing phases starting with a basic lab test in a development environment and simulated devices and interfaces. Beginning there each subsequent test phase will add an additional element or interface to the test set up until the final test phase when the entire architecture is tested with live interfaces to all operational systems.

By the time D5.5 is due for submission (May 2018) the project team has performed the first two phases of testing. The results show that the basic functionalities of the SGH are fully developed and were tested without fault. A communication channel to a control box has been successfully established and a controllable device has been controlled by the SGH in a lab setting. With this the team is ready to move on and start the next phase of acceptance testing with devices in the field by early June 2018.

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1. INTRODUCTION

One of the main aspects of Demo #4 of Interflex is the development of the Smart Grid Hub (SGH). The SGH acts as an aggregation – disaggregation platform and enables DSOs to monitor, measure and control small scale flexibilities offered by residential customers. The SGH is located within the grid control SCADA environment and communicates with customer's devices via the Smart Meter Framework as set out by the Federal Agency for Cyber Security in Germany. In doing so, the SGH architecture offers superior security, reliability and scalability. On the flipside however, the integration with these highly secured systems introduces additional requirements and challenges for the design of interfaces and system security.

To ensure a seamless transition from development to operation and a Go-Live without hiccups the project team has laid out a comprehensive strategy to test all critical interfaces and functions and identify bugs to be fixed before the field testing phase can start.

The development and testing of the Smart Grid Hub has been carried out by a consortium of subcontractors led by Europäische Funk-Rundsteuerung GmbH (EFR) and coordinated by Avacon and linked third party E.ON Business Services (EBS).

1.1. Scope of the document

Deliverable 5.5 describes the testing procedures for lab and acceptance testing of the extended Smart Grid Hub installation including all interfaces to other IT-systems and communication channels with the outside world. It describes the project organisation and roles and responsibilities of the involved parties. It further lists the functionalities to be tested and the detailed timeline for the test execution. Beyond that it gives an overview over test location, specifications of hardware and software used. Finally, records of initial test results are being presented.

1.2. Notations, abbreviations and acronyms

The table below provides an overview of the notations, abbreviations and acronyms used in the document.

Table 1 - List of Acronyms

AC	Alternating Current
CHP	Combined Heat and Power
DER	Distributed Energy Resources
DSO	Distribution System Operator
GWA	Smart Meter Gateway Administration Service
IP	Data Integration Platform
kW	Kilo Watt
kWp	Kilo Watt peak
PLC	Power Line Communication
PV-System	Photovoltaic- system
RSRP	Reference Signal Received Power
RSRQ	Reference Signal Received Quality
SCADA	Supervisory Control And Data Acquisition
SGH	Smart Grid Hub
SMGW	Smart Meter Gateway
LTE	Long term evolution telecommunication standard
V	Volt

2. SMART GRID HUB TESTING OVERVIEW

2.1. Test locations and timeline

To account for the complexity of the project and to ensure a complete and comprehensive delivery of all project results in the light of unexpected delays and technological challenges the team has devised a multi-step approach to testing. Implementation and testing is being carried out in multiple stages, adding an additional level of complexity in the form of another live interface to other IT-systems one by one. The following describes the scope of testing, involved elements and interfaces, locations and scale of the separate test upset ups.

1. **Basic Lab Tests – P0:** The basic testing scenario checks the Smart Grid Hub Process Unit for its fundamental functionality. During this first testing stage the SGH runs on Avacon-owned machines located with the development team at the subcontractors site in Munich. During the first phase the SGH is tested while the Gateway Administration Service (GWA), Integration Platform (IP), SCADA and field devices are simulated.

2. **Advanced Lab Tests – P1:** Test Scenario P1 adds actual field devices in the lab environment in Munich to the testing procedures. GWA, IP and SCADA remain simulated.

3. **Basic Field Tests – P2.1:** Once P0 and P1 are successful the test location moves the field devices from the lab environment to the field-test area in Lüneburg. Testing is carried out with devices at pilot customer's premises. GWA and SCADA remain simulated.

4. **Semi-Integrated Field Tests – P2.2:** Once the operational GWA has acquired the capabilities to support the operation of the SGH field test devices are swapped out for standard customer equipment in accordance with the national smart meter framework and GWA. SCADA remains simulated

5. **Fully Integrated Field Tests – P3:** Once all previous tests have been completed successfully the SGH is migrated to the SCADA environment in Salzgitter and tested with the live interface to the eBase SCADA at Avacon.

