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integrated Smart GRID Cross-Functional Solutions for Optimized Synergetic Energy Distribution, Utilization & Storage Technologies

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D8.1 – inteGRIDy Pilot Evaluation Methodology and Framework

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Executive Summary

This document is part of the T8.1 Detailed Pilot Evaluation Framework (M18-M36) of WP8 Overall Evaluation & Impact Assessment. This document defines the evaluation methodology followed by inteGRIDy project and that will be finally applied in the different pilot sites of the project in the context of T8.2 Overall Evaluation of inteGRIDy Framework & Tools Performance (M37-M48).

The deliverable analyses general methodological background from the bibliography and describes the four evaluation phases that the proposed methodology in inteGRIDy project will follow. These four stages are: a) definition and analysis of the evaluation parameters, b) selection of the appropriate evaluation methodology, c) mechanisms for data collection as needed for the evaluation process and d) evaluation process based on the collected data.

The evaluation parameters for the pilot sites are the KPIs, the goals and purposes of the pilot sites that were first defined in WP1. The evaluation methodology followed for gathering the necessary data for the proper evaluation is presented in chapters 3 and 4 of this document. Evaluation of the purposes of the scenarios, any deviations, the steps implemented towards the overall achievement as well as the overall goals will be defined for validating the compliance with the scenarios described in WP1. Updates on the KPIs from WP1 for each pilot site are presented in this document and the corresponding stakeholders' interest. For the KPIs evaluation the baseline scenario is defined for each pilot site together with the data methodology. Moreover for the Smart Grid (SG) project implementation the data collection is also defined with the evaluation method that will be implemented in T8.2. Finally, the preliminary measure of success of each KPI, overall results and the stakeholder engagement are further defined.

Chapter 5 presents the timeline and the preparatory activities of the next period for T8.2. Moreover it analyses methods for data and KPIs visualisation for KPIs of the technical, economic, environmental and social domain. All this information and results of each pilot site which are presented, will set the basis for the next tasks of WP8.

Table of Contents

1. Introduction 11
   1.1 Scope and objectives of the deliverable 11
   1.2 Structure of the deliverable..11
   1.3 Relation to Other Tasks and Deliverables..11
2. General Evaluation Parameters 12
   2.1 Objectives of the evaluation..12
   2.2 Methodological Background 12
   2.3 Evaluation phases 13
3. inteGRIDy Evaluation Methodology.. 15
   3.1 Validation of the compliance with the defined WP1 objectives 15
   3.2 Developing KPIs evaluation framework 15
      3.2.1 Evaluation Scenarios 15
      3.2.2 Methods followed for gathering data / Data collection methodology 15
      3.2.3 Revision of collected data 16
      3.2.4 Stakeholders engagement 16
   3.3 Process followed for updating KPI evaluation Framework per inteGRIDy pilot site 16
4. Methodology of overall evaluation per inteGRIDy Pilot 18
   4.1 Isle of Wight 18
   4.2 Terni...20
   4.3 San Severino 22
   4.4 Barcelona 25
   4.5 St. Jean...27
   4.6 Nicosia-Cyprus..31
   4.7 Lisbon...32
   4.8 Xanthi...35
   4.9 Ploiesti 38
   4.10 Thessaloniki Pilot 40
   4.11 Results of KPIs Evaluation Framework...42
5. Time plan for evaluation analysis 44
   5.1 Preparatory activities...44
   5.2 Presentation of consolidated results 44
6. Conclusions... 46

7. References ... 47

8. Annex I. Results of KPIs Evaluation Framework per pilot ... 48

8.1 Isle of Wight Pilot ... 48

8.1.1 KPIs update ... 48

8.1.2 Baseline Scenario and System Information ... 50

8.1.3 Smart Grid (SG) Project Implementation ... 52

8.1.4 Stakeholders engagement ... 56

8.2 Terni ... 59

8.2.1 KPIs update ... 59

8.2.2 Baseline Scenario and System Information ... 62

8.2.3 Smart Grid (SG) Project Implementation ... 65

8.2.4 Stakeholders engagement ... 69

8.3 San Severino ... 73

8.3.1 KPIs update ... 73

8.3.2 Baseline Scenario and System Information ... 76

8.3.3 Smart Grid (SG) Project Implementation ... 80

8.3.4 Stakeholders engagement ... 87

8.4 Barcelona ... 90

8.4.1 KPIs update ... 90

8.4.2 Baseline Scenario and System Information ... 93

8.4.3 Smart Grid (SG) Project Implementation ... 95

8.4.4 Stakeholders engagement ... 99

8.5 St. Jean ... 102

8.5.1 KPIs update ... 102

8.5.2 Baseline Scenario and System Information ... 104

8.5.3 Smart Grid (SG) Project Implementation ... 107

8.5.4 Stakeholders engagement ... 115

8.6 Nicosia-Cyprus ... 118

8.6.1 KPIs update ... 118

8.6.2 Baseline Scenario and System Information ... 120

8.6.3 Smart Grid (SG) Project Implementation ... 122

8.6.4 Stakeholders engagement ... 125

8.7 Lisbon ... 128

8.7.1 KPIs update ... 128

8.7.2 Baseline Scenario and System Information ... 130

8.7.3 Smart Grid (SG) Project Implementation ... 133

8.7.4 Stakeholders engagement 136
8.8 Xanthi....140
8.8.1 KPIs update 140
8.8.2 Baseline Scenario and System Information 142
8.8.3 Smart Grid (SG) Project Implementation 144
8.8.4 Stakeholders engagement 147
8.9 Ploiesti....149
8.9.1 KPIs update 149
8.9.2 Baseline Scenario and System Information 150
8.9.3 Smart Grid (SG) Project Implementation 152
8.9.4 Stakeholders engagement 155
8.10 Thessaloniki....157
8.10.1 KPIs update....157
8.10.2 Baseline Scenario and System Information 159
8.10.3 Smart Grid (SG) Project Implementation 162
8.10.4 Stakeholders engagement....166

Table of Figures

Figure 1. Evaluation phases 13
Figure 2. An example of filling the online survey for Thessaloniki Pilot #1. 16
Figure 3. An example of filling the online survey for Thessaloniki Pilot #2. 17
Figure 4. Timeline of M37-M48 regarding evaluation....44

Table of Tables

Table 1. Use Case IOW_UC01....18
Table 2. Use Case IOW_UC02....19
Table 3. Use Case IOW_UC03....19
Table 4. Use Case IOW_UC04....20
Table 5. Use case ASM_UC01....20
Table 6. Use case ASM_UC02....21
Table 7. Use case ASM_UC03....21
Table 8. Use case ASM_UC04....22
Table 9. Use Case ASS_UC01....22
Table 10. Use Case ASS_UC02....23
Table 11. Use Case ASS_UC03....24
Table 12. Use Case BCN_UCA1 Optimization of swimming pool control 25

Table 13. Use Case BCN_UCA2_Usage of swimming pool as thermal storage system 25
Table 14. BCN_UCB1_Stacking battery functionalities..26
Table 15. BCN_UCB2_Smartening the distribution grid: service to the grid..........................26
Table 16. BCN_UCC1_Usage of battery system in case of grid outages.............................27
Table 17. Use Case INN_UC01...27
Table 18. Use Case INN_UC02...28
Table 19. Use Case INN_UC03...30
Table 20. Use Case UCY_UC01 31
Table 21. Use Case UCY_UC02 32
Table 22. Use Case LIS_UC01 33
Table 23. Use Case LIS_UC02 34
Table 24. Use Case LIS_UC03 34
Table 25. Use Case SUN_UC01 35
Table 26. Use Case SUN_UC02 36
Table 27. Use Case SUN_UC03 37
Table 28. Use Case DR_PL 01 39
Table 29. Use Case DR_PL 02 39
Table 30. Use Case DR_PL 03 40
Table 31. Use Case TH_UC01..41
Table 32. Use Case TH_UC02..41
Table 33. Use Case TH_UC03..41

