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Abstract:

The pilot sites detailed project plan defines how the project activities in the different X-FLEX pilot sites will be executed, monitored and controlled providing a summarized framework of the project and its purpose. The detailed project plans represent the foundations for executing the project, including the work plan together with a Gantt chart.

Moreover, the pilot sites detailed project plan describes the main challenges and risk logs for each pilot site and creates a link between pilot sites and previous WP's trough UC's / KPI's / Pilot sites Matrix.

Keywords:

List of activities, Status of Activities, Challenges, Gantt chart, Risk log.

Revision History

Revision	Date	Description	Author (Organisation)
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V1.0	26.3 2021	Final version of the deliverable	Borut Jereb (PETROL), Gašper Artač (PETROL), Svilen Pirlakov (ALBENA), Stamatia Gkiala Fikari (HEDNO), Lola Alacreu (ETRA), Chloe Fournely (UL).

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Copyright Statement

Executive Summary

The Pilot sites detailed project plan is a document which gives an overview of how management and coordination activities of pilot sites are handled. Pilot sites detailed project plan lists and describes already performed activities and the major planned activities until the end of the project. Moreover, the main challenges and risks for each pilot site are also represented in the document.

Actions that are necessary for successful implementation and demonstration of X-FLEX technical tools defined in WP3 to WP6 and UCs and KPIs defined in WP2 in each pilot site are defined in the document. These actions are necessary to ensure good coordination between technical implementation of new assets or upgrade of existing assets in each pilot site on one hand and the development and especially implementation of X-FLEX tools in pilot sites on the other hand.

Coordination of efforts, status of activities in pilot sites and open issues are being presented in biweekly General Meetings which enables very effective dissemination of information within the consortium.

A UC/KPI/Pilot Site matrix, which connects D2.2 Use cases and requirement definition [1] and D2.5 KPI identification and monitoring preparation [2] with demonstration activities in WP7, was prepared to provide all partners of X-FLEX project with a simple overview on all planned demonstrations in pilot sites.

List and status of activities in pilot sites has been regularly (monthly) updated by pilot site leaders during the last year and this process will remain so until the end of X-FLEX project. The focus of the pilot sites during the first 18 months was on technical deployment of new assets, upgrading existing assets, and analysing and integrating existing systems, with the aim to enable demonstration of X-FLEX project goals. Latest status of all activities shows that in the first year of WP 7 implementation (month 6 to month 18 of the project) all main activities in all pilot sites are going according to plan despite the COVID-19 enforced restrictions in all pilot sites. Timely execution of planned activities was achieved through quick intervention, good communication of all involved partners and appropriate replan of actions.

The main challenges differ from pilot site to pilot site, however integration and operational issues (being able to promptly solve real problems) can be found in all pilot sites. Slovenian and Bulgarian pilot sites (Ravne na Koroškem, Luče and Albena) focus more on market mechanisms for flexibility use. Those market mechanisms are ancillary services for the Transmission System Operator, short-term markets (Day Ahead and Intraday) optimization of flexibility in Albena and Ravne na Koroškem and local flexibility markets / ancillary services for the Distribution System Operator in Luče. Greek pilot site Xanthi, as the biggest residential area between all X-FLEX pilot sites, is oriented towards distribution system grid issues and the use of flexibility for solving local congestions and ensuring stability of the grid conditions.

Future activities in pilot sites will mainly focus on the integration of X-FLEX tools with the existing IT infrastructure in pilot sites and testing of developed X-FLEX tools in pilot locations.

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1 INTRODUCTION

1.1 PURPOSE OF THE DOCUMENT

This document aims to summarize a detailed plan of activities, to define main risks and to define main challenges for all the pilot sites.

The pilot sites detailed project plan contains all the relevant information to facilitate control of different activities in pilot sites and it enables pilot site leaders, work package leader and the coordinator of X-FLEX project to meet all the requirements from the description of actions (DOA) and to supervise start and finish of the activities according to the project plan.

The purpose of this document is, therefore, to provide a detailed overview of all main activities (past, present and future) in pilot sites which are part of X-FLEX project in order to ensure proper and effective exchange of information between all partners and especially between pilot site leaders and the developers of the technical tools.

1.2 SCOPE OF THE DOCUMENT

The Deliverable 7.1 is produced within Demonstration activities work package (WP7) to provide an overview of the actions and technical assets implemented at each pilot sites, to define main challenges each pilot site is facing.

The document, and especially the detailed action list for each pilot, will serve to the team leaders within each organisation, researchers and administrative responsible to have at any moment a clear vision of what and when WP objectives are to be achieved.

1.3 STRUCTURE OF THE DOCUMENT

Section 2 includes a basic summary of key communication and coordination activities between X-FLEX pilot sites. General implementation process of all pilot sites with the matrix connecting UCs and KPIs with pilot sites is represented in section 3. Sections 3 also includes short description, list of completed and planned activities including Gantt chart, main challenges and main risks for each pilot site. Finally, section 4 presents the main conclusions of the deliverable, section 5 the references and section 6 the acronyms list.

2 PILOT SITES COMMUNICATION & MEETINGS

To monitor the progress of pilot sites and to ensure the constant flow of information and exchange of gained experience with all pilot site leaders, regular meetings were planned on a regular (at least monthly) basis. Due to the fact that Project Coordinator (PC) and the rest of the Consortium decided for all partners to attend the online bi-weekly meetings and to optimize the resources of pilot site leaders and the rest of the partners, bi-weekly consortium meetings are being exploited to discuss ongoing developments in pilot sites. When urgent issues need to be resolved or when additional aspects of pilot sites development need to be the discussed, additional meetings with all involved partners will be organised. In Person GA meetings will also be exploited for onsite meetings between pilot site leaders. Additional in Person meetings between pilot site leaders are not foreseen.

All other communication will be done through dedicated emails that were set up by the project coordinator and in accordance with chapter 6 of D1.1 Project Management Plan [3].

General activities related to T7.1 (for all pilot sites) are shown below.

Table 1: List of major communication activities for T7.1

Activity	Planned deadline	Status
Pilot sites detailed Project Plan – Table of contents prepared and sent to partners for revision.	April 2020	Completed
1st online meeting of pilot site leaders.	May 2020	Completed
Pilot sites detailed Project Plan – 1st version prepared (general description, risk log and basic action list for all pilot sites).	June 2020	Completed
2nd online meeting of pilot site leaders.	June 2020	Completed
Pilot sites detailed Project Plan – 2nd version prepared (updated risk log, updated action list, challenges).	January 2021	Completed
Final Pilot sites detailed Project Plan prepared for revision.	February 2021	Completed
Revision of the Pilot sites detailed Project Plan completed.	March 2021	Completed
Final Pilot sites detailed Project Plan prepared for submission.	March 2021	Completed
Regular biweekly meetings (as a part of biweekly GM's) are organised till the end of the project	October 2019 - September 2023	Ongoing

3 DEMONSTRATION ACTIVITIES IN PILOT SITES

As described in the following chapters, in general all pilot sites are following the same process of implementation. First part of implementation process is overseeing the installation of new assets (e.g. electrode boiler in Ravne na Koroškem, home EV chargers in Luče) and upgrades of already installed assets (e.g. PV and BESS in Albena). Second part of activities monitors the installation of measuring equipment (e.g. SLAMs) and integrating the data collection process into existing SCADA systems with the aim to ensure availability of needed data for the integration and demonstration of X-FLEX tools which will be implemented in pilot sites in the second half of the project.