2.2. Testing Set Up and Environment

Figure 1 shows the basic architecture for the testing environment. For Test P0 the SGH is tested entirely with simulated interfaces including GWA, SCADA and field devices. Test P1 – here depicted as V1 – adds a message server and the market communication element "aEMT", a simulated GWA and actual field devices located in the lab in Munich. Adding these elements enables testing for the functionality of communication channels to field devices in full accordance with the national smart meter framework. The next step includes additionally field devices in the field test region of Lüneburg (labelled "Lüneburg One") and the test phase P2.2 will evaluate the functionality with standard devices by Avacons standard suppliers. Eventually the SGH server will migrate to their final location with grid control SCADA in Salzgitter.

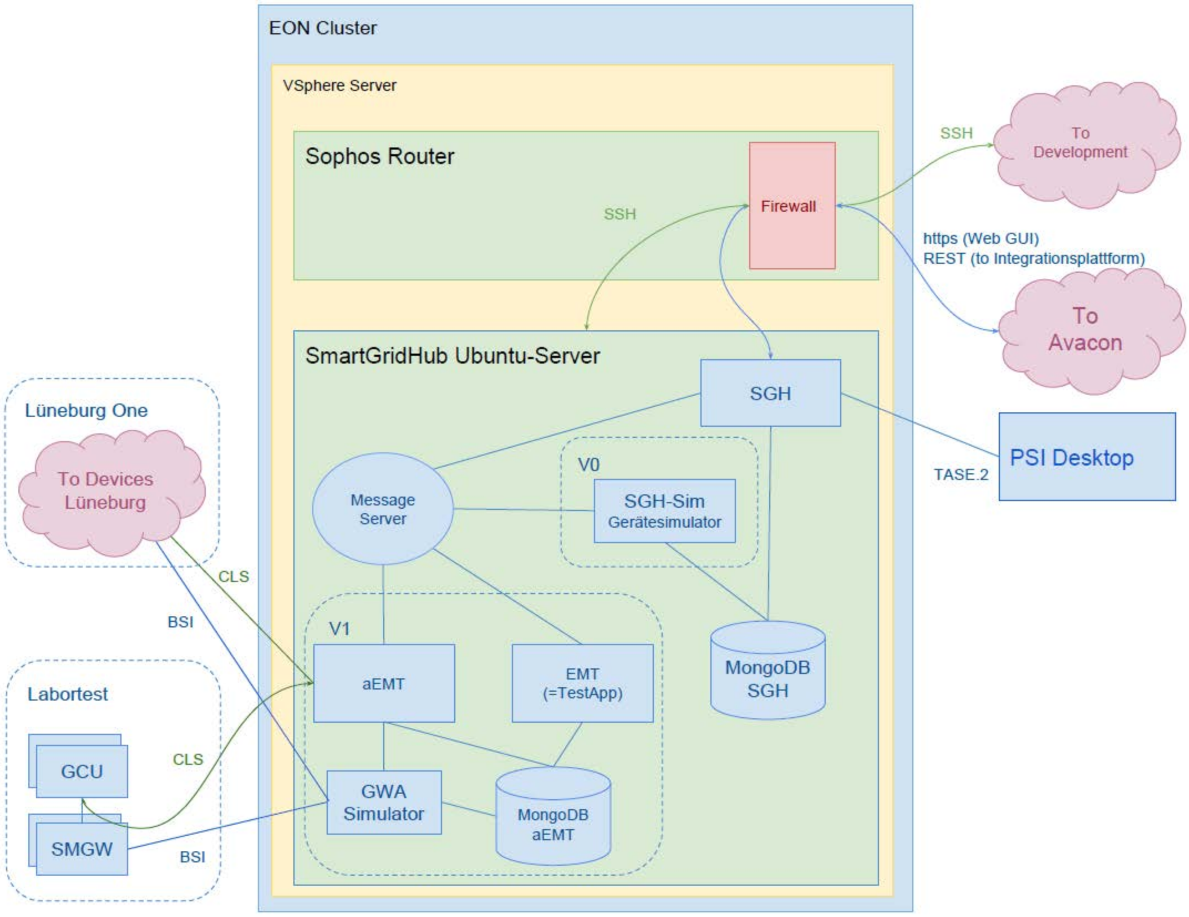

Figure 1 Testing Environment

In total 10 weeks have been allocated to the testing procedures across all test scenarios including all set up, installation and migration activities, evaluation of intermediate steps and bugfixing. Initial lab testing is completed by end of May 2018 while the full acceptance test is targeted for June 2018. A detailed timeline is depicted in Figure 2.