List of Acronyms and Abbreviations

Term	Description
AI	Artificial Intelligence
API	Application Programming Interface
BEMS	Building Energy Management System
BESS	Battery Energy Storage System
BMS	Building Management System
CBA	Cost-benefit analysis
CEA	Cost-effectiveness analysis
CHP	Combined Heat and Power
CPP	Critical Peak Pricing
CTP	Critical Tier Pricing
DG	Distributed Generation
DNO	Distribution Network Operator
DoD	Depth of Discharge
DR	Demand Response
DSO	Distribution System Operator
DSR	Demand-Side Response
DSS	Decision Support System
ESS	Energy Storage System
EU	European Union
EV	Electric vehicle
GHG	Greenhouse Gas
HVAC	Heat Ventilation Air-Conditioning
IoT	Internet of Things
ISO	International Organization for Standardization
KPI	Key Performance Indicator
MQTT	Message Queueing Telemetry Transport
MV	Medium Voltage
LV	Low Voltage
PTR	Peak Time Rebate
PV	Photovoltaic
RES	Renewable Energy Source
REST	Representational State Transfer
RTU	Remote Terminal Unit
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCADA	Supervisory Control and Data Acquisition
SG	Smart Grid
SoC	State of Charge
SSEN	Scottish and Southern Electricity Networks
ToU	Time-of-Use
TRL	Technology Readiness Level

TSO	Transmission Systems Operator
UI	User Interface
UPS	Uninterruptible Power Supply
US	United States
VES	Virtual Energy Storage

1.Introduction

1.1 Scope and objectives of the deliverable

Scope of this deliverable is to identify the proper evaluation methodology for justifying the results of the inteGRIDy pilot. Evaluation is also targeted on the evaluation of the degree of compliance of the inteGRIDy overall results to the use case requirements identified in WP1, such as goals and objectives of each pilot site and refinement of demonstration scenarios and KPIs that were first gathered and categorized in D1.4. In this deliverable, appropriate methods for data collection are also defined for each KPI category which will be further followed in T8.2.

1.2 Structure of the deliverable

This deliverable is structured as follows:

- Chapter 1: Introduction
  An introduction including the scopes, the structure and relation to other tasks and deliverables.
- Chapter 2: General Evaluation Parameters
  Description of general evaluation parameters including objectives of the evaluation, methodological background and evaluation phases.
- Chapter 3: inteGRIDy Evaluation Methodology
  Description of the evaluation methodology followed in the inteGRIDy project including validation of the compliance with the defined WP1 objectives and developing KPIs evaluation framework.
- Chapter 4: Methodology of overall evaluation per inteGRIDy pilot
  In this chapter the results of the KPIs evaluation framework that was distributed to inteGRIDy partners are presented.
- Chapter 5: Time plan for evaluation analysis
- Chapter 6: Conclusions
- Chapter 7: References
- ANNEX I: Results of KPIs Evaluation Framework per pilot

1.3 Relation to Other Tasks and Deliverables

This deliverable has close ties with the analysis conducted within the activities of WP1, and in particular in T1.3 and T1.4. More specific the results of T1.3, presented in the respective Deliverable D1.3, that is the use case requirements, have identified the needs and goals set for each pilot site, whereas the outcomes of T1.4, as demonstrated in Deliverable D1.4, define the framework of evaluation of the pilots progress. Moreover, it poses a close relation with its follow-up task, that is Task 8.2 and its respective Deliverable D8.2, during which the evaluation process will take place, and the rest of the WP8 task, for which it lays down the framework.

Additionally, since it has a parallel course with WP5, during which the integration of the pilots takes place and the activities of WP6 and WP7, where the actual deployment of the pilots occurs, it bears a close tie with the tasks of those WPs.

2. General Evaluation Parameters

2.1 Objectives of the evaluation

The aim of the deliverable is to provide the methodology to evaluate the level of fulfillment of the project objectives by redefining and analysing KPIs, goals and objectives previously described in D1.3. Evaluation process is a valuable process conducted for a project in order to determine the relevance and level of achievement of project objectives.

1. Performance improvement
2. Assure quality of project outcomes
3. Knowledge-sharing
4. Collaborative working environment
5. Ease of use and overall satisfaction
6. Problem identification
7. Better use of resources

An evaluation examines in detail the project and it assists in conducting solid judgments in order to improve its effectiveness and reliability. Any evaluation process is mainly based on real measurements and records from the pilot test sites in the context of T8.2, thus a detailed view on the pilot installations and measurement data was delivered in previous documents. In order to ensure that benefits outweigh costs a Cost-benefit analysis (CBA) should be conducted and a Cost-effectiveness analysis (CEA) which will be further implemented in the context of Task 8.4.

2.2 Methodological Background

Evaluation in reality is inevitably an iterative process and it normally takes more than one pass through the steps to cover all of the essential tasks. Use Cases, goals and objectives of the pilot sites and the KPIs have been identified in D1.4. In order to determine the evaluation framework of the KPIs, a review of existing methodologies followed in projects with goals similar to inteGRIDy project was conducted.

In bibliography**,** in other Horizon 2020 projects in order to evaluate users' experience a User-Centred design (UCD) methodological approach as advocated by the ISO 9241-210 and methods based on Human-centric evaluation methodology according to ISO 9241-210 (ISO 2010), which is the new revision of ISO 13407, are adopted. These methods are combined together with the implementation of system evaluation tests for the overall evaluation of the system or ECOGRAI evaluation methodology which is mostly for designing and implementing performance measurement systems for industrial organisations [below]. Alternative method for gathering and evaluating the project KPIs is to divide them into domain categories separating the data collection methodology and evaluation methodology into several steps, measuring Baseline scenario, Business as Usual scenario and Smart Grid Scenario.

Glenaffric in [GLE07] has proposed the "**Six Steps to Effective Evaluation**" analyzing in detail each step recommended by the Joint Committee on Standards for Educational Evaluation. These six steps are defined as:

1. Identify stakeholders
2. Describe project and understand program
3. Design evaluation
4. Gather evidence
5. Analyze Results
6. Report Findings

Evaluation plan is defined by a number of factors to be evaluated, questions that the evaluation will answer, timing, methods that will be used and how success will be measured. This methodology also defines data collection methods (methodology, primary and secondary sources) and data processing procedures that prove its value to the stakeholders; finally results are collated, compared and analysed.

Generally in Europe two main assessment frameworks have been introduced, as described in the **assessment of Smart Grid Benefits and impact** comparing EU and US by JRC and DOE [47]. Measurement of the contribution of each project to the ideal Smart Grid is quantified in terms of benefits and KPIs on the one hand and in terms of functionalities and services on the other, as introduced by the EC Task Force for Smart Grids. Assessing the impact of project in term of functionalities is succeeded through assigning a weight to quantify relevance of benefits and corresponding functionalities. The European Electricity Grid Initiative divides the system into thematic areas defining KPIs and measures the contribution of projects to each area.

2.3 Evaluation phases

In order to assist the evaluation process and for the results to be effectively managed, the proposed methodology in inteGRIDy project will comprise of the following 4 phases as presented in Figure 1.

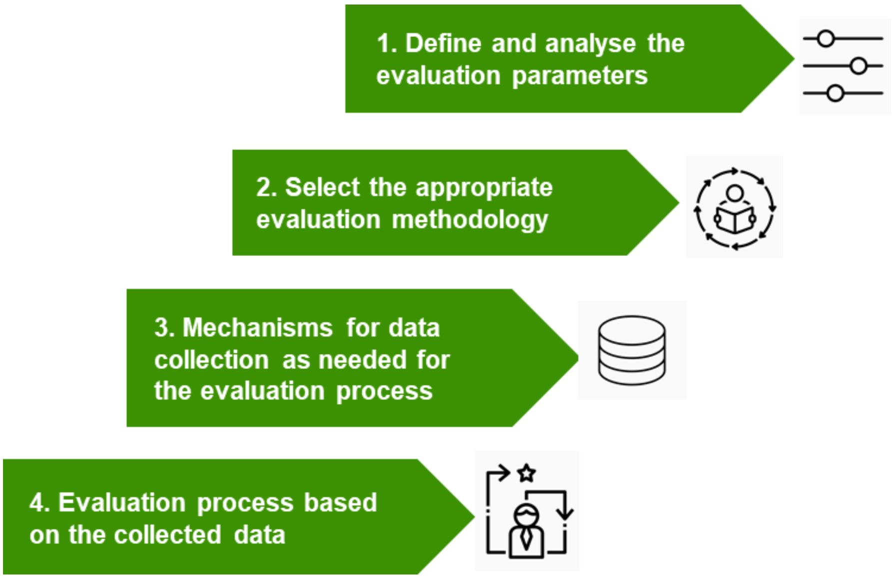

Figure 1. Evaluation phases

1. **Define and analyse the evaluation parameters**
    a. A preliminary work has already been delivered in D1.4 and D1.3, defining the preliminary measures (KPIs, Purposes of the pilot sites and post conditions). In this phase, an update and a refinement will be implemented for the use cases of the pilot sites as the project is in a more mature phase, taking into account the latest technical developments within the project.
    b. In order to efficiently evaluate the project the parameters that need to be analysed and measured are defined in D1.4 and D1.3 and **redefined / updated** in this document in chapter 4.
    c. This process was led by CERTH as Task leader, in collaboration with all pilot leaders, through an online survey method, which is presented in chapter 3.3.