In order to bring together excellent work in WP2, where all the relevant UC's and KPI's were identified and described, and to provide an overview for all internal and external stakeholders, the UC's / KPI's / pilot sites matrix was prepared to, as the name suggests, show all the relations between UC's and KPI's and also in which Pilot sites each UC or KPI will be demonstrated. As shown in the matrix altogether more than 350 calculations will be made during the X-FLEX project.

Table 2: UCs / KPIs / Pilot sites SERVIFLEX Matrix

	SERVIFLEX							
KPI/UC	**UC 1.1**	**UC 1.2**	**UC 1.3**	**UC 1.4**	**UC 1.5**	**UC 1.6**	**UC 1.7**	**UC 1.8**
TECH_01	LU, RA, AL, XA	LU, RA, AL, XA	LU	XA				
TECH_02						LU, RA, AL, XA	AL, XA	
TECH_03	LU, XA	LU, XA	LU	XA				
TECH_07		LU, RA, AL, XA	LU	XA				
TECH_08		LU, RA, AL, XA	LU	XA				
TECH_09		LU, RA, AL, XA	LU	XA	AL, XA			
TECH_10						LU, RA, AL, XA	AL, XA	
TECH_11	LU, AL, XA							
TECH_12			LU	XA				
TECH_13	LU, XA	LU, XA	LU	XA				
TECH_23			LU					
TECH_25							AL, XA	
TECH_26						LU	AL	
ENV_01						LU, RA, AL, XA	AL, XA	
ENV_02						LU, RA, AL, XA	AL, XA	
ENV_03						LU, RA, XA	XA	
SOC_02	LU, RA, AL, XA	LU, RA, AL, XA	LU	XA	AL, XA	LU, RA, AL, XA	AL, XA	LU, RA, AL, XA
SOC_03	LU, RA, AL, XA	LU, RA, AL, XA	LU	XA	AL, XA	LU, RA, AL, XA	AL, XA	LU, RA, AL, XA

Table 3: UCs / KPIs / Pilot sites GRIDFLEX Matrix

	GRIDFLEX														
KPI/UC	UC 2.1	UC 2.2	UC 2.3	UC 2.4	UC 2.5	UC 2.6	UC 2.7	UC 2.8	UC 2.9	UC 2.10	UC 2.11	UC 2.12	UC 2.13	UC 2.14	UC 2.15
TECH_01	LU, RA, AL, XA			LU, AL, XA	LU, XA	XA	LU, AL, XA						XA	LU, XA	
TECH_02									LU, AL, XA	LU, AL					LU, (XA)
TECH_03				LU											
TECH_05			XA	LU, AL, XA	AL, LU, XA		LU, AL, XA		LU, AL, XA						
TECH_06										LU, AL					
TECH_07					LU, AL										
TECH_10										LU, AL					LU, (XA)
TECH_11								LU, AL, XA							
TECH_12								LU, XA							
TECH_13								LU, XA							
TECH_14							LU, AL, XA		LU, AL, XA						
TECH_15							LU, AL, XA								
TECH_16						XA								LU, XA	
TECH_17													XA		

TECH_18						XA	LU, AL, XA		LU, AL, XA					LU, XA	
TECH_19				LU											
TECH_20				LU											
TECH_21						XA								LU, XA	
TECH_22				LU, AL, XA	LU, AL, XA			LU, AL, XA		LU, AL	XA				LU, (XA)
TECH_24		LU, XA													
TECH_25			XA				LU, AL, XA		LU, AL, XA	LU, AL					
TECH_26										LU, AL					
TECH_27					LU, XA		LU, AL, XA								
ENV_01				LU, AL, XA											
ENV_02				LU, AL, XA											
ENV_03				LU, XA											
SOC_01												LU, AL, XA			
SOC_02	LU, RA, AL, XA	LU, XA	XA	LU, AL, XA	LU, AL, XA	XA	LU, AL, XA	LU, AL, XA	LU, AL, XA	LU, AL	XA	LU, AL, XA	XA	LU, XA	LU, (XA)
SOC_03	LU, RA, AL, XA	LU, XA	XA	LU, AL, XA	LU, AL, XA	XA	LU, AL, XA	LU, AL, XA	LU, AL, XA	LU, AL	XA	LU, AL, XA	XA	LU, XA	LU, (XA)

Table 4: UCs / KPIs / Pilot sites MARKETFLEX Matrix

	MARKETFLEX					
KPI/UC	UC 3.1	UC 3.2	UC 3.3	UC 3.4	UC 3.5	UC 3.6
TECH_02	LU, RA, AL	LU, RA, AL	RA, AL	LU, AL	LU, AL	LU
ECO_01	LU, RA, AL					
ECO_02	RA					
ECO_03	RA	RA				
ECO_04			RA, AL			
ECO_05				LU		
ECO_06			AL			
ECO_07					LU	
SOC_02	LU, RA, AL	LU, RA, AL	RA, AL	LU, AL	LU, AL	LU
SOC_03	LU, RA, AL	LU, RA, AL	RA, AL	LU, AL	LU, AL	LU

3.1 PILOT SITE: RAVNE NA KOROŠKEM

3.1.1 Context

Ravne na Koroškem (SI) is a small remote town (population 7,268) with poor transport connection in the north-east part of Slovenia, known for its steel industry. The town is divided into residential area, where ELCE is the DSO, and industrial area, where PETROL has a role of DSO. PETROL also owns and operates electricity and heat production, operates district heating and sanitary hot water distribution for the town of Ravne na Koroškem (later also abbreviated as Ravne). The areas are linked with 2x20kV lines between each other (DSO-DSO) and both have a direct connection to the TSO 110kV level (DSO-TSO). They also share the same district heating and hot sanitary water system. The medium voltage grid consists of 32 20/0.4 kV substations and one 110/20/5 kV substation, with approximately 10 km of 20 kV cable and 2 km of 5 kV cable.

The following technologies already in place are:

- 6 MW CHP units;
- 268 kW PV power plant;
- District heating system (residential & industry);
- Sanitary hot water system;
- Natural gas distribution network;
- 24/7 power and heat network dispatch operation centre.

The new installations foreseen in X-FLEX are:

- 6 MW electrode boiler;
- 6 MWt cooling system.

The pilot site will demonstrate all X-FLEX tools where various use cases will be tested with the main aim of providing flexibility and ancillary services for the TSO and to optimize the combined operation of CHP units and the electrode boiler (RES Power2Heat).

3.1.2 Activities

As described in Chapter 3, the first prerequisite for implementation, testing and evaluation of X-FLEX tools is the technical installation of flexible and controllable assets that will be used in the demonstration activities. Preparation activates played an important role in the whole pilot site development process, as many of those activities which are presented in Table 5 include administrative procedures. The duration of administrative procedures is very hard to predict and could potentially represent a big risk for the whole pilot site if not addressed early in the project. In Ravne many activities started even before the X-FLEX project started and all of them were competed in the first 18 months of the project.

Table 6 and Gantt chart in Table 7 represents an overview of all completed and future major technical installation and integration activities in pilot site Ravne. As represented in Table 6 the installation of key new asset (electrode boiler) was already completed in 2020.