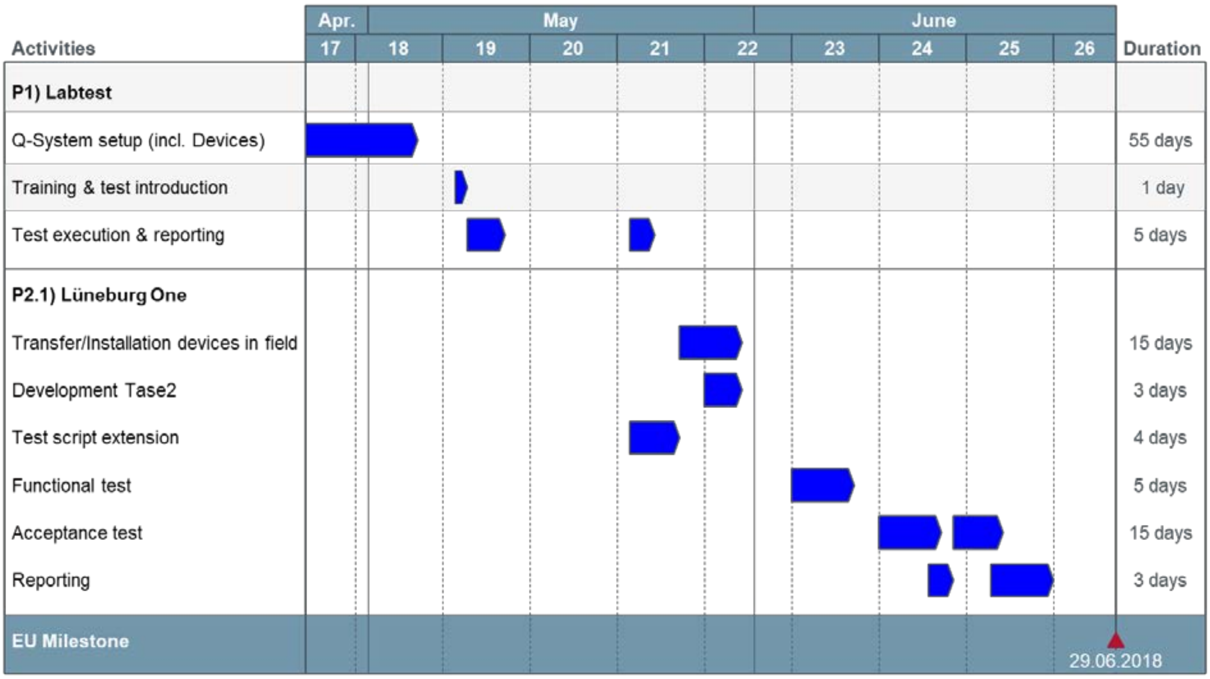

Figure 2 - Timeline Testing Procedures

2.3. Roles and Responsibilities

The team responsible for testing procedures consists of the experts who have been involved in the development and implementation of the SGH so far. A steering committee is implemented to focus required escalation procedures and to provide guidance for the overall workstream. The project management is in shared responsibility between the subcontractor and the beneficiary. Below the team is split into two, one assuming ownership of the development and integration activities, the other responsible for the actual execution of tests and the validation of results.