2. **Select the appropriate evaluation methodology**
    d. Based on the analysis of the currently available methodological background in the bibliography, a combination of the available methodologies (as described in the previous chapter, e.g. questionnaires and algorithms) is adopted for the inteGRIDy project.
    e. This is presented in detail in chapters 3 and 4.

3. **Mechanisms for data collection as needed for the evaluation process**
    f. A critical stage for the evaluation process is the establishment of a process (automated or manual) for acquiring the necessary data. This mechanism is differentiated depending on the type of the data and can be grouped into 2 main categories: technical and business (stakeholder / users oriented).
    g. The mechanisms are presented in chapter 3.2.2 and the possible mechanisms that will eventually be adopted for each use case of the inteGRIDy pilots are presented in chapter 4.2.
    h. This was done in collaboration with WP6 and WP7 tasks, where an early pre-validation of results will be performed in the small-scale pilots (in WP6), followed with the Real-life demonstration in the large-scale pilots (in WP7).

4. **Evaluation process based on the collected data**
    i. Definition of the evaluation process and the analysis of the collected data
    j. Possible ways of visualizing the evaluation results
    k. A timeline is presented in chapter 5 and will set the basis of T8.2 Overall Evaluation of inteGRIDy Framework & Tools Performance (M37-M48).

3. inteGRIDy Evaluation Methodology

3.1 Validation of the compliance with the defined WP1 objectives

In WP1 use cases, scenarios, objectives, needs and goals of each pilot site were analysed. In the context of the definition and analysis of the evaluation parameters, this step highlights the key subjects that need to be redefined due to technological changes and processes occurred throughout the project lifetime. In WP1 use cases' requirements for pilot sites were defined and analysed based on the inteGRIDy overall results. Refinement of purposes and goals of the demonstration scenarios that were firstly defined in D1.3 [INT17], the degree of compliance of the inteGRIDy overall results to the use case requirements identified at WP1, as well as a validation of the level that goals and objectives of each pilot are reached are implemented.

Evaluation of the purposes of the scenarios, the steps implemented towards the overall achievement, as well as the overall goals will be defined for validating the compliance with the scenarios described in WP1.

3.2 Developing KPIs evaluation framework

As mentioned in D1.4, KPIs will continue to evolve and should be further redefined as they will constitute the basis for the evaluation framework of inteGRIDy project. KPIs, their explanation and formula were derived from D1.3 and pilot site representatives have to specify the time intervals that the measurements for each KPI will take place.

3.2.1 Evaluation Scenarios

In line with the high level business scenarios defined by the stakeholders of the inteGRIDy system at the initial project phase, two evaluation scenarios are characterized:

- **Baseline Assessment (BA)**
  Baseline assessment provides information on the situation of the pilot sites before the inteGRIDy project. It is expressed by an actual number, an existing measured value prior the actual beginning of the deployment of the inteGRIDy tools and components.
- **Smart Grid (SG) Project Implementation**

  It is the scenario after the actual implementation and integration of inteGRIDy tools in the pilot sites.

3.2.2 Methods followed for gathering data / Data collection methodology

Data collection is generally implemented though gathering information autonomously from metadata arising from the IoT devices, energy meters or gateways and from questionnaires from users and stakeholders.

In inteGRIDy project, data collection methodology needs to be defined for both evaluation scenarios (BA and SG). Methods for data collection are divided into technical and business. Technical methods are basically algorithms and measurable data gathered from smart meters or devices and databases, e.g. through RESTful services visualised in proper dashboards or User Interfaces. Business KPIs refer mostly to user satisfaction and are measured through corresponding questionnaires. The evaluation phase involves the active participation of the end users in the evaluation process via user specific demonstration activities (seminars and workshops), where the users have the chance to get insights into the project results and further evaluate in practice (via user specific questionnaires). Ideally, some of the stakeholders will be consulted to note any improvement/failing using relevant questions from workshops and on-site meetings.

Questions that need to be answered are:

- *Who will collect the data?*
- *What data need to be collected?*

- *Where will the data be found?*
- *How will the data be obtained?*

3.2.3 Revision of collected data

An estimation of the corresponding goal should be defined depending on the KPIs, for example an estimation of the overall reduction which will be introduced as a measure of success. This is important for T8.2, where the KPIs will actually be implemented and measured. The estimation of success defined in this report will be compared and evaluated.

3.2.4 Stakeholders engagement

Stakeholders have been defined in previous deliverables and a more detailed plan regarding their interests in the project and its outcome will be further presented, defining roles and responsibilities in the context of the KPIs.

3.3 Process followed for updating KPI evaluation Framework per inteGRIDy pilot site

In order to update the KPI Evaluation Framework per inteGRIDy pilot site, CERTH (as D8.1 leader) has followed an interactive process in coordinating with related pilot leaders.

At first, an online google sheet has been shared with all partners involved, regarding the KPIs and related information based on D1.4. In the following figures an example for the Thessaloniki Pilot is presented. In the red rectangles above the Pilot, Use cases, as presented in D1.3, and the Stakeholders of the pilot ecosystem, as presented in D1.4, are depicted. The red rectangles below in the figure, surrounding the yellow highlighted cell, indicate an update regarding the inclusion of those stakeholders to the related KPIs, that is Energy Consumption and Peak to Average Ratio, after consideration they involve also End Users and Policy Bodies and Governance.

			Use Cases			Stakeholders Group			
		Key Performance Indicators	TH_UC01 - Demand Response in residential buildings with smart meters	TH_UC02 - Demand Response in residential buildings with BESS	TH_UC03 - Demand Response in Commercial Building with BESS	DSO	End Users	Market Operator (inc. Retailer / ESCO)	Policies Bodies and Governance
ID	Local/ Global	Demand Response							
T.01	G	Energy Consumption (Monthly, Daily...)	YES	YES	YES	YES	YES	YES	YES
T.02	G	Peak to Average Ratio (PAR)	YES	YES	YES	YES	YES (added)	YES	YES (added)

Figure 2. An example of filling the online survey for Thessaloniki Pilot #1.

Moving on the online google sheet, as depicted in the following figure, the related information regarding the evaluation scenarios, the precision of data and the Stakeholders engagement are presented, as stated in 3.2.1, 3.2.2 and 3.2.4 of the current manuscript.

As an example, for the Energy consumption, the data collection methodology for the baseline assessment is based on historical data retrieved by W+V partner from the consumers participating in the various Use Cases of the pilot. Regarding the Smart Grid Project implementation Data Methodology, again W+V partner will collect the data from the consumers participating in the various Use Cases of the pilot, via their energy meters infrastructure already in place, using RESTful services and storing them in the W+V database. For the evaluation method of that particular KPI, an algorithm calculating each consumer's energy consumption is utilized, based on measurements retrieved every 15 minutes. The estimation threshold/measure of success, when the DR or BESS optimized schemes/schedules are put at full length, is a 2% reduction of energy consumption, as far as the residential buildings of the pilot are concerned, either via DR or BESS implementation, and a 5% reduction for the commercial ones. Finally, in the last column, the roles and responsibilities of the identified stakeholders are stated. In the said case, the end users are engaged to reduce and mainly shift their energy consumption via DR programs proposed, or dictated by W+V partner, which plays the role of the aggregator in the case of the Thessaloniki pilot, after having calculated the end users' load flexibility.

		Evaluation Scenarios				Revision of data	Stakeholders Engangement
		Baseline Assessment	Smart Grid (SG) Project Implementation				
	Key Performance Indicators	Data Collection Methodology	**Data Collection Methodology** *- Who will collect the data?* *-What data needs to be collected?* *-Where will the data be found?* *-How will the data be obtained?*	Evaluation Method (Questionnaire, Algorithms) + per Stakeholder	Frequency of Data Collection	stimation of Threshold / Measure of success + per Stakeholder (if applicable)	**Roles and Responsibilities**
ID			Demand Response				
T.01	Energy Consumption (Monthly, Daily...)	Historical Data from W+V (kWh prior to inteGRIDy project)	-W+V will collect the data -Metrics from W+V energy meters -W+V database -RESTful services	Algorithm that counts the energy consumption of the buildings depending on the values of the smart meters	Every 15 minutes	**stimation of the overall eduction** **esidential:** 2% reduction **ommercial:** 5% reduction	-**End users** are enganged through DR (both explicit and implicit) program -**MO** (W+V) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.02	Peak to Average Ratio (PAR)	Historical Data from W+V (kWh prior to inteGRIDy project)	-W+V will collect the data -Metrics from W+V energy meters -W+V database -RESTful services	Algorithm that counts the energy consumption of the buildings depending on the values of the smart meters, finding the peak energy consumption and the average	Every 15 minutes		-**End users** are enganged through DR (both explicit and implicit) program -**MO** (W+V) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility

Figure 3. An example of filling the online survey for Thessaloniki Pilot #2.