Preparation Activities

Table 5: Preparation Activities in Ravne na Koroškem

Activity	Status
Conceptual design (for acquisition of design conditions) was made.	Completed
Favourable opinion for the project from Slovenian water agency was received.	Completed
Favourable opinion for the project from Slovenian railroads was received.	Completed
Project documentation (DGD) for building permit was made.	Completed
Favourable opinion for the project from SIJ Metal Ravne was received.	Completed
Application for building permit was submitted.	Completed
Favourable opinion for the project from Municipality Ravne na Koroškem was received.	Completed
Detailed executive design for removal of existing buildings was made.	Completed
Detailed executive design for construction waste management was made.	Completed
Application for beginning of construction/demolition of existing buildings was submitted.	Completed
First supplementation of building documentation (DGD).	Completed
Consensus to building documentation (DGD) from SIJ Metal Ravne was received.	Completed
Supplementation to application for building permit was submitted.	Completed
Decision about Community Infrastructure Levy (CIL) received.	Completed
Building permit received.	Completed
Fire safety plan received.	Completed
Tender for the holder of the activity completed.	Completed

Technical installation activities

Table 6: Technical installation Activities in Ravne na Koroškem

Activity	Planned deadline	Status
R1: Electrode Boiler deployment (includes ordering and delivering process).	October 2020	Completed
R2: Construction works (includes all construction works needed for electrode boiler deployment).	September 2020	Completed
R3: Steel Construction and façade deployment.	September 2020	Completed
R4: Pumps and other installation deployment.	September 2020	Completed
R5: Mechanical installations.	November 2020	Completed
R6: Electrical installations.	November 2020	Completed
R7: On site assembly of electrode boiler.	November 2020	Completed
R8: Electrode boiler operational.	December 2020	Completed
R9: Pilot site operational.	March 2021	Completed
R10: Integration of installed assets (electrode boiler) to existing IT Infrastructure (connect onsite SCADA systems with IoT platform TANGO) completed.	June 2021	Ongoing
R11: Data gathering, and data storage procedures implemented.	September 2021	Ongoing

R12: Implement Procedures for Data Quality assurance of operational data.	December 2021	Planned
R13: First testing of Ancillary Services provision to the TSO.	December 2021	Planned
R14: Qualification process for provision of Ancillary Services for the TSO completed.	February 2022	Planned
R15: 1st round (depending on the level of functionalities available) of testing of first versions of X-FLEX tools in the pilot site (M21-M30).	March 2022	Planned
R16: Full integration with X-FLEX platform (M24-M36).	September 2022	Planned
R17: 2nd round of testing of final versions of X-FLEX tools in the pilot site (M33-M45).	June 2023	Planned
R18: Pilot site Ravne na Koroškem report prepared.	September 2023	Planned

Gant diagram of the activities

Table 7: Gantt diagram for Ravne na Koroškem for year 2020

Activities in 2020	Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
R1: Electrode Boiler deployment				■	■	■	■	■	■	■	■	■	■	■				
R2: Construction works									■	■	■							
R3: Steel Construction and Façade deployment										■	■							
R4: Pumps and other installation deployment							■	■	■	■	■	■						
R5: Mechanical installations												■	■	■	■	■		
R6: Electrical installations													■	■		■		
R7: Boiler onsite assembly																■	■	
R8: Electrode Boiler tested and operational																	■	■

Figure 1: Electrode boiler deployment

Table 8: Gantt diagram for Ravne na Koroškem for years 2021 - 2023

Year	2021												2022												2023								
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
R9: Pilot site operational.	■	■	■																														
R10: Integration of installed assets		■	■	■	■	■																											
R11: Data gathering, and data storage procedures implemented.		■	■	■	■	■	■	■	■																								
R12: Data Quality assurance of operational data.							■	■	■	■	■	■																					
R13: First testing of Ancillary Services provision to the TSO.										■	■	■																					
R14: Qualification process for provision of Ancillary Services for the TSO completed.										■	■	■	■	■																			
R15: 1st round of testing of first versions of X-FLEX tools in the pilot site							■	■	■	■	■	■	■	■	■																		
R16: Full integration with X-FLEX platform.										■	■	■	■	■	■	■	■	■	■	■	■												
R17: 2nd round of testing of final versions of X-FLEX tools.																			■	■	■	■	■	■	■	■	■	■	■	■			
R18: Pilot site Ravne na Koroškem report prepared.																												■	■	■	■	■	■

3.1.3 Challenges

The main identified remaining challenges for pilot site Ravne na Koroškem are:

- Communication and integration with the existing systems in Ravne na Koroškem. The main challenge is to ensure the implementation of the most appropriate communication protocols that are compatible with the existing infrastructure on one hand and to enable advanced Demand Response algorithms on the other hand.
- To develop advanced control Algorithms which will combine optimization of heat production for the town Ravne from the electrode boiler and the existing CHP units, taking into account on site RES production and energy system conditions. In normal operation the control algorithms will be implemented in the following way:
    - **Electrode Boiler – RES algorithm**

      This is a simple algorithm which will aim to use all electricity from onsite RES production for producing heat in the electrode boiler. The result of the algorithm will be a schedule for electrode boiler operations.
    - **Electrode Boiler – CHP heat production algorithm**

      The second algorithm will optimize the schedules for CHP and electrode boiler, taking into account the predicted heat demand and the prices of input energy sources (NG and electricity) and prices of output energy (heat and electricity), with the aim to optimize economic benefits and reduce CO_2 emissions. The result of the algorithm will be the schedule for electrode boiler and CHP operations.
    - **Flexibility algorithm**

      Flexibility algorithm (which will be part of SERVIFLEX) will calculate the amount of capacity and energy that can be offered to flexibility markets, especially ancillary service market.
    - **Overall optimization Algorithm**

      This algorithm represents the top-level algorithm which will combine the inputs of all previously described algorithms with the aim to provide an overall optimized schedule for Electrode boiler operations.

3.1.4 Risk Log

The risk analysis for each pilot site has been performed jointly with all relevant partners as a part of risk assessment in WP1. Table 9 represents the main technical and managerial risks in pilot site Ravne. The process how the risks are monitored and updated is described in D1.3 Risk assessment report and is not the part of this section.

Table 9: Risk Log for Ravne na Koroškem

Description of risk	Likelihood	Impact	Proposed mitigation measure
Pandemic (Coronavirus) related restrictions that affect the possibility of carrying out planned activities.	HIGH	HIGH	Closely monitor the situation and re-plan activities in a way to try to stick with the originally planned deadlines or notify everyone involved in case of delays.
Delays in equipment delivery.	LOW	MEDIUM	We will actively cooperate with all the vendors. We are aware of long delivery time and have contacted suppliers at the proposal stage already and investigated delivery times.
All necessary permits (land use agreements, environmental permits, construction permit…) not received.	LOW	HIGH	We will actively cooperate with all relevant stakeholders to identify any potential barriers and find alternative solutions if needed.
Inadequate equipment and facilities to perform all Uses cases for location.	LOW	HIGH	Detailed testing activities will be pre-defined, and tests performed. Pre-installed equipment will be upgraded with necessary hardware and software upgrades to run all defined Use cases.
Equipment, technical issues and communication system failures.	MEDIUM	HIGH	Detailed review and analysis of the equipment, investigating alternative solutions at the time or ordering a specific component, have been done. Various experts have been involved in the selection of the equipment.
Demonstration tasks are limited due to constraints of infrastructure availability, market operations and regulatory framework.	LOW	MEDIUM	We already have understanding on the infrastructure, markets and regulatory framework which we will continue to monitor closely
Measurement data gathered at demo locations is unreliable, corrupted and evaluation is not possible.	LOW	MEDIUM	Prior research and evaluation of selected ICT solutions will indicate possible issues, afterwards selected technologies will be tested.

3.2 PILOT SITE: LUČE

3.2.1 Context

The village of Luče (SI) is situated in the remote Upper Savinja Valley in Štajerska. The municipality is counting 400 people in 160 households in town Luče. The village is placed in a mountainous area. The climate is continental, and temperature range between 0 °C and 10 °C in winter, and between 15 °C and 30 °C in summer. Luče on average receives a little bit over 2000 hours of Sun irradiation with approximately 3200 Wh/m2/day of irradiation on the horizontal plane.