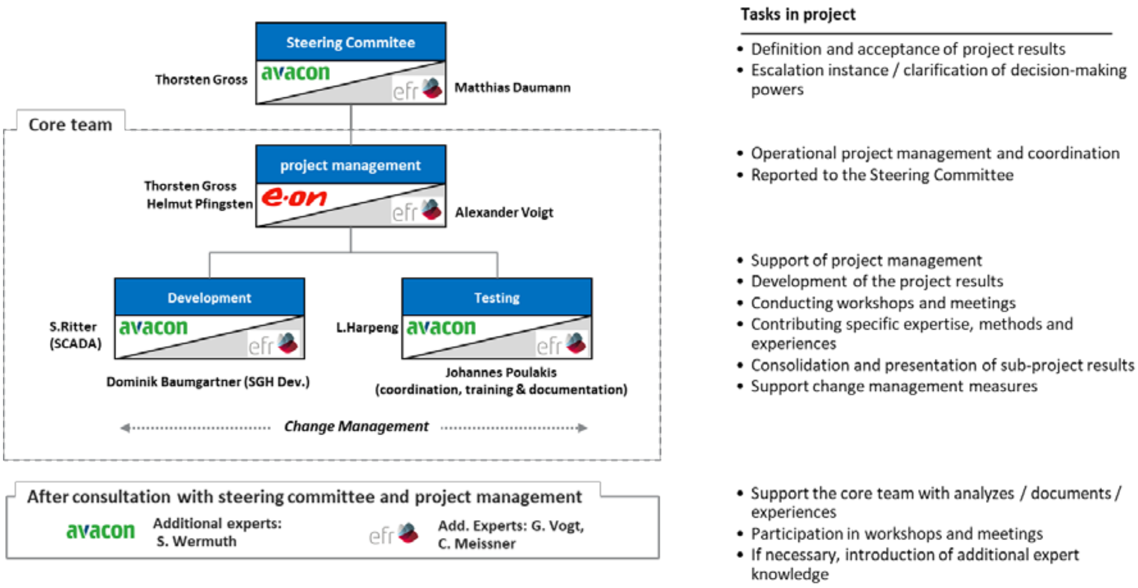

Figure 3 - Project organisation

3. TESTING

3.1. Test Objects

The following objects and interfaces are to be tested:

1. Objects

- Use cases according to requirements specification
- Front End “active external market agent” (“aEMT”)
- Smart Meter Gateway (“SMGW”)
- Gateway Administration System (“GWA”)
- Grid Control SCADA
- Control Box

2. Interfaces

- SCADA <> SGH (TASE.2)
- aEMT <> SGH
- SGH Process Unit <> SGH Data Unit
- GWA <> aEMT
- SGH <> Control Box
- GWA <> SMGW

3.2. Test Features

Functional Requirements

To carry out the envisioned use cases a few use-case-specific functionalities must be tested one by one. The following tables list the individual functionalities along with their corresponding use case.

Table 2 - Test Scenarios Use Case 1

ID	Scenario	ID	Step
3.5.2	Measuring	2.2.1.2	Request current power output
		2.2.3.3	Request current grid KPI
3.5.3	Switching		Activate setpoint for group of DG to (100/60/30/0)
3.5.4	Controlling	2.2.1.4	Reduce power output by absolute value (kW)
		2.2.1.5	Reduce power output by relative value (% nameplate rating)
		2.2.1.6	Limit power output to relative value (% nameplate rating)
3.5.5	Request active setpoint	2.2.1.3	Active setpoint for (group of) DG (100/60/30/0)
3.5.6	Determine available flexibility	2.2.3.2	Current power output of (group of) DG (kW)

Table 3 - Test Scenarios Use Case 2

ID	Scenario	ID	Step
3.5.2	Measuring	2.2.2.2	Request current load
		2.2.3.3	Request current grid KPI
3.5.3	Switching	2.2.2.4	Activate setpoint (100/0)
3.5.4	Controlling	2.2.2.5	Reduce load by absolute value (kW)
		2.2.2.6	Reduce load by relative value (% current load)
3.5.5	Request active setpoints	2.2.2.3	Active setpoint for (group of) loads (100/0)
3.5.6	Determine available flexibility	2.2.3.2	Current load of connected devices (kW)

Table 4 - Test Scenarios Use Case 3

ID	Scenario	ID	Step
3.5.7	Thresholds	2.2.3.4	Set threshold value for grid KPI
3.5.8	Data acquisiton	2.2.3.1	Collect comprehensive set of grid KPI and perform basic statistic analysis
3.5.9	Data analyisis	2.2.3.6	Perform data and state analysis based on data obtaned under 3.5.8
3.5.9.1	Activate scenarios	2.2.4.1.3	Save and de-/re-activate scenarios
3.5.9.2	Manage scenarios	2.2.4.1.4	Scenario queue and schedule, scneario overview
3.5.9.3	Data reporting	2.2.4.1.5	Report on grid KPI, data points and threshold events

Table 5 - Test Scenarios System Administration

ID	Scenario	ID	Step
3.5.10	Manipulate measurements		Scaling of data points to allow for scenario anlysis
3.5.11	Provide CLS channel		Enable switching
3.7.2	Access management		Check for log in
tbd	Base data provision	2.2.1.1 2.2.4.1.2	Import data on elements and groups (CSV import)
		2.2.4.1.7	Create, delete, modify elements (CSV, REST)
		2.2.4.1.8	Data transfer data unit – process unit
3.6	SGH Reporting system		Export data process unit – data unit (CSV)
			Performance report (KPI, measurements, switching log)
			Use Case reports (relevant use case KPI)
			Curtailment reports (in accordance with relevant legal obligations)

Table 6 - Test Scenarios Control Boxes

Scenario	Step
Double tariff schedule	Local implementation of double tariff schedule at installation via Android App
	Documentation and management of double tariff schedule in SGH
Time sync active EMT	Tbd
Firmware update via active EMT	Tbd

3.3. Method

The testing approach is used to ensure that errors that may affect the system are identified and remedied as early as possible.