The updated results regarding the KPIs have been filled in collaboration with all the involved Pilot partners, pilot leaders and involved technology providers. The related data are included in this deliverable in chapter 8.

4. Methodology of overall evaluation per inteGRIDy Pilot

In the upcoming deliverable D8.2 (within activities of task T8.2), all identified deviations in respect to the purposes, goals and postconditions that were initially described in WP1 for each one of the higher-level use cases, will be further analysed. Moreover, the steps towards achieving these goals will be further described for evaluation purposes. Therefore, an initial indication of such deviations are described in this report, to be further analysed and justified in D8.2.

In the following paragraphs, we used as a basis the initial finding (as presented in deliverable D1.3) in respect to the purposes, goals and postconditions of each pilot for each one of the higher level use cases identified, further including two more parameters that should be clearly defined in D8.2, i.e.:

- Deviations from the purposes/goals and postconditions of WP1
- Steps towards achieving goals

In the following paragraphs preliminary results of these two parameters of the inteGRIDy pilot sites are presented, based on the analysis performed by each pilot leader.

Finally, the initial list of KPIs and the mapping performed per each pilot site (as part of the work of T1.3 and respective deliverable D1.4) have been re-evaluated and updated by each pilot leader. The detailed updated tables are included in chapter 8 of this document, where they are highlighted in yellow, while some key findings are further presented in the paragraphs below.

4.1 Isle of Wight

With respect to the goals and purposes of the Pilot Use cases, by the time of the submission of this deliverable, presented in the following Tables, it seems that some major deviations have occurred in the 3rd and 4th Use Cases with respect to the scale of the implementation. In case more deviations take place they will be addressed within the activities of Task 8.2 and reported appropriately in the respective Deliverable D8.2.

This has also caused a modification in the KPIs for the pilot, as presented in the Annex in 8.1.

Table 1. Use Case IOW_UC01

Purposes and Goals	Innovative suite of applications helps monitor building system performance, energy demand and energy supply more effectively and efficiently. It provides transparency on revenue and cost reduction strategies for GHG, kWh and £'s.
Postconditions	Ongoing maintenance and improvement is based on lower cost to serve, lower overall consumption, load curve flattening and flexibility for revenue generation contract agreed with various actors.
Deviations from the purposes/goals and postconditions of WP1	N/A
Steps towards achieving goals	The tool has been deployed and is ready for demonstration to the wider consortium.

Table 2. Use Case IOW_UC02

Purposes and Goals	Minimise energy import and export to realise self-sufficient supply of electricity on Isle of Wight.
Postconditions	Self-sufficient in electricity supply.
Deviations from the purposes/goals and postconditions of WP1	N/A
Steps towards achieving goals	UNEW has developed the model of the electrical network and tested that considering the load profile of the network and different DGs in the network. The model will be able to be updated with future demand and generation scenarios being provided by the DNO. Also, it would be able to consider inputs from partners such as the EVs and electric heating demand and the generation in one of the following cases: 1) If the other partners involved in IoW pilot or DNO can provide the impact of these penetration in form of increase in generation or increase/decrease in demand at 11 kV level. 2) If they would not be able to give us the impact of their tools at 11kV we will just scale up the impact of declared 400V changes by an arbitrary number and to the closest 11kV bus. Also, using a heat map analysis, different areas of the network from voltage and line flow constraints are analysed to identify areas likely to be violated. In addition, potential storage connection capacity are also analysed.

Table 3. Use Case IOW_UC03

Purposes and Goals	Integration of multiple heat pumps, thermal stores, optional PV generation and possible electrical storage into an energy system with a single ‘entry point’ to the distribution network.
Postconditions	Virtual power plant topology capable of peak shaving and network balancing. Reduced utility bills for residents.
Deviations from the purposes/goals and postconditions of WP1	- Reduction in the number of heat storage systems being deployed, from 10 systems serving 30 properties to only one property. System monitoring has been discontinued due to the systems failing to deliver the required performance. A revised system has been developed and will be installed in one property in the final reporting period with an initial focus on data monitoring. Moreover, there are some technical issues with the targeted innovative technology and the practical usage of storage in the Isle of Wight network systems is still not guaranteed;
Steps towards achieving goals	System monitoring from 50 houses has been discontinued due to the systems failing to deliver the required performance. A revised system has been developed and will be installed in one property in October 2019 with an initial focus on data monitoring. A prototype Arduino

	hardware-based data monitoring and control system will also be deployed at the property, linked to cloud-based storage system. The control strategy is being reworked with the new heat pump and thermal store configuration. The new control protocol is complete and the software is being coded.

Table 4. Use Case IOW_UC04

Purposes and Goals	Evaluate the energy management methods to the EV charging solution which stores energy in batteries to provide rapid charging on demand without increasing network capacity of the end-user.
Postconditions	Displaying the system capability to provide on demand EV rapid charging by utilising stored energy on battery to reduce the amount of energy pulled from the grid during the event. Offer grid balancing solutions through the ability to provide flexibility in DSR, UPS and peak shaving functionality.
Deviations from the purposes/goals and postconditions of WP1	- Reduction of the number of EV charging systems, from 15 systems to just one charging point to be installed in the future and which is also not fully confirmed, as it is subject to final budget approval. This means that it will be impossible to analyse the impact of the transport system on the operation of the electrical grid at the large scale.
Steps towards achieving goals	Pilot partner EMSc is on course to provide the solution as elaborated. The delivered system will be a combination Chademo/CCS DC 50kW Rapid Charger with LiFePO4 batteries connected to a 6kWp PV delivering energy to EV and providing National Grid Frequency/Balancing services. Pilot partner EMSc is on course to deliver the flexibility service capability. Subject to budget approval, the system will be completed by end of March 2020.

4.2 Terni

The goals and purposes of this pilot, presented in the Tables that follow, do not highlight any deviation at all, and from the step forward sections it can be concluded that is well on track.

This is reflected on the results of the updated KPIs presented in the Annex in 8.2, that no major updates have taken place apart from adding some new ones that have been included since the first evaluation of the pilot during the activities of T1.4.

Table 5. Use case ASM_UC01

Purposes and Goals	Exploiting and optimising the flexibility of microgrid resources to improve the MV grid operation by minimising energy losses
Postconditions	The MV grid operation is improved by reducing energy losses.
Deviations from the purposes/goals and postconditions of WP1	N/A
Steps towards achieving goals	• Equipment is already installed on-site and all the relevant inteGRIDy tools have been developed and installed on the Pilot server.

	• Communication between equipment and tools is being finalised. • Preliminary simulations testing the capability of the microgrid to fulfil the goals have been conducted. • Evaluation of possible DSO's remuneration pattern and its leverage on microgrid management costs.

Table 6. Use case ASM_UC02

Purposes and Goals	Exploiting and optimising the flexibility of microgrid resources to improve the distribution grid reliability.
Postconditions	The grid reliability is improved and both SAIDI and SAIFI indices are reduced.
Deviations from the purposes/goals and postconditions of WP1	N/A
Steps towards achieving goals	• Equipment is already installed on-site and all the relevant inteGRIDy tools have been developed and installed on the Pilot server. • Communication between equipment and tools is being finalised. • Preliminary simulations testing the capability of the microgrid to fulfil the goals have been conducted. • Consideration about the congestion management services to be provided in order to improve power quality and grid operations in progress.

Table 7. Use case ASM_UC03

Purposes and Goals	Increasing of MG self-consumption. Improving reliability of MV network
Postconditions	The grid reliability is improved and both SAIDI and SAIFI indices are reduced.
Deviations from the purposes/goals and postconditions of WP1	N/A
Steps towards achieving goals	• Equipment is already installed on-site and all the relevant inteGRIDy tools have been developed and installed on the Pilot server. • Communication between equipment and tools is being finalised. • Preliminary simulations testing the capability of the microgrid to fulfil the goals have been conducted. • Battery model implemented in the relevant inteGRIDy tools will be refined by data gathered from the pilot during the pilot lifespan. • Energy storage performance during off-grid operation will be tested and evaluated.