Pilot site Luče is a small rural alpine village with weak supply connection of a remote with near-by town Ljubno with MV overhead line results in frequent power outages due to weather events, even several times per night. Due to low capacity of the local LV network, the distributed RES generation is curtailed as the voltage during the day rises above the limits (up to 1.16 p.u.). Through X-FLEX we will be able to test and analyse different scenarios, like: inclusion of electric vehicles on a micro grid level, inclusion of very high grade of RES production on a micro grid level and also to prove that reliability of supply issues on micro grid level can be successfully addressed with energy management of Local Energy Communities.

Luče pilot site also participates in COMPILE project [4] which is also a H2020 project. The COMPILE project started in November 2018 and its main aim is to show the opportunities of energy islands for decarbonisation of energy supply, community building and creating environmental and socioeconomic benefits. As part of COMPILE new flexible assets were installed which support the community building process and also provide the basis for demonstrating X-FLEX project goals. Many of the solutions implemented in COMPILE will be further developed during the X-FLEX project. A more detailed description of technical solutions and installed assets is shown in the table below.

Technologies already in place:

- Community battery: 150 kW / 333 kWh;
- Several home batteries (5): 5 – 20 kWh;
- Solar PV: 152 kW (102 kW were added in year 2020);
- Wind generation: 3.5 kW (the first one installed in Slovenia).

3.2.2 Activities

Preparation Activities

A lot of new assets installations and grid infrastructure (transformer station) upgrades have already been done as a part of COMPILE project, as described in the previous chapter. Table 10 represents an overview of all relevant activities that were already done as part of COMPILE and will be used in X-FLEX project.

Table 11 and Gantt chart in Table 12 represents an overview of all completed and main future activities in pilot site Luče. The main focus of activities in Luče are related to integration and data quality topics.

Table 10: Preparation Activities in Luče

Activity	Status
Community battery in Luče installed (as part of COMPILE).	Completed

Transformer modifications completed (as part of COMPILE).	Completed
Home batteries installed at end users (as part of COMPILE).	Completed
All necessary permits for public EV charging station received (as part of COMPILE).	Completed

Technical installation activities

Table 11: Technical installation activities in Luče

Activity	**Planned deadline**	**Status**
L1: Microgrid establishment (as part of COMPILE).	June 2020	Completed
L2: Public EV charging installed (as part of COMPILE).	June 2020	Completed
L3: Test Data exchange via TANGO to technical tools established.	November 2020	Partially Completed
L4: 9 Home EV charging stations installed.	December 2020	Completed
L5: Pilot site operational	March 2021	Partially Completed*
L6: Integration of installed assets (full integration of Home EV chargers to HEMS, SCADA and to TANGO)	May 2021	Ongoing
L7: Data gathering, and data storage procedures implemented.	September 2021	Planned
L8: Implement Procedures for Data Quality assurance of operational data.	December 2021	Planned
L9: 1st round (depending on the level of functionalities available) of testing of first versions of X-FLEX tools in the pilot site (M21-M30).	March 2022	Planned
L10: Full integration with X-FLEX platform (M24-M36).	September 2022	Planned
L11: 2nd round of testing of final versions of X-FLEX tools in the pilot site (M33-M45).	June 2023	Planned
L12: Pilot site Luče report prepared.	September 2023	Planned

**Due to COVID19 restrictions Home EV charging stations are not fully integrated with the Home Energy System*

Table 12: Gantt diagram for Luče for years 2021 - 2023

Year	2021												2022												2023								
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
L5: Pilot site operational	■	■	■																														
L6: Integration of installed assets	■	■	■	■	■																												
L7: Data gathering, and data storage procedures implemented.			■	■	■	■	■	■	■																								
L8: Data Quality assurance of operational data.							■	■	■	■	■	■																					
L9: 1st round of testing of first versions of X-FLEX tools in the pilot site.					■	■	■	■	■	■	■	■	■	■	■																		
L10: Full integration with X-FLEX platform.										■	■	■	■	■	■	■	■	■	■	■	■												
L11: 2nd round of testing of final versions of X-FLEX tools.																		■	■	■	■	■	■	■	■	■	■	■	■	■			
L12: Pilot site Luče report prepared.																												■	■	■	■	■	■

3.2.3 Challenges

The main challenges that are currently foreseen in Luče can be in general divided into two categories: technical and social.

The technical challenges include:

- **Integration of newly installed assets** (home EV chargers) into existing infrastructure (already installed HEMS). Integration between HEMS and home EV charging units will be done via Modbus TCP/IP and then HEMS are further connected to microgrid controller.
- **Connectivity of all sublocations in pilot site Luče**. As some locations do not have Internet access or GSM signal, possible solutions are being investigated.
- **Creating a local flexibility market**: One of the main challenges in Luče is to create a local flexibility market with the implementation of X-FLEX tools (especially MARKETFLEX) and with the cooperation of many different stakeholders: DSO, aggregator, flexibility providers.

The social challenges include:

- **Community or end user's engagement process.** The goal of the community engagement process in Luče is to encourage the deployment of RES and storage technologies. We will be looking at supporting the investment of the local citizens in order to maximize the local benefits to their community and their energy system and trying to engage as many end users as possible to become the flexibility providers with their flexible assets.

3.2.4 Risk Log

Table 13: Risk Log for Luče

Description of risk	Likelihood	Impact	Proposed mitigation measure
Pandemic (Coronavirus) related restrictions that affect the possibility of carrying out planned activities.	HIGH	HIGH	Closely monitor the situation and re-plan activities in a way to try to stick with the originally planned deadlines or notify everyone involved in case of delays.
Uncooperative end users.	LOW	MEDIUM	Pilot site leader is in constant contact with the end users (they are informed about every installations and other activities).
Inadequate equipment and facilities to perform all Uses Cases.	LOW	HIGH	Detailed definition of testing activities will be pre-defined, and tests performed. Pre-installed equipment will be upgraded with necessary hardware and software upgrades to run all defined Use Cases.

Equipment, technical issues, and communication system failures.	MEDIUM	HIGH	Detailed review and analysis of the equipment, investigating alternative solutions at the time or ordering a specific component. Various experts have been involved in the selection of the equipment.
Demonstration tasks are limited due to constraints of infrastructure availability, market operations and regulatory framework.	LOW	MEDIUM	We have already a basic understanding on the infrastructure, markets, and regulatory framework.
Measurement data, gathered at demo locations is unreliable, corrupted and evaluation is not possible.	LOW	MEDIUM	Prior research and evaluation of selected ICT solutions will indicate possible issues, afterwards selected technologies will be tested.

3.3 PILOT SITE: ALBENA

3.3.1 Context

Albena, Bulgaria, is an area on the Black Sea coast, which consists entirely of hotel resorts, whose main purpose is to provide hospitality services to guests. Its most active season is during the summer when it can accommodate up to 20 000 people. On site, there are 43 hotels, 25 restaurants, bars, swimming pools, an aqua park, and other facilities. Altogether, along with the electrical and water grids, communications and street infrastructure are owned by Albena AD, which is a listed Joint Share Company on the Bulgarian Stock Exchange.

The connection point of Albena resort to the transmission grid is situated in the north eastern region where the bulk part of the installed wind farm capacity in Bulgaria is connected as well. In case of high wind power output, bottlenecks often arise in the transmission grid; respectively wind power output is curtailed. Due to the lower loads and higher RES output during the spring the Bulgarian TSO sometimes is not able to balance the power system with the existing amount of ancillary service’s reserve. This leads to curtailment of more RES power.