3.3.1. Smart Grid Hub System Test

The SGH frontend should work as a fat client, as the main functionality is moved into the backend. Therefore, the system test is divided into technical (devices like SMGW & Control Box) and functional system tests.

Depending on the Use Case, data is sent to the SGH from different source systems (including grid control SCADA, integration platform (IP)). Hence the SGH frontend should work as the main system during the test phase, in which all process operations and movement data can be reconstructed manually.

To validate the functionality in the SGH, the tests are programmatically supported by partly simulated values from a SCADA simulator or a manually generated CSV-file (consisting of IP and control-group information).

The tests are performed manually in Salzgitter to validate the SGH characteristics. These tests aim to validate the P1 phase. They represent the basis for the follow-up test "Lüneburg One".

3.3.2. Test definition

All defined Use Cases & scenarios, which have been defined in the requirements specification document, are documented in a test excel sheet and prioritized there.

To ensure that the specific test cases are completed at the same time as the implementation, Use Cases are being developed further based on the project implementation plan and the Use Case priorities. So, the most important tests can be done first. The execution of the Use Cases with a lower priority occurs afterwards or subsequently.

3.3.3. Test Procedure

Once the software is migrated from development (d-system) to test (q-system), a manual test is carried out by the developer team. This allows EFR to back up the basic functionality of the system and approve it for further testing.

This is followed by the execution of manual tests.

After the manual tests (by developer team) have been carried out successfully, the release for the acceptance test can be enabled.

3.3.4. Test Reporting

A test report is created after test execution. If the test is successfully carried out, the report also represents the acceptance document.

3.4. Acceptance and test entrance criteria

The following test entry and acceptance criteria apply only to test tasks undertaken by Avacon.

The system tests for the SGH can be accepted if the following requirements are met:

- The number of tests completed and defined for the system test is 100%
- No incident with error severity Blocker or Critical has occurred.

The acceptance test level can be accepted if the following requirements are met:

- The number of tests completed and defined for the acceptance test is 100%
- No incident with error severity Blocker or Critical has occurred.

This statement concerns not only errors found in the acceptance test, but all errors from all test levels and all test objects

Severity

Level	To be used at	Impact
trivial	A deviation that does not lead to the failure of a (sub-) system functionality and has no effect on functionality and usability. There are spelling mistakes, blemishes or simple layout deviations.	The test object can be released.
heavy	A deviation that results in the failure of a non-essential (sub) system functionality. It is possible to apply a workaround.	The test object can be released with restrictions.
critical	A drift that results in failure of significant (sub) system functionality. A workaround can be applied. In any case, this also includes errors leading to a vulnerability with limited or unrestricted access to non-critical or sensitive data, limited performance of a system or necessary function, corruption of non-critical system or application data.	The test object should not be released.
blocker	A drift that results in failure of significant (sub) system functionality. No workaround can be applied. In any case, this also includes errors resulting in a vulnerability with limited or unrestricted access to critical or sensitive data, severely limited performance of a system or necessary function, corruption of critical system or application data.	The test object can't be released.

3.5. Criteria for test termination and continuation

The test manager can cancel a test run at any time and stop the test if

- the test cases report unexpected errors or
- the application is extremely prone to error (which is not test-ready), and thus further testing is not (efficiently) feasible

Before an official test run against a new release, the developer team runs a manual smoke test that confirms the basic functionality of a software delivery. If a smoke test fails, the test run is cancelled.

3.6. Documentation

Test level / Document	Test script	test cases	Concrete test cases	Test protocol	Defect log	Test report
Acceptance test (AT)	X	X	X	X	X	X

There is only one test concept for all test tasks that must be performed by Avacon. Since a test concept is a living document, it could be regularly updated to reflect new measures or changes.

The implementation results are recorded in a test protocol.

Regardless of the test method, in the case of a deviation / error, it is recorded in the error management sheet.

After a complete test of a test level, the test manager generates a test report

3.7. Tasks

For a complete and comprehensive execution of the test procedures the following tasks will be carried out by the parties identified in 2.3.