Table 8. Use case ASM_UC04

Purposes and Goals	Preliminary impact estimation of the EV charging positions on the network
Postconditions	Demonstrating system's availability to supply energy to EV recharging stations, by managing flexibility.
Deviations from the purposes/goals and postconditions of WP1	Even though the EV charging station will not be installed, offline simulations will be performed for assessing the collaboration mechanism among DSO, microgrid owner and EV fleet manager.
Steps towards achieving goals	• Relevant network data (MV feeder parameters, historical active and reactive power profiles of other loads supplied by the feeder) have been collected. • Charging profiles of existing EV charging stations have been collected. • Real microgrid load profiles will be collected during the pilot demonstration. • Two scenarios will be considered: one without the implementation of the inteGRIDy solution on the Terni pilot; the other considering the advantages of the inteGRIDy solution on this pilot.

4.3 San Severino

Regarding the goals and purposes of this pilot, presented in the following tables, no major changes are detected, apart from the installation site of the Batteries, where the first phase has indicated that it would be better to install the BESS systems in residential premises only.

Regarding the updated KPIs, included in the Annex in 8.3, several KPIs originally included for this pilot they have been discarded as no longer applicable, such as Demand Flexibility Ratio, and have been replaced by other ones, such as the Battery Demand Flexibility baseline and Battery Demand Flexibility.

Table 9. Use Case ASS_UC01

Purposes and Goals	Evaluate the effectiveness of a resources aggregation in order to provide grid services.
Postconditions	Energy Storage apparatuses will be controlled according to the Aggregator needs. Customers, those provided with the energy storage equipment, will be informed about their energy behaviour in order to improve their awareness (also with respect to the grid needs). Measure of the energy flows and evaluation of the effective contribution to the grid services will be carried out.
Deviations from the purposes/goals and postconditions of WP1	N/A

Steps towards achieving goals	The data regarding the user behaviour (load and generation trends, battery usage, etc.) will be made available to users (the ones provided with the Energy Storage equipment) through a webpage (already developed by UNE), aiming at improving their awareness with respect to their behaviour. Data collected will be also stored and properly organized in a database already installed in the DSO's control centre through specific interfaces already developed by E@W. ESSs will then be controlled in order to provide front of the meter or behind the meter services (as detailed in ASS_UC03). In case of a congestion, or a critical condition, in the local distribution grid, the DSO will be in charge to ask for a service (increase or decrease the aggregated load) proposing also a price signal. The aggregator will be in charge to check the feasibility of the control action required and to evaluate its economic viability.

Table 10. Use Case ASS_UC02

Purposes and Goals	Exploit the real time monitoring of the grid and weather/loads forecast in order to identify the optimal grid topology.
Postconditions	Grid efficiency and reliability result optimised.
Deviations from the purposes/goals and postconditions of WP1	*N/A*
Steps towards achieving goals	The overall MV grid of San Severino Marche is modelled in a Matlab environment. Measurements collected in real-time on the network and on MV users and MV/LV substations equipped with power meters are stored in an Oracle database and used to perform a state estimation of grid's working conditions in real-time and in advance. Electrical quantities (eg. voltages in grid's busses and currents on branches) are evaluated by power flow calculations. A random forest algorithm is used to forecast RES production up to three days ahead, historical data are then used by an autoregressive and persistence model to compute mid/long term predictions (up to 1 year) of generation and load. The output of the forecasting process is given in input to the state estimation module, which evaluates the voltage profile, current/power flows and losses on the MV network. The computation is carried out on the selected time horizon (eg. 1 year) with hourly resolution. The optimal configuration is identified among all the possible ones through a heuristic optimization algorithm (during the experiment, also other strategies will be tested, eg. exhaustive research, for comparison). The tools developed will perform a real-time monitoring of the grid and will estimate the network behaviour in advance in order to identify possible problems on the network (over/under voltages or congestions). If an issue is identified, a warning message is sent to the DSO.

	Remote terminal units, power meters and three-phase switching devices are deployed on the MV distribution network. They will be used to enable the remote reconfiguration of the MV grid (acting on the remote-controlled switching devices) and to collect measurements in the MV/LV substation to support the state estimation and check the accuracy of the provided results.

Table 11. Use Case ASS_UC03

Purposes and Goals	Coordinate several Energy Storage apparatuses in order to provide front-of-the meter services. Locally manage an energy storage apparatus in order to provide behind-the-meter services.
Postconditions	Energy Storage Systems will be controlled in absorbing/injecting power
Deviations from the purposes/goals and postconditions of WP1	Installation site of ZHERO ESS **Original plan:** deploy ZHERO ESSs both in the DSO MV/LV substations and behind-the-meter of LV users. **Explanation of the issue:** The evaluations performed in the first phase of the InteGRIDy project highlighted as optimal choice the deployment of all the available ESSs at residential users' premises. In fact, this way the multi-service approach (behind and front-of-the-meter services) can be extended at the whole fleet of storage apparatuses. No negative impact is foreseen on the functionalities to be tested, since in the proposed scenario all the ESSs will still be able to supply ancillary services to the network. **Proposed change:** all ESSs will be deployed at residential users' premises.
Steps towards achieving goals	The Sodium Nickel Chloride ESSs are deployed at residential users' premises. These systems will be used to supply both behind-the-meter and front-of-the-services, supporting the end-users and power system operation. In the first case, the goal is to improve end-users' incomes from the local energy production. In the latter case the goal is to support the grid and, at the same time, to improve ESS economics. In particular, ESSs will be controlled in order to provide secondary and tertiary frequency reserve to be sold on the ancillary services market, supporting the power system balancing. The developed algorithm defines the quantities of service to be offered on the market according to ESS State of Charge. A cloud web-service interface is in charge to allow the exchange of data with Zhero ESSs, scheduling and managing the communication between Zhero ESSs and the control center. In particular, Power setpoints are sent from the control center to dispersed ESSs (e.g. to manage the provision of ancillary services) and measurements are collected on ESSs (e.g. state of charge, exchanged power).

4.4 Barcelona

In spite of the major changes in this pilot, i.e. the leaving of the pilot leader partner, and the followed change in the pilot site, the goals and purposes of this pilot remain as they were. This, however, has set the pilot in a bit of setback. The regulator barriers also pose an obstacle towards the full-length desired implementation. The stated steps forward, though, are promising that the pilot will be back on track soon and the various obstacle can be overcome.

Additionally, no major changes have been detected regarding the original declared KPIs. The respective results of the updated KPIs are included in the Annex in 8.4.

Table 12. Use Case BCN_UCA1 Optimization of swimming pool control

Purposes and Goals	Optimisation of the operating energy costs in the operation of the swimming pool control.
Postconditions	Heating and cooling set-points vary between some margins to optimize operating energy costs taking into account weather forecast and usage schedule. These margins must fit inside the swimming pool user's comfort criteria.
Deviations	No deviations are considered in this use case since there are no significant differences in infrastructure between the former and the new pilot sites.
Steps towards achieving goals	The pilot development activities for this use case have been on hold since June 2019. Activities will resume once the EC approves the amendment proposal. The TRNSYS Swimming Pool Model has been developed and extensively tested, and it is containerized in Docker. The model is currently deployed at AIGUASOL's server and it is ready to be deployed at the pilot site server. The model has been successfully coupled with the optimizer Intelligent Building Control & Flexibility Prediction-Forecasting from CERTH.

Table 13. Use Case BCN_UCA2_Usage of swimming pool as thermal storage system

Purposes and Goals	Usage of the swimming pool to provide virtual energy storage through water heating regulation
Postconditions	Use of the flexibility in energy requirements and thermal inertia that the swimming pool can provide through variation of heating and cooling set-points, and considering weather forecast and usage schedule. The flexibility takes into account the constraint provided by the swimming pool users' comfort margins.
Deviations	There is currently no compensation mechanism in Spain to reduce/increase their energy consumption for consumers connected to the distributed grid. The use case will be physically implemented using only the electricity market prices as driving signal. Furthermore, a virtual full implementation of the use case will be implemented to assess the implementation potential of this use case in more favourable scenarios.
Steps towards achieving goals	The pilot development activities for this use case have been on hold since June 2019. Activities will resume once the EC approves the amendment proposal. The TRNSYS Swimming Pool Model has been developed and extensively tested, and it is containerized in Docker. The model is currently deployed at AIGUASOL's server and it is

	ready to be deployed at the pilot site server. The model has been successfully coupled with the optimizer Intelligent Building Control & Flexibility Prediction-Forecasting from CERTH. Grid signals and compensation schemes will be provided by a Market Emulator. The Market Emulator has been conceptualized but development work has not started yet.