As part of its sustainability strategy, Albena joined a consortium in 2015 and took part in the INVADE [5] Horizon 2020 project. INVADE is about a cloud-based flexibility management system integrated with electric vehicles (EVs) and batteries empowering energy storage to increase the share of renewables in the smart grid. The X-FLEX platform will build upon the INVADE integrated platform tool by allowing for a greater exposure of energy carriers to partake more openly and holistically in the management of energy distribution. It would further seek opportunities to quantify and market this flexibility by creating sustainable valuation models.

Existing infrastructure and technology:

- 21 secondary substations 20/4 kV;
- Six 20 kV power lines with a total length of 43 km directly connected to one 110/20 kV Primary Substation owned by the Bulgarian TSO (ESO EAD);
- An existing 200 kWh battery on site at one of its five-star hotels, along with a 27 kWp PV installation
- Six controllable water heating stations (around 0.5 MW);
- A 1 MW biogas generation plant owned by Perpetuum Mobile BG AD (subsidiary of Albena AD).

3.3.2 Activities

Preparation Activities

Most of the assets such as grid infrastructure, PV, battery, boilers, biogas plant and SCADA have already existed or have been done as a part of the INVADE project. Table 14 represents an overview of all relevant activities that were already done as part of INVADE and will be used in X-FLEX project.

Table 15 and Table 16 represents an overview and timetable of all completed and main future activities in Albena pilot site. The main activities are related to infrastructure and software upgrades and series of tests.

Table 14: Preparation activities in Albena

Activity	Status
27 kWp PV panels installed (as part of INVADE).	Completed
200 kWh battery installed (as part of INVADE).	Completed
Converted 6 boiler systems to controllable loads (as part of INVADE).	Completed
SCADA monitoring and data warehouse software installation (as part of INVADE).	Completed
Connected and tested PV installation, battery and six boiler systems to flexibility cloud (as part of INVADE).	Completed
Performed a scheduled and periodic internal flexibility optimization utilizing battery and boiler systems energy storages (as part of INVADE).	Completed

Technical installation activities

Table 15: Technical installation activities in Albena

Activity	Planned deadline	Status
A1: Perform software upgrades, improvements and optimizations to allow for a collective control of flexibility resources	September 2022	Ongoing
A2: Integration workshop – a seminar for Albena AD and ESO EAD to meet on site and plan communication connection requirements and data exchange as well as possibly needed software and hardware changes	July 2020	Completed
A3: Perform a manual end-summer-season controllable load test of turning on or off all available controllable loads for a short period of time (15 minutes) for different ancillary services provision and for intraday market participation.	September 2020	Completed

A4: Perform conversion of 5 or more boiler systems to controllable loads in time for summer season 2021	June 2021	Planned
A5: Develop a guide for other industries to quantify and decide whether they should participate in the flexibility market	September 2023	Ongoing
A6: Perform a manual end-summer-season battery test of turning on or off all available controllable loads for a short period of time (15 minutes) for different ancillary services provision and for intraday market participation.	November 2020	Completed
A7: Perform a manual biogas plant test for controlling the power generation for a short period of time (15 minutes) for different ancillary services provision and for intraday market participation.	April 2021	Planned
A8: Upgrade Albena SCADA to allow for a seamless connection with X-FLEX tools and platform	May 2021	Planned
A9: Perform conversion of 5 or more boiler systems to controllable loads in time for summer season 2022	June 2022	Planned
A10: Connect to the X-FLEX platform by setting up data feeds and control feeds successfully	June 2022	Planned

A11: Perform initial self-optimisation tests	December 2022	Planned
A12: Perform initial ancillary services to ESO tests	December 2022	Planned
A13: Perform conversion of 5 or more boiler systems to controllable loads in time for summer season 2023	June 2023	Planned
A14: Perform demonstration activities as per DOA	August 2023	Planned
A15: Complete deliverables and submit test results and analysis	September 2023	Planned
A16: Complete scalability and replicability task deliverables	September 2023	Planned

Table 16: Gantt diagram for Albena for Years 2021 - 2023

Year	2021												2022												2023								
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
A1: Perform software upgrades	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■												
A4: Convert of 5 boiler systems	■	■	■	■	■	■																											
A5: Develop flexibility guide	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
A7: Manual biogas plant test	■	■	■	■																													
A8: Upgrade Albena SCADA	■	■	■	■																													
A9: Convert of 5 boiler systems											■	■	■	■	■	■	■	■															
A10: Connect to X-FLEX platform													■	■	■	■	■	■															
A11: Initial self-optimisation tests																	■	■	■	■	■	■	■	■									
A12: Initial ancillary services tests																	■	■	■	■	■	■	■	■									
A13: Convert of 5 boiler systems																							■	■	■	■	■	■	■	■			
A14: DOA demonstration activities																													■	■	■	■	
A15: Complete pilot deliverables																									■	■	■	■	■	■	■	■	■
A16: Complete S&R deliverables													■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

3.3.3 Challenges

The main challenges foreseen in pilot site Albena are:

- Determining the fair price of flexibility;
- Connecting developed X-FLEX systems and modules to the Independent Bulgarian Energy Exchange (IBEX) market systems to allow for testing and prototyping flexibility transactions;
- Perform system connection and data exchange between Albena AD and ESO EAD;
- Adapting various existing local infrastructure at Albena Resort to perform monitoring and increase the fleet of controllable loads.

3.3.4 Risk Log

Table 17: Risk log for Albena

Description of risk	Likelihood	Impact	Proposed mitigation measure
Pandemic (Coronavirus) related restrictions that affect the possibility of carrying out planned activities.	HIGH	HIGH	Closely monitor the situation and the impact it has on the project. Adjust the schedule so all work which may be done remotely is performed during the pandemic where possible (mainly software changes and documentation). Move all work requiring on site and gathering of people to a later stage if necessary (boiler conversion, technical workshops). Notify all partners of any drastic and notable changes to the original plan.
Equipment, technical issues and communication system failures.	MEDIUM	HIGH	Detailed review and analysis of the equipment during selection. In case of a failure or other issues, investigate and document cause, identify failure tendencies and explore alternative configurations and adjustment. In case of increasing tendencies to specific failures or issues – explore alternative solutions.
Demonstration tasks are limited due to constraints of infrastructure availability	LOW	HIGH	Monitor the tendencies and impact it has on the project. Adjust project plan and available controllable load power capability as needed. Notify ESO EAD in case of drastic changes to the original controllable loads plan. Notify all partners in case of drastic changes to the planned demonstration activities.
Demonstration tasks are limited due to market	LOW	MEDIUM	In case we are not able to perform real-life demonstration activities, perform

operations and regulatory framework.			simulations of such. Devise steps and proposition plan (along with simulation results) for the path to real life implementations and demonstrations (this is especially true in case of regulatory difficulties). Notify all partners in case of drastic changes to the planned demonstration activities.
Measurement data gathered at demo locations is unreliable, corrupted and evaluation is not possible	LOW	MEDIUM	Isolate components and controllable loads with unreliable data and temporary exclude them from the total controllable loads until issues are resolved. Notify all partners in case of drastic changes to the planned demonstration activities.

3.4 PILOT SITE: XANTHI

3.4.1 Context

The city of Xanthi is the capital of Xanthi prefecture, administratively belonging to the Region of Eastern Macedonia and Thrace, which is in the northern part of Greece. The prefecture has a population of around 111,222 (according to 2011 population census) and covers an area of 1,793 km^2. The city of Xanthi has a population of 63,083 (according to 2011 population census). The area experiences harsh winters and extreme weather events, mainly including snowfall and heavy rain storms.