Table 7 - Test Tasks and Individual Responsibility

Test task	Responsible person
Test script	
Create test script	Voigt/Poulakis
Create test case design	Voigt / Baumgartner
Test plan	Voigt/Poulakis
Procure / create test tools	Voigt
Test cases	
Test user introduction	Voigt
Assignment of the features to be tested to the test users for the creation of the concrete test cases.	Voigt/Poulakis
Prepare test specification	Voigt / Baumgartner
Create conrete test cases	Voigt / Baumgartner
Test data definition and creation	Voigt, Harpeng, Baumgartner
Test execution	
Test execution (functional test)	Developer team, Ritter
Re-test execution (functional test)	Developer team, Ritter
Test execution (Acceptance test)	Harpeng
Testmanagement	
Ordering test infrastructure	Already in place (Munich)
Define test case range	Baumgartner/Voigt/Poulakis
Create test report	Voigt/Poulakis
Test coordination and communication	Voigt/Poulakis
Defect log management	Poulakis
Defect log management (development)	Baumgartner

3.8. Infrastructure

3.8.1. Test environment

The test requires a test system provided by EFR in Munich. The system sizing, test procedures, contents, and goals are part of this document and described below.

For all activities during a test execution, a test environment must be provided which covers all the requirements of the test phase.

A test environment is the entirety of all the hardware and software components necessary to perform defined Use Cases. These include the test objects, the necessary test data, appropriate hardware and operating systems.

3.8.2. Testing Hardware Specifications

1. Q-System hardware:
   - RAM: 16GB
   - CPU: Intel® Xeon® E5-2620 v4
   - HD: >= 2TB
2. Q-System software:
   - Ubuntu Linux Server Version 16.04 LTS
   - JAVA Version 8
   - MongoDB Version 3.4
3. Browser:
   - Angular JS Version 1.6
   - Bootstrap CSS
4. Interfaces:
   - REST / Websockets
   - JSON
   - TASE.2
   - IEC 61850
   - SOAP

3.8.3. Test workplace and tools

Depending on the test cases/scenarios different tools are needed.

- For the test objects SGH Client (see figure 1 “Q-system architecture”)
- MS Excel for the documentation of the test execution
- Access to the test environment
- Capture tool for screenshots

3.9. Responsibility

The entire test personnel are divided into different test groups for test management. Table 8 shows an association between persons / test groups and test roles.

The following people are named as testers in the project:

Table 8 - Testers

Business unit	Surname	Last name	Role
EFR	Johannes	Poulakis	Test coordinator
Avacon	Lars	Harpeng	Tester

Alexander Voigt provides the main responsibility for the planning, preparation and execution of the test phase. As a test analyst, he is also responsible for the analysis of requirements, specifications and design to derive Use Cases. Furthermore, the data preparation is one of his tasks. He also puts the created test cases into practice, evaluates the results and records possible deviations from the expected result.

If necessary, consultants, developers and experts from Avacon are called in to assist.

It is not intended that Lars Harpeng performs each test, but overall there is a complete coverage of all Use Cases. Attention should be focused to parallel project or line activities as well as vacation-related absences.

The tests for P1 phase scheduled in the period from 30.04.2018 to 04.06.2018. Phase 2 “Lüneburg One” is scheduled from 04.06.2018 to 29.06.2018.

3.10. Personnel, Training, Education

Before the test starts, the testers receive a briefing on the tools on-site. This instruction explains the handling of SGH and Excel-tool. The test coordinator provides advice during the test phase. Further tool training is not necessary.

3.11. Schedule and Work Plan

The scheduled and the associated use cases for phases P1 and P2.1 are shown in Figure 3:

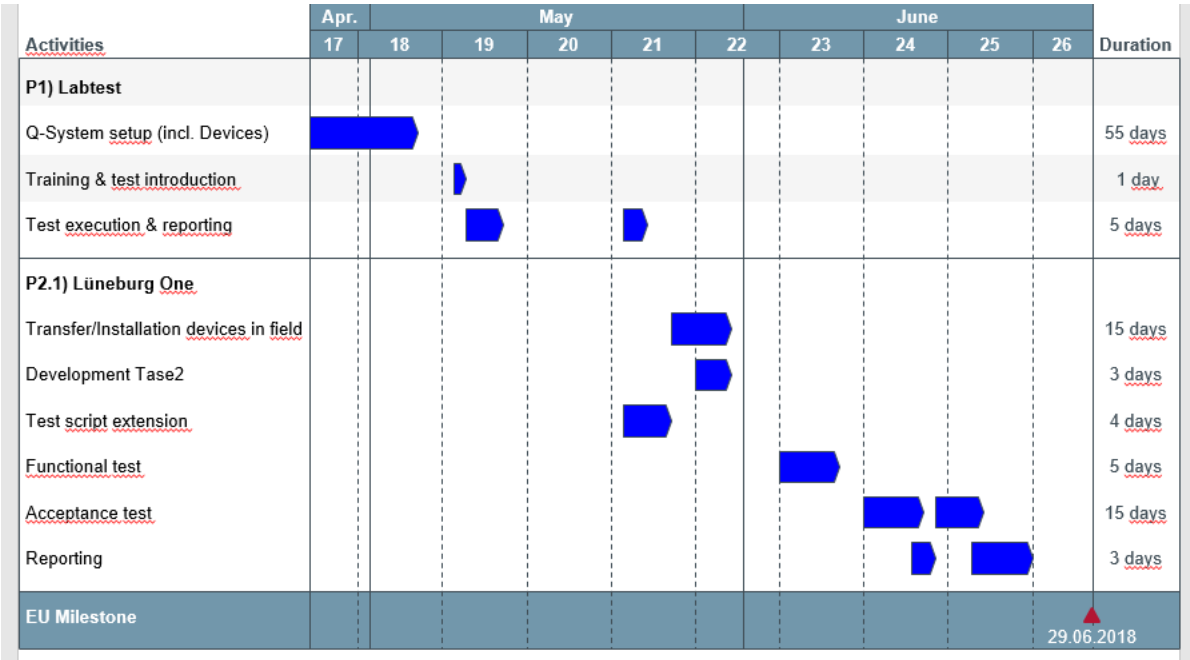

Figure 3 – Testing Schedule

For phase P1 the following Use cases are expected to be tested and a result is available in Appendix 1 – Test Protocol (German).

Table 9 - Test objectives Use Case 1 During Test Phase P1

ID	Scenario	ID	Step
3.5.2	Measuring	2.2.1.2	Request current power output
		2.2.3.3	Request current grid KPI
3.5.3	Switching		Activate setpoint for group of DG to (100/60/30/0)

Table 10 - Test objectives Use Case 2 During Test Phase P1

ID	Scenario	ID	Step
3.5.2	Measuring	2.2.2.2	Request current load
		2.2.3.3	Request current grid KPI
3.5.3	Switching	2.2.2.4	Activate setpoint (100/0)

During the P1 phase, the PSI-Desktop is still being configured and can hence not be part of the test. All grid control SCADA information is simulated within the SGH itself.

For phase 2.1 all in chapter 0 listed Use Cases are expected to be tested and a result is available until 29.6.2018 excl. following scenarios which require additional reworks:

Table 11 - Remaining Test Objects Beyond 30.06.2018

2.2.3.3	Request current grid KPI
2.2.3.4	Set and monitor threshold values for grid KPI
2.2.4.1.5	Data analytics based on real time grid data, measured values and threshold events
	Login validation
2.2.4.1.8	Base data transmission SGH Data Unit-> SGH Process Unit

3.12. Metrics and KPI

The following metrics are being evaluated:

Test case-based metrics with absolute scales:

- No. of created test procedures (concrete test cases)
- No. of unplanned new test cases
- No. of completed test cases
- No. of performed high priority test cases
- No. of completed test cases without error effect (pass)
- No. of executed test cases without error effect with priority high
- No. of performed test cases with error effect (failed)
- No. of performed test cases with error effect with priority high
- No. of blocked test cases (for example, non-executable function)
- No. of blocked test cases with priority high

3.13. Results

In conclusion test phase P1 has been completed successfully. It has been demonstrated that the SGH process unit is functional and fulfils the requirements to enable expanded testing and very soon the beginning of the targeted field tests. As shown in Appendix 1 – Test Protocol (German) the tests for the most crucial functionalities have been performed successfully in a lab setting as described earlier. The SGH has proved to be capable of establishing a communication channel to a control box via a simulated smart meter framework and performed several measurement- and switching actions. A detailed testing protocol and video documentation is made available in the Appendix.

4. APPENDICES

4.1. Appendix 1 – Test Protocol (German)

Projekt	INTERFLEX	Ergebnisse in Jira dokumantieren
Pflichtenheft ID	3.5.2 und 3.5.3	
Testobjektname	Demand Response (Lastmanagement)	
Designer	voigt	
Status	In Bearbeitung	
Iteration	1	