Table 14. BCN_UCB1_Stacking battery functionalities

Purposes and Goals	Optimisation of the use of the PV captured energy.
Postconditions	Optimization of the operation of the PV and battery system considering electricity market prices, arbitrage, peak shaving actions, maximization of self-consumption and provision of grid services.
Deviations	The pilot development activities for this use case have been on hold since June 2019. There is currently no compensation mechanism in Spain to reward consumers connected to the distribution grid to reduce their peak load or provide grid services, not to mention that arbitrage is not currently allowed. This use case will be physically implemented driven by the electricity price fluctuation. A virtual implementation will also be performed evaluating multiple scenarios including arbitrage, peak shaving, maximize self-consumption of solar PV generation and provision of grid services.
Steps towards achieving goals	The battery storage system of 52 kWh has already been procured to Sunlight facilities and it is awaiting to be deployed at the new pilot site. Preparation of deployment of NEMO and assessment of requirements to control the battery + solar PV system. The Market Emulator has been conceptualized but development work has not started yet.

Table 15. BCN_UCB2_Smartening the distribution grid: service to the grid

Purposes and Goals	Provision of services to the distribution grid
Postconditions	Provision of services to the grid using the pilot site assets battery + solar PV system, building load and swimming pool.
Deviations	The pilot development activities for this use case have been on hold since June 2019. There is currently no compensation mechanism in Spain to reward the provision of grid services to those consumers connected to the distribution grid, not to mention that aggregation of demand and generation from different users is not allowed in the current legislation. This use case will assess virtually the potential to provide services to the grid using the pilot site assets battery + solar PV system, building load and swimming pool. The altered operation of assets to provide grid services will be determined based on synthetically generated grid signals, forecast of energy demand and solar generation, and state of charge of batteries among others.
Steps towards achieving goals	Full integration of DEMS in the framework of the pilot project to enable the provision of asset management and demand aggregation services. The Market Emulator has been conceptualized but development work has not started yet.

Table 16. BCN_UCC1_Usage of battery system in case of grid outages

Purposes and Goals	Controlled islanding during grid outages. Energy security of supply.
Postconditions	This use case assesses the use of the battery system during grid outages to feed a critical load at the pilot site.
Deviations	The pilot development activities for this use case have been on hold since June 2019. No changes are forecasted in this use case, as there are no changes to the battery system characteristics. The distribution grid and energy supply at the pilot site presents high reliability, and as such, no grid outages are expected during the testing period. The use case will be tested using synthetic grid outage signals generated by the Market Emulator.
Steps towards achieving goals	The battery storage system of 52 kWh has already been procured to Sunlight facilities and it is awaiting to be deployed at the new pilot site. Preparation of deployment of NEMO and assessment of requirements to control the battery + solar PV system. The Market Emulator has been conceptualized but development work has not started yet.

4.5 St. Jean

Although major changes have taken place in this pilot since the beginning of the project, resulting in its virtual reduction in size, the goals and purposes have not been affected much and the steps forward are showing a progress well under way.

This is also reflected in the not that much change in the KPIs, presented in the Annex in 8.5.

Table 17. Use Case INN_UC01

Purposes and Goals	The main purpose of this use case is to infer accurate prosumers' energy behaviour and comfort profiles towards the extraction of context-aware demand flexibility profiles to facilitate end-users participation in DSO triggered DR campaigns. The main goal of the specific use case is to create a tool for the definition of explicit Demand Response (DR) schemas, addressing both residential and commercial applications. This tool takes into consideration the occupants' comfort boundaries in the decision-making process and establishes a demand side management framework to fully preserve the personalised needs and preferences of the users. Towards the establishment of the described framework, the behaviour and comfort of the prosumers will be modelled in order to extract context-aware demand flexibility profiles to increase end users' satisfaction and consequently their participation in the DR campaigns triggered by the DSO.
Postconditions	Explicit demand flexibility models that will be configured to address dynamic occupancy contexts and evolving ambient conditions in the pilot sites in relation to the end-user comfort boundaries.
Deviations from the purposes/goals and	Within the framework designed to fulfill the goals of INN_UC01, the applied methods are social/gender agnostic, extracting end-user comfort profiles in a continuous and dynamic manner based on the analysis of building operational and ambient data. Moreover, the

postconditions of WP1	applied comfort profiling engine assumes no inherent theoretical assumptions of correlation between the comfort boundaries of end-users and their gender and/or age. Based on that, the initially defined group of around 80 end-users (corresponding to 10 residential sites and one commercial office building) was deemed sufficient for the validation of the solution and no deviations from the goals and postconditions of WP1 were foreseen. However, as this has been conceived as an important deviation in the review report, significant extensions have been planned for the pilot sites leading to an overall increase of the pilot site population to at least 200 end-users. These extensions refer to 20 additional residential sites and one additional commercial office building. In this way, the diversity of the evaluation group is foreseen to be increased and reinforce the produced results, ensuring that the goals set for INN_UC01 are reached.
Steps towards achieving goals	To address the goals set by the Use Case INN_UC01, the following steps have been followed at both residential and commercial sites: • A number of sensors, smart metering and control devices have been installed to facilitate the real-time monitoring of energy consumption and operational status of the lighting and HVAC devices installed at the pilot sites, as well as the environmental conditions at the user premises. • A field middleware has been deployed for the management, pre-processing and storage of the data collected locally by the installed sensors and meters. • A dispatch control mechanism has been developed and deployed at the gateways located at the premises of each pilot end-user, to allow the implementation of the remotely applied Demand Response actions to the locally installed actuators. • The Demand Side Energy Profiling (DSEP) tool is developed and deployed to TREK's cloud server for the definition of context-aware visual and thermal comfort profiles, using raw data collected at the end users' premises. Based on these profiles, the tool further calculates the context-aware demand flexibility of the end users upon request. • • The Visual Analytics Engine (VAE) is developed and deployed to TREK's cloud server. Upon receiving the demand flexibility profiles developed by the DSEP tool, it calculates the optimal Demand Response strategies for the selected assets (residential or commercial) in the DSO's portfolio.

Table 18. Use Case INN_UC02

Purposes and Goals	To provide a tool that enables a better management of portfolio performance and facilitates the implementation of DR strategies. The goal of this use case is the creation of a tool that allows the DSOs to monitor the performance of the residential and commercial assets within their portfolio. Moreover, this tool facilitates the decision making regarding the implementation of the available context-aware, human centric DR strategies, by providing independent forecasts for the requested DR in the form of what-if scenarios. The VAE tool

	allows a detailed analysis of the prosumer's demand flexibility and facilitates the management and implementation of the optimal DR strategies.
Postconditions	Analytics engine to facilitate decision making under different market and building operational conditions.
Deviations from the purposes/goals and postconditions of WP1	As mentioned in the previous use case, the initial number of pilot sites selected for the validation of the sensor fusion techniques utilized in the demonstrated tools was deemed to be in line with the goals and postconditions of WP1. The context-aware, human-centric Demand Flexibility profiling and forecasting functionality described in the use case goals was initially planned to be tested and evaluated on 10 fully equipped residential prosumers and one fully equipped commercial office building. Moreover, for the evaluation of the decision support VAE functionalities, including clustering techniques and portfolio analysis, additional metering/billing data from a number of the available SOREA customers was planned to be included in the tool. As in the case of INN_UC01 in order to reinforce the evaluation of the specific use case, the human-centric DR strategies are expected to be tested on 30 residential prosumers and two commercial office buildings. All new pilot sites will be also fully equipped. On top of that, and in line with the initial planning, the inclusion of metering/billing data for a significant proportion of the overall population of St. Jean consumers is foreseen within the validation of the visual analytics framework. Therefore, no deviation from the original goals defined in WP1 is expected.
Steps towards achieving goals	The use case INN_UC02 focuses on the development of the Visual Analytics Engine (VAE), designed to facilitate the portfolio management, offering a user-friendly visualisation of asset performance analytics. Moreover, the VAE further supports the decision making of the DSO by providing different options of DR strategies and their forecasted performance (what-if scenarios) based on the end-user comfort profiles generated by the DSEP tool according to real-time raw data collected at the end-user premises. Last but not least, the DSO has the opportunity to directly implement the selected DR campaigns to the prosumer premises remotely, through the VAE interface. As in the INN_UC01, the described functionalities and analytics are also based on the collection of real-time data at the end-user premises and, therefore, the initial steps followed towards the goal achievement are very similar: • A number of sensors and smart metering devices have been installed to facilitate the real-time monitoring of energy consumption, environmental conditions and operational status of the devices installed in the pilot site. • A field middleware has been deployed for the management, pre-processing and storage of the data collected locally by the installed sensors and meters. • A bilateral communication between the hardware deployed locally at the user premises and the tool deployed to TREK's