In terms of its distribution network, Xanthi Area belongs to the Department of Macedonia – Thrace Region of Hellenic Electricity Distribution Network Operator (HEDNO). The area is being supplied by the HV/MV substations of Xanthi (2 x 50 MVA) and Magikou (2 x 50 MVA), while part of its loads is being served by the substations of Iasmos and Zarkadia. The length of the overhead MV and LV network is 1,302 km and 1,330 km, respectively. The MV underground network has length of 42 km, while the LV underground network has a total length of 115 km, most of which can be found within the city of Xanthi. There are 1,934 MV/LV distribution substations with total capacity of 244,410 kVA (82,005 kVA within the city of Xanthi).

For the pilot site of Xanthi, two local partners shall cooperate involving their assets for the implementation of the developed tools: HEDNO S.A., as the network operator, and Systems Sunlight S.A., with the microgrid installed in their facilities. The technologies that are in place in the area and the ones that are going to be installed are described below. For the scope of the pilot, only a part of the distribution network of Xanthi will be involved. Certain MV lines will be used in the demo and their selection has been based on specific criteria serving the needs of the UCs and scenarios to be demonstrated providing a representative part of the network capable to clearly demonstrate the tools operation and effectiveness of the proposed solutions. Some of these criteria are the illustration of the lines in GIS systems, the supply points and respective lines of Sunlight S.A. installation, the connection of RES and telemetered customers to the lines, the existence of tele-monitored and tele-controlled assets, the facilitation of reconfiguration scenarios that would serve the needs and most frequent problems of the local network operation department and the potential of the installation of SLAM meters at LV end-users.

Thus, the Greek demo will include 3 MV lines with different characteristics. Line 39X is located inside the city of Xanthi covering urban loads, starts from Xanthi HV/MV substation and is depicted in GIS at its major part (on MV and LV level). Line 420M starts from Magiko HV/MV substation, feeds mainly rural and industrial loads, supplies the facilities of Sunlight, while there are also several PVs connected to this line. Line 33X is also fed by Xanthi HV/MV substation, is quite long starting from the city of Xanthi and covering suburban and rural areas, faces problems due to extreme weather events and provides connection to several PVs. There is an open point between lines 33X and 42M, through which they can be connected with each other when needed. This will allow for the demonstration of scenarios where reconfiguration of the distribution network is required and/or the provision of flexibility services from Sunlight is needed.

Technologies and assets included in Xanthi X-FLEX demo, are:

- 3 MV lines from 2 HV/MV substations feeding around 211 MV/LV substations;
- approximately 58 MV and major LV (between 55 kVA and 250 kVA) telemetered consumers;
- around 19 MV and LV RES producers (telemetered PVs of approx. 3.7 MW total installed power);
- SCADA system monitoring the 3 MV lines feeders;
- GIS illustrating the major part of 39X line;
- RES-powered microgrid located at Sunlight S.A premises outside of city of Xanthi (AC loads, PV generation, small wind turbine, Lead-acid batteries, diesel generator, Polymer Electrolyte Membrane (PEM) electrolyser, PEM fuel cell, SCADA).

The assets of Sunlight's microgrid are analytically shown below:

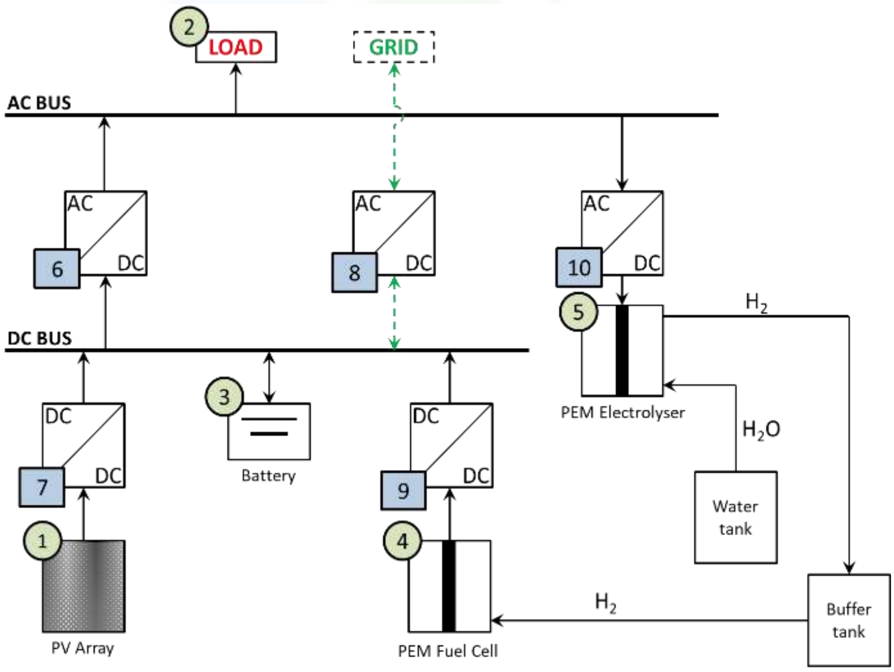

Figure 2. The microgrid at Sunlight S.A.

Table 18. Technical data of generation / storage / loads

No.	Component	Total Rated Power or Rated Capacity	Model	Status[1]
1	PV system	4680 W	Eurosolare 65 Wp	Functional
2	AC load	to be decided	Custom	Functional
3	Battery system	1500 Ah	Sunlight OpZV 1500	Functional
4	PEM FC	3000 W	FCS-C 3000 Horizon	Functional
5	PEM electrolyzer	4.0 kW	HyLizer 2.0 Hydrogenics	Partially functional (to be repaired)

Table 19. Technical data of power electronic converters

No.	Component	Rated Power (kW)	Model	Communication protocol	Status
6	DC/AC inverter	4.5	Xantrex	Micronics proprietary protocol	Functional
7	DC/DC converter	2 x 3	Phocos PL60	Micronics proprietary protocol	Functional
8	DC/AC inverter	1 x 4.5	SMA Sunny Island	Modbus	Installed
9	DC/DC converter	2.7	ELTEK	Modbus	Functional
10	AC/DC converter	6	PS9080-200 EA Elektro Automatik	N.A.	Functional

The new installations, which have been or are foreseen to be made operational during the X-FLEX project, are:

- around 40 SLAM meters (in houses, offices, commercial and public buildings and at Sunlight's facilities).
- Monitoring equipment at the HV/MV Magikou substation (monitoring electrical values in 42M line feeder with high sample rate) or/and at indicative MV/LV substation(s) of the demo lines. The installation of observability devices at HV/MV substation aims to collect data of higher quality, while the re-equipping of at least one MV/LV substation is important to acquire typical load curves and contribute to the observability of the demo network.

- SMA Sunny Island, DC/AC inverter (4.5 kW) allowing the operation of Sunlight's microgrid both in connection with the distribution network of the area, while the existing Xantrex inverter is responsible for the operation of the microgrid in islanded mode.

SERVIFLEX tool and GRIDFLEX tool will be demonstrated at Xanthi and the main users will be Sunlight and HEDNO, respectively. The goals are:

- to facilitate the optimal operation of Power2Gas and storage devices at the microgrid,
- to contribute to the increased resilience of the system under extreme weather events,
- to achieve power losses reduction, and
- to increase voltage stability through RES scheduling and smart grid automation devices deployment in the field.

3.4.2 Activities

For the accomplishment of the pilot site's goals and the successful application of the developed tools, a range of activities have been detected. These include preparatory activities affecting the coordination of the demo and the respective partners, the definition of the demo in terms of range and assets, the equipment required and IT work, as well as the deployment activities referring directly to the implementation of the tools and the testing of the determined scenarios. In this sense tables 20 and 21 show the main identified completed, ongoing and planned activities of Xanthi demo based also on the different stages of the project, while tables 22 and 23 present the respective timelines in Gant chart format for the years 2020 to 2023.