			Funktion Messen und Schalten (tatsächliches Ergebnis)				
			TF01	TF02	TF03	TF04	TF05
Testfall-ID							
Testfall-Kurzbeschreibung *Messen und Schalten von Anlagen*							
Testfallbeschreibung *In diesem Szenario wird die Ist-Einspeisung einer Gruppe bzw. einer Anlage kontinuierlich abgefragt und im SGH abgelegt. Für eine definierte Gruppe/Anlage werden die Anlagen auf 0%-30%-60%-100% limitiert. Dabei soll der Auftrag für einen bestimmten Zeitpunkt vordefiniert werden. Nach Durchführung der Maßnahme muss der Erfolgs- oder Fehlerstatus je Anlage ausgegeben werden. Die Schalthandlung soll bei Erfolg auch als „Reduktionsstand" je Anlage im SGH mit Anlagenbezug, Datum und Uhrzeit gespeichert werden. Die dabei zum Einsatz kommenden Gruppen dürfen nur Anlagen gleichen Typs beinhalten (Last)*							
Testfall-Priorität			High	High	High	High	High
Testfall-Ergebnis			positiv	positiv	positiv	positiv	positiv
Teststufe			Abnahmetest	Abnahmetest	Abnahmetest	Abnahmetest	Abnahmetest
Step-Name	**Testschritt**	**Erwartetes Ergebnis**					
Vorbedingungen - statisch							
	Es existiert eine Gruppe, die das Gerät enthält = Konfiguration / Gruppen = Klicken auf Gruppe NB_V1 = Kontrollieren: Gerät eefr1700000010 ist in Liste 'enthaltene Anlagen' eingetragen	Die Ergebnisse werden mit Bildern in der "Interflex TEST MSM 0-30ß-60-100.ppt" dokumentiert					
	Das Gerät ist auf 0% (=aus) geschaltet = aktuelle Werte / 'Anlagen' = Anlage aussuchen (z.B. Filterwert eefr1700000010 unter Anlage eingeben) = Kontrollieren: Schaltzustand für Gerät ist 0%						
Vorbedingungen - dynamisch							
	Gruppe		NB_V1				
	Gerät		eefr17000000106				
Messung starten							
	Bitte wählen Sie folgende Einstellungen aus: = Reiter Ablaufsteuerung / Queues öffnen = Queue: Start Messung = Startzeitpunkt: sofort = Zielgruppe: NB_V1 = Start betätigen	Aktive Queues wird erfolgreich durchgeführt	Messung erfolgreich gestartet. Messwerte ca. 0kWh				
akt. Einspeisung kontrollieren							

	Wählen Sie bei aktuelle Werte 'Anlagen' aus und suchen Sie z.B. Filterwert eefr1700000010 unter Anlage eingeben)	akt. Messwert für Gerät ist ca. 0 Watt	Messwerte liegen bei ca. 0kWh				
Schalten 30%							
	Bitte wählen Sie folgende Einstellungen aus: = Reiter Ablaufsteuerung / Queues öffnen = Queue: Einspeisung 30% limitieren = Startzeitpunkt: sofort = Zielgruppe: NB_V1 = Start betätigen	Aktive Queues wird erfolgreich durchgeführt	Limitierung auf 30% erfolgreich geändert				
akt. Einspeisung kontrollieren							
	Wählen Sie bei aktuelle Werte 'Anlagen' aus und suchen Sie z.B. Filterwert eefr1700000010 unter Anlage eingeben)	akt. Messwert für Gerät ist auf ca. 30% der Nennleistung	Messwerte liegen bei ca. 4kWh				
Schalten 60%							
	Bitte wählen Sie folgende Einstellungen aus: = Reiter Ablaufsteuerung / Queues öffnen = Queue: Einspeisung 60% limitieren = Startzeitpunkt: sofort = Zielgruppe: NB_V1 = Start betätigen	Aktive Queues wird erfolgreich durchgeführt	Limitierung auf 60% erfolgreich geändert				
akt. Einspeisung kontrollieren							
	Wählen Sie bei aktuelle Werte 'Anlagen' aus und suchen Sie z.B. Filterwert eefr1700000010 unter Anlage eingeben)	akt. Messwert für Gerät ist auf ca.60% der Nennleistung	Messwerte liegen bei ca. 8kWh				
Schalten 100%							
	Bitte wählen Sie folgende Einstellungen aus: = Reiter Ablaufsteuerung / Queues öffnen = Queue: Einspeisung 100% limitieren = Startzeitpunkt: sofort = Zielgruppe: NB_V1 = Start betätigen	Aktive Queues wird erfolgreich durchgeführt	Limitierung auf 100% erfolgreich geändert				

akt. Einspeisung kontrollieren							
	Wählen Sie bei aktuelle Werte 'Anlagen' aus und suchen Sie z.B. Filterwert eefr1700000010 unter Anlage eingeben)	akt. Messwert für Gerät ist auf ca.100% der Nennleistung	Messwerte liegen bei ca. 13kWh				

4.2 Appendix 2 – Test Videolink

https://www.dropbox.com/l/scl/AACCRXgh-And7--pmY-oJYjn5p9oD1RS7kQ