	cloud has been established to allow the Demand Response signals of the DSO to reach the locally deployed gateways at the consumers' premises • A dispatch control mechanism has been developed and deployed at the gateways located at the premises of each pilot end-user, to allow the implementation of the remotely applied Demand Response actions to the locally installed actuators. • The DSEP (Demand Side Energy Profiling) tool has been developed and deployed to TREK's cloud server for the generation of context-aware visual and thermal comfort profiles using raw data collected at the end-users premises. Based on these profiles, the tool calculates the context-aware demand flexibility of the end-users in order to enable the definition of explicit Demand Response schemes for both residential and commercial users. • The VAE tool has been developed and deployed to TREK's cloud • The VAE tool has been integrated with the DSEP tool in order to receive the context-aware flexibility profiles generated by the DSEP tool to calculate the optimal DR strategies upon request. • The VAE has been further developed to support the decision making of the DSO by providing performance analytics for the assets in the portfolio and impact forecasts (what-if scenarios) for the proposed DR strategies.

Table 19. Use Case INN_UC03

Purposes and Goals	By combining the context-aware thermal comfort profiles with raw data collected at the end-user premises, the thermal properties and the heating dynamics of the building shall be inferred. In this way the demand flexibility potential shall be calculated. By also incorporating the concept of Virtual Energy Storage (VES), an innovative power-to-heat solution shall be demonstrated on the portfolio assets through the optimized HVAC and water heaters control. INN_UC03 will examine the potential of the controllability of thermal inertial devices under demand side management strategies (demand shifting potential), in order to evaluate the impact of energy storage as an inherent component of future grids.
Postconditions	Demand flexibility profiling models that will facilitate the implementation of demand shifting strategies in an automated way by exploiting thermal inertia of specific devices in premises.
Deviations from the purposes/goals and postconditions of WP1	As far as the VES potential investigated within the use case INN_UC03 is concerned, a very similar prosumer behavior modelling approach to INN_UC01 was adopted. In this context, to evaluate the VES potential, the algorithm follows the same social/gender agnostic method, to extract and dynamically update end-user thermal comfort profiles and DHW demand profiles based on building operational and ambient data. For this reason, no deviation was initially foreseen from the planned pilot site size. Nevertheless, the planned pilot extensions described above are expected to further consolidate the results of

	the behavioural modelling performed by increasing the size and diversity of the end-user group.
Steps towards achieving goals	The use case INN_UC03 addresses the Virtual Energy Storage (VES) concept included within the Demand Side Energy Profiling Engine (DSEP). Combined with the generated user profiles and the DER models defined within the project, the demand flexibility potential of the end users is calculated. The steps followed towards the incorporation of the VES aspect are very similar to the steps followed in the previous use cases and are summarized below: • A number of sensors and metering devices have been installed to facilitate the real-time monitoring of energy consumption, environmental conditions and operational status of the devices installed in the pilot site. • A field middleware has been deployed for the management, pre-processing and storage of the data collected locally by the installed sensors and meters. • The DSEP (Demand Side Energy Profiling) tool has been developed and deployed to TREK's cloud server for the generation of context-aware visual and thermal profiles using data collected at the end-users premises. • • The DSEP tool has been further developed to calculate demand flexibility potential incorporating the VES concept in a simulation engine based on the building mass and thermal load modelling and the water heater model.

4.6 Nicosia-Cyprus

Major changes seem to have afflicted this pilot as well in terms of one of its Use Cases, leading to a possible downsizing of its scale. However, by the efforts of the pilot partners, the goals and purposes for the Nicosia-Cyprus Pilot have remained unchanged and the course of the pilot, although altered, seems to still lead to its original aims.

The respective results of the updated KPIs are included in the Annex in 0, where it is indicated that regardless of the pilot modification a lot of effort has been made to leave them unharmed.

Table 20. Use Case UCY_UC01

Purposes and Goals	Increase the effectiveness of the energy within the campus and provide ancillary services to the DSO.
Postconditions	Optimised microgrid operation and provision of flexibility to DSO.
Deviations from the purposes/goals and postconditions of WP1	Due to unforeseen delays in the implementation of the MW scale PV park and storage system of the university of Cyprus pursued by the university with its own funds, thus external to the project, we as UCY, a partner to the inteGRIDy project, have decided to complete a small nanogrid (using third party funds) with all the required technologies to facilitate all the targeted investigations on complete systems but at a smaller scale. However, all other activities planned through the project have progressed as planned, and they are delivering all the anticipated results that will facilitate the complete analysis of the university

	campus and reach conclusions that will complement the set-out objectives of the inteGRIDy project.
Steps towards achieving goals	As indicated above, the work for deploying the central management system is up and running, accessing all load in the university through deployed smart meters and direct control of four buildings through the channelled accessibility of the central system to the dedicated BEMSs. Through this control, load is managed and flexibilities can be generated to be made available to the local DSO on request. The system for providing these flexibilities is in place and running with recorded results. Hence, the central system is marshalling all the load and generation of the campus capable of managing the available resources for optimal use and provision of flexibilities in the service of the local DSO. The system is capable of handling all future extensions, including the planned MWp PV system and the MWh storage system that will enhance the availability of flexibilities in the service of the wider system. It should be said, however, that the market of Cyprus is still not open in this field and expected to be operational from 1st of January 2021 onwards.

Table 21. Use Case UCY_UC02

Purposes and Goals	Trade flexibility with the prosumers and solve problems of the DSO.
Postconditions	The DSO will solve issues of the distribution grid and the prosumers will profit from the flexibility offers and the new pricing scheme for adopting a more grid-friendly demand curve.
Deviations from the purposes/goals and postconditions of WP1	No deviations in the scope of this use case, since all expected solutions are in place providing full connectivity to the targeted prosumers fully equipped with smart meters and flexibility trading infrastructure. The solution includes the university of Cyprus as a single commercial prosumer fully compliant with the requirements of flexibility trading through the infrastructure that was commissioned during the course of the project using funds external to the project.
Steps towards achieving goals	The targeted systems have been implemented; the DSO of Cyprus has commissioned all the employed infrastructure and is currently implementing flexibility trading and collection of valuable data that will help to prepare the cost and benefit analysis targeted through the project. There are no outstanding issues in relation to this use case and all reports have been documented with the results achieved. Once again it must be said that the market of Cyprus for flexibility trading is non-existent, but the DSO of Cyprus being a partner to the project is using the built-up system for managing system needs and reporting benefits through the inteGRIDy project. It has to be noted, however, that all infrastructure works and costs are covered through another source external to the inteGRIDy project.

4.7 Lisbon

Another pilot with major changes in two of its Use Cases in its size and configuration. The goals and purposes for the Lisbon Pilot though again have not indicated a major change. Neither have the respective results of the updated KPIs included in the Annex in 0.

Table 22. Use Case LIS_UC01

Purposes and Goals	Use the prediction of the PV plant energy profile to manage the building electric energy consumption.
Postconditions	Prediction of the building forecast profile.
Deviations from the purposes/goals and postconditions of WP1	It was initially planned to use the data from a PV plant under construction near the pilot building in the Lisbon University campus. However, not only the power of this PV plant is lower than the initially projected, due to some legal restrictions (from the 2 MW planned, around 837 kW is installed), but also the company responsible to collect the data from the PV plant filed for insolvency and the information needed for the pilot become unavailable.; It was decided, with the support of the Municipality, to install a small PV plant of 16 kW (maximum possible power given the available area) in the rooftop of the building to provide real data from PV production. The new PV plant will provide the elements to study a real case instead of the conceptual case the was initially planned; The data collected from the new plant will also provide the necessary information to study the case where the PV would supply the demand of the building by scaling up the forecast. This last use case will be used to prepare for the coming legislation (expected in 2020) focused on energy communities that will enable renewable energy sources to be shared by close by consumers; In short, the PV generation of the University plant would be used in simulation since the legislation nowadays does not allow to have flow of electricity from two different locations (contracts). Furthermore, since the company responsible to install the monitoring system of the PV plant went bankrupt, all the real data is no longer available. A smaller PV plant will be installed on the rooftop of the building that will provide the required data.
Steps towards achieving goals	• The existing online BEMS was updated; the new web-based system enabled the integration of all the required data sources: BMS (Siemens SCADA), standard EV chargers monitoring platform (Schneider), fast EV chargers management platform (MOBI.E), and weather data; • Load and PV generation forecasts and profiles were developed and can be used by the building manager to manage the building electric energy consumption and in a sense balance supply and demand of the building; • An optimization algorithm to maximize the auto-consumption of the PV generation was developed and can be used to schedule flexible loads based on a predetermined priority; • The specification for the tendering of the PV plant to be installed in the rooftop was concluded; • • Scaled-up generation data from the PV will be used to study the case where renewable energy can be ‘imported’ from nearby plants, in accordance with upcoming Portuguese legislation on energy communities and aggregation of prosumers, thus enabling a deeper validation of the use case.