Preparation Activities

Table 20 : Preparation Activities for Xanthi

Activity	Status
Analysis of the UCs in collaboration among HEDNO, SLS, ICCS, ETRA and S5 to identify the data and equipment needed, as well as on their availability.	Completed
Decision of criteria for the selection of MV lines to be included in Xanthi pilot site.	Completed

Technical installation activities

Table 21: Technical installation activities in Xanthi

Activity	Planned deadline	Status
X1: Collaboration among HEDNO, ICCS, SLS and S5 to explore the potential usage for the microgrid RES and storage units in the framework of combinatory scenario based on UC 2.15.	December 2020	Completed
X2: Selection of MV lines to be included in Xanthi pilot site.	June 2020	Completed
X3: Cooperation of SLS with ICCS and S5 regarding the topology and the adaptations needed to support the implementation of relevant UCs.	December 2020	Completed
X4: Identification of assets involved.	July 2020	Completed
X5: Start of HEDNO data collection based on the assets involved.	July 2020	Completed
X6: Planning of SLAM meters allocation at customers' premises (electrical installations) at Xanthi – phase 1 (forming initial potential list of users)	2nd semester of 2020	Completed
X7: Installation of a DC/AC inverter of 4.5 kW SMA by SLS in order to operate the microgrid both in connection with the distribution network.	December 2020	Completed
X8: Start of the discussion to define the implementation of resilience algorithm in Xanthi.	December 2020	Completed
X9: Migration of existing HEDNO X-FLEX server and upcoming SLAMs to the new VPN provided by ICCS.	January 2021	Completed
X10: Necessary preparation by IT HEDNO team in order to support the storage of data coming from the company's systems and the development of the necessary wrappers for their usage throughout the project.	April 2021	Ongoing
X11: Geographic representation of the MV lines included	March 2021	Ongoing

in the project.		
X12: Finalization of the scenarios for UC 2.15 implementation and scheduling of potential necessary reparatory steps in cooperation with Xanthi pilot partners.	March 2021	Ongoing
X13: Topology models of the 3 MV lines.	March 2021	Ongoing
X14: Planning of SLAM meters allocation at customers' premises (electrical installations) at Xanthi – phase 2 (efforts for the engagement of more end-users)	1st semester of 2021	Ongoing
X15: Re-initiation of the process for the installation of monitoring equipment at substations.	1st quarter of 2021	Ongoing
X16: Start of the process for the detection of the weakest buses of the distribution network in cooperation with the local department of network Operation.	March 2021	Rescheduled
X17: Design and implementation of programmable AC load for the microgrid by SLS.	April 2021	Planned
X18: Integration of systems and interfaces with the demo assets in X-FLEX ecosystem - 1st round	October 2021	Planned
X19: Data gathering, and data storage procedures implemented - 1st round	October 2021	Planned
X20: Data quality assurance - 1st round	October 2021	Planned
X21: SLAM meters installation	November 2021	Planned
X22: Installation of metering equipment on the substations	January 2022	Planned
X23: Integration of systems and interfaces with the demo assets in X-FLEX ecosystem - 2nd round	March 2022	Planned
X24: Data gathering and data storage procedures implemented - 2nd round	June 2022	Planned
X25: Data quality assurance - 2nd round	July 2022	Planned
X26: 1st round of testing of first versions of XFLEX tools	June 2022	Planned

in the pilot site.		
X27: Full integration with X-FLEX platform.	September 2022	Planned
X28: Testing of the ancillary service scenario between SLS - HEDNO	October 2022	Planned
X29: 2nd round of testing of final versions of X-FLEX tools.	June 2023	Planned
X30: Pilot site Xanthi report prepared.	July 2023	Planned
X31: Contribution on Task 7.1 Pilot sites final report with details and corrections on Xanthi demo	August 2023	Planned

Table 22: Gantt diagram for Xanthi for year 2020

Activities in 2020	Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
X1: Collaboration among HEDNO, ICCS, SLS and S5 to explore the potential usage for the microgrid RES and storage units in the framework of combinatory scenario based on UC 2.15.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
X2: Selection of MV lines to be included in Xanthi pilot site.	■	■	■	■	■	■												
X3: Cooperation of SLS with ICCS and S5 regarding the topology and the adaptations needed to support the implementation of relevant UCs.	■	■	■	■	■	■	■	■	■	■	■	■	■	■				
X4: Identification of assets involved.						■	■	■										
X5: Start of HEDNO data collection based on the assets involved.							■	■	■	■	■	■						
X7: Planning of SLAM meters allocation at customers' premises (electrical installations) at Xanthi – phase 1 (forming initial potential list of users)							■	■	■	■	■	■	■	■	■	■	■	■
X9: Installation of a DC/AC inverter of 4.5 kW SMA by SLS in order to operate the microgrid both in connection with the distribution network.											■	■	■	■	■	■	■	■
X10: Start of the discussion to define the implementation of resilience algorithm in Xanthi.															■	■	■	■
X11: Necessary preparation by IT HEDNO team in order to support the storage of data coming from the company's systems and the development of the necessary wrappers for their usage throughout the project.													■	■	■	■	■	■
X12: Geographic representation of the MV lines included in the project.													■	■	■	■	■	■
X15: Migration of existing HEDNO X-FLEX server and upcoming SLAMs to the new VPN provided by ICCS.															■	■	■	■

Table 23: Gantt diagram for Xanthi for years 2021 - 2023

Year	2021												2022												2023								
Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9
X6: Start of the process for the detection of the weakest buses of the distribution network in cooperation with the local department of network Operation.																																	
X8: Re-initiation of the process for the installation of monitoring equipment at substations.																																	
X11: Necessary preparation by IT HEDNO team in order to support the storage of data coming from the company's systems and the development of the necessary wrappers for their usage throughout the project.																																	
X12: Geographic representation of the MV lines included in the project.																																	
X15: Migration of existing HEDNO X-FLEX server and upcoming SLAMs to the new VPN provided by ICCS.																																	

X16: Design and implementation of programmable AC load for the microgrid by SLS.																																	
X17: Planning of SLAM meters allocation at customers' premises (electrical installations) at Xanthi – phase 2 (efforts for the engagement of more end-users)																																	
X14: Topology models of the 3 MV lines																																	
X13: Finalization of the scenarios for UC 2.15 implementation and scheduling of potential necessary reparatory steps in cooperation with Xanthi pilot partners.																																	
X18: Integration of systems and interfaces with the demo assets in X-FLEX ecosystem - 1st round																																	
X19: Data gathering, and data storage completed - 1st round																																	
X20: Data quality assurance - 1st round																																	
X21: SLAM meters installation																																	

X22: Installation of metering equipment on the substations										■	■	■	■																				
X23: Integration of systems and interfaces with the demo assets in X-FLEX ecosystem - 2nd round														■	■																		
X24: Data gathering, and data storage completed - 2nd round																■	■	■															
X25: Data quality assurance - 2nd round																			■														
X26: 1st round of testing of first versions of XFLEX tools in the pilot site.								■	■	■	■	■	■	■	■	■	■	■															
X27: Full integration with X-FLEX platform.										■	■	■	■	■	■	■	■	■	■	■	■												
X28: Testing of the ancillary service scenario between SLS - HEDNO																		■	■	■	■	■											
X29: 2nd round of testing of final versions of X-FLEX tools.																						■	■	■	■	■	■	■	■	■			
X30: Pilot site Xanthi report prepared.																										■	■	■	■	■	■		
X31: Contribution on Task 7.1 Pilot sites final report with details and corrections on Xanthi demo																																■	

3.4.3 Challenges

The challenges the partners of Xanthi pilot need to face are mostly technical, but there is also a social one, as indicated below:

- Ensure the observability of the distribution network of the demo and have adequate data to run the developed algorithms despite the low level of MV and LV distribution network tele-monitoring and tele-controlling capabilities and unavailability of smart-metering systems at residential LV customers.
- Usage of GRIDFLEX to successfully serve real problematic scenarios of the local department of network operation, like reconfiguration, despite the low level of tele-controllable assets.
- Interaction with SCADA system in a way that would ensure the undisturbed and safe operation of the network (i.e. actions on the network and data reception).
- Integration of grid topology in GRIDFLEX and execution of the algorithms.
- Detailed definition and implementation of the scenario including cooperation between Sunlight's microgrid and distribution network (HEDNO). ICCS, S5 and ETRA have been closely collaborating with SLS and HEDNO team in order to finalize the scenarios that will be implemented in the context of UC 2.15 and will allow for a demonstration of flexibility provision by SLS to assist the distribution network operator. The scenarios have emerged from real problematic operational situations the local network operation department faces. Upon the finalization of the selected scenario, the necessary preparatory actions shall be scheduled both for Sunlight and HEDNO.
- Citizen engagement.
- Evaluation of the capabilities of SERVIFLEX for flexibility extraction, profiling, forecasting, classification, clustering and management of the resources
    - Management of the islanded microgrid by SERVIFLEX for operation time maximization
    - Design of proper models for the definition and formalization of the flexibility characteristics of generation, storage and P2G.

3.4.4 Risk Log

Table 24: Risk Log for Xanthi

Description of risk	Likelihood	Impact	Proposed mitigation measure
Losing critical staff or partners at crucial point of the project.	LOW	MEDIUM	Regular monitoring / The consortium has enough diversity and expertise to replace them by equally qualified staff within the same organisation or within the consortium. If partner replacement is not technically feasible some UCs could be demonstrated via simulators.
Technical disagreement between the pilot site partners.	LOW	MEDIUM	There has been a communication among the pilot site partners, assisted by the tools developers wherever needed and telcos

			have been hold in order to establish common understanding.
Lack of installation and use of equipment at the Pilot Site.	HIGH	HIGH	Strong cooperation among demo partners and tool developers when needed, in order to be or get prepared in time for the requirements of the project. Provision of information regarding the available infrastructure by the pilot site partners early enough in the project in order to acknowledge them and be able to get prepared and handle any potential issue.
Problem with the installation of metering equipment at Substations.	MEDIUM	HIGH	Good communication among the departments of HEDNO and ICCS has been established. The impact of the problem will be lower than stated if related only to the HV/MV Magiko substation, and not to MV/LV substation.
Low end-users' participation at X-FLEX and usage of SLAM. / Reluctance on data consensus	HIGH	HIGH	Active participation of the demo partners at Xanthi and efforts for the communication with potential end-users in order to ensure at least a minimum number of SLAMs at the pilot. Communication of the project to the citizens and information regarding the usage of their data (type and way and goal of process). Special attention will be given to ensure confidentiality and incorporate appropriate technologies to ensure protection from data breaches. Consortium partners have the capacity and the experience to cope with the delivery of advanced security mechanisms (if needed). Usage of anonymized data if possible.
Lack of the necessary data (in terms of type and/or quantity).	LOW	MEDIUM	Active participation and communication among demo partners to define the required data as early as possible and start the data collection. There has been a lack of historical data for SLS, but efforts are made to set up the microgrid as soon as possible and start collecting data that could be used as

			historical. It is under consideration if the granularity of available network data could affect the project. Demo partners have provided the complete information regarding the available data to the tool developers in order to be able to jointly manage arising issues.
Unsuccessful selection / definition of the specific part of the network (MV, LV lines) used for the implementation of UCs and testing of tools.	LOW	MEDIUM	Active participation of the demo partners at Use Cases review and communication in order to decide on the criteria for the selected network sections included in the demo.
Technical constraints in the use of equipment.	MEDIUM	MEDIUM	These constraints were considered even from the Use Cases review phase. Alternative ways to deal with them are examined and implemented.
COVID-19 pandemic: Difficulties in working in the field and contact end-users	HIGH	HIGH	Many field activities have been stalled, due to low availability of workforce and the difficulties in interacting with the end-users due to the confinement measures and the second outbreak in Greece. Closely monitor the situation and reschedule some activities (if possible) in order to minimize the impact or the delay
Technological inefficiencies of components developed in the project during the deployment phase. / Abnormal behaviour of algorithms run by GRIDFLEX due to the length and the complexity of the network due to previous experience.	MEDIUM	MEDIUM	The rigorous verification will prevent fails that could impact on the project success. The technical manager will monitor progress and suggest corrective actions if needed, to ensure components' suitability. The demo partners as end-users will actively participate and notify the tool developers for any issue/incompatibility as soon as possible.
Interoperability problems between pilot sites' operation systems and the developed tools.	MEDIUM	HIGH	Communication among the demo partners and tool developers regarding the existing data, data format and standards and involved operational systems.

Fault at the equipment necessary for the implementation of some UCs.	MEDIUM	HIGH	Asset maintenance by the demo partners and timely response in case of fault.

4 CONCLUSION

All main activities in all four X-FLEX pilot sites and other relevant information about pilot sites, including list of activities, challenges and risks are summarised in this report.

The Pilot sites detailed project plan includes the status of technical deployment and integration process in each pilot site and provides an overview of each pilot site. The main risk that affected all pilot sites and was not foreseen beforehand is the COVID19-pandemic which limited all activities related to domestic users. Good risk management and good cooperation between all partners enabled pilot sites to minimize the impact of the pandemic on planned activities. In the first 18 months of the project all main activities in all pilot sites are going according to plan which confirms that the excellent planning in earlier stages of the project and good cooperation between all partners was a key factor for achieving set results.

The pilot sites are very divers and they face many different challenges which are described in the document, however one of the main challenges in the next period for all pilot sites will be integration of X-FLEX tools with the existing systems and demonstration of all selected Use Cases. Established communication channels between stakeholders in pilot sites and with all the partners of the project will be exploited to ensure that optimal solutions will be integrated and tested.

The document aims to present a cross-section of current status of pilot sites and to present planned activities in pilot sites to all partners and to enable optimization of coordination efforts in all related WPs.

5 REFERENCES

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6 ACRONYMS

Acronyms List	
AC	Alternating Current
AL	Albena pilot site
BESS	Battery Energy Storage System
CHP	Combined heat and power
DA	Day Ahead market
DC	Direct Current
DOA	Description of Actions
DSO	Distribution system operator
ELCE	Elektro Celje
EV	Electric vehicle
GA	General Assembly
GIS	Geographic information system
HEMS	Home Energy Management System
HV	High voltage
IBEX	Independent Bulgarian Energy Exchange
ID	Intraday market
IoT	Internet of things
KPI	Key Performance Indicator
LU	Luče pilot site
LV	Low voltage
MV	Middle voltage
NG	Natural Gas
PC	Project Coordinator
PEM	Polymer electrolyte membrane
PV	Photovoltaic
RA	Ravne pilot site
RES	Renewable energy source
S&R	Scalability and Replicability
SCADA	Supervisory control and data acquisition

SI	Slovenia
SLAM	Smart meters resulting from the H2020 NOBEL GRID project
SLS	Sunlight solutions
TSO	Transmission system operator
UC	Use case
UL	University of Ljubljana
WP	Work Package
XA	Xanthi pilot site