Table 23. Use Case LIS_UC02

Purposes and Goals	Implement an operational managing application for the ice tanks to improve managing side flexibility charging and discharging the ice tanks.
Postconditions	An application to manage the ice tanks operation.
Deviations from the purposes/goals and postconditions of WP1	None
Steps towards achieving goals	• Data regarding the operation of the chillers and ice tanks (typically, the chillers are programmed to work during the off-peak hours to provide the cooling to be stored in the ice tanks that will help supply the cooling needs during the day) was integrated with the developed BEMS tool; • An optimization algorithm was developed that recommends load shifting of the ice tanks charging, depending on the energy tariff: Time of use Tariff or the Tariff Indexed to the MIBEL wholesale electricity price.

Table 24. Use Case LIS_UC03

Purposes and Goals	Avoid EV charging in peak hours with dynamic tariffs implemented.
Postconditions	EV charging management system prepared to manage dynamic tariffs, avoiding peak price hours.
Deviations from the purposes/goals and postconditions of WP1	During the execution of the project, the Municipality decided to increase the number of EV chargers and 11 new chargers with more power than the previous ones were installed. This lead to a complete renovation of the electric board and the previous managing system had to be removed; while the monitoring of all the chargers was accomplished, the ability to control some of them was lost for the time being.
Steps towards achieving goals	• The integration of EV fleet management with the BEMS tool is in place, including the collection of data from 45 charging stations, with different charging velocities, from normal and semi-fast options to fast ones in order to ensure the supply of a fleet of around 100 EV; • Since the charging of EVs is done mostly during the day because workers take the cars home at the end of the day, the developed optimization algorithm can be used to recommend charging schedules based on minimizing the cost of the electricity derived from dynamic tariffs. The Portuguese regulator ERSE is willing to conduct pilots for the possibility of the evolution of existing EV charging solutions (with the future possibility of supplying energy to the grid during peak hours). The pilot building at Campo Grande 25 is under consideration.

4.8 Xanthi

In case of the Xanthi pilot, in spite of the major change due to an unexpected fire accident, because the situation has been handled carefully, this has not resulted in any other negative effects, neither in the goals and purposes, nor in the KPIs included in the Annex in 8.8., apart from some minor updates, where some KPIs have been excluded and replaced by other, since it has been deduced that they offer a better metric for presenting the pilot's good order and performance.

Table 25. Use Case SUN_UC01

Purposes and Goals	Apply online supervisory control of the grid based on loads behaviour in order to optimally exchange energy upon request, maximise the RES usage and network autonomy.
Postconditions	Optimal and stable grid operation upon request, online performance analysis and avoid RES curtailment.
Deviations from the purposes/goals and postconditions of WP1	A loss of a large capacity of the local PV installation has occurred, due to an unfortunate recent fire accident; this critical situation was handled appropriately with PV local generation being replaced quickly with diesel units. Although this modification changes significantly the characteristics of this pilot, the validation of the main functionalities to be addressed in this pilot could be still possible.
Steps towards achieving goals	The steps that have been followed in order to achieve the goals defined can be briefly described by the following • Check the existing pilot site infrastructure for device availability, functionality and communications. • Rearrange, replacement and upgrade of power devices, batteries, Fuel Cell and EV charger in the pilot site. • Installation of new equipment in order to achieve energy exchange and energy balance between the nodes of the grid implementing a virtual central storage. • Deployment of communication interfaces for the new installed devices (grid DC/DC converters, Fuel Cell, Fuel Cell converter, Electrolyzer power supply). • Check and upgrade the communications and protocols for the existing meters and devices along with the installation of the IoT MQTT server for the data exchange between field devices-SCADA system and the tools. • Check and update the SCADA system's figures and tags for the supervision of the updated grid infrastructure. • Deployment of the mathematical models of the power devices and the mathematical models of the energy management strategies applied in the nodes in order to derive the model of the grid. • Redevelopment of the pilot tools in order to be consistent with the functional requirements and needs of the InteGRIDy pilot site project's goals and purposes. • Data exchange testing between pilot site and remote monitoring, using the Data Exchange Tool. • Simulations of the nodes and grid energy flows given historical data from solar irradiation, wind speed and load demand, using the developed models.

	• • Simulations of the control actions for energy exchange and balance, derived from the NMPCFES tool, using the developed models.

Table 26. Use Case SUN_UC02

Purposes and Goals	Protect the lifetime and operational capacity of the local storage systems and utilise the virtual central storage system at the grid level.
Postconditions	Online status and performance analysis of the storage capacity and capabilities for long-term optimal battery utilization and stable operation.
Deviations from the purposes/goals and postconditions of WP1	None
Steps towards achieving goals	The steps that have been followed in order to achieve the goals defined can be briefly described by the following • Check the existing pilot site infrastructure for device availability, functionality and communications. • Rearrange, replacement and upgrade of power devices, batteries, Fuel Cell and EV charger in the pilot site. • Installation of new equipment in order to achieve energy exchange and energy balance between the nodes of the grid implementing a virtual central storage. • Deployment of communication interfaces for the new installed devices (grid DC/DC converters, Fuel Cell, Fuel Cell converter, Electrolyzer power supply). • Check and upgrade the communications and protocols for the existing meters and devices along with the installation of the IoT MQTT server for the data exchange between field devices-SCADA system and the tools. • Check and update the SCADA system's figures and tags for the supervision of the updated grid infrastructure. • Deployment of the mathematical models of the power devices and the mathematical models of the energy management strategies applied in the nodes in order to derive the model of the grid. • Redevelopment of the pilot tools in order to be consistent with the functional requirements and needs of the InteGRIDy pilot site project's goals and purposes. • Data exchange testing between pilot site and remote monitoring, using the Data Exchange Tool. • Simulations of the nodes and grid energy flows given historical data from solar irradiation, wind speed and load demand, using the developed models. Simulations of the control actions for energy exchange and balance, derived from the NMPCFES tool, using the developed models.

Table 27. Use Case SUN_UC03

Purposes and Goals	The operational objectives are to charge batteries utilising stored energy from RES and to derive charging profiles upon request and overall evaluation of the EV charging effect at the storage systems.
Postconditions	Online status and performance analysis of the storage capacity and capabilities for long-term optimal battery utilization and stable operation.
Deviations from the purposes/goals and postconditions of WP1	A loss of a large capacity of the local PV installation has occurred, due to an unfortunate recent fire accident; this critical situation was handled appropriately with PV local generation being replaced quickly with diesel units. Although this modification changes significantly the characteristics of this pilot, the validation of the main functionalities to be addressed in this pilot could be still possible.
Steps towards achieving goals	The steps that have been followed in order to achieve the goals defined can be briefly described by the following • Check the existing pilot site infrastructure for device availability, functionality and communications. • Rearrange, replacement and upgrade of power devices, batteries, Fuel Cell and EV charger in the pilot site. • Installation of new equipment in order to achieve energy exchange and energy balance between the nodes of the grid implementing a virtual central storage. • Deployment of communication interfaces for the new installed devices (grid DC/DC converters, Fuel Cell, Fuel Cell converter, Electrolyzer power supply). • Check and upgrade the communications and protocols for the existing meters and devices along with the installation of the IoT MQTT server for the data exchange between field devices-SCADA system and the tools. • Check and update the SCADA system’s figures and tags for the supervision of the updated grid infrastructure. • Deployment of the mathematical models of the power devices and the mathematical models of the energy management strategies applied in the nodes in order to derive the model of the grid. • Redevelopment of the pilot tools in order to be consistent with the functional requirements and needs of the InteGRIDy pilot site project’s goals and purposes. • Data exchange testing between pilot site and remote monitoring, using the Data Exchange Tool. • Simulations of the nodes and grid energy flows given historical data from solar irradiation, wind speed and load demand, using the developed models. • • Simulations of the control actions for energy exchange and balance, derived from the NMPCFES tool, using the developed models.

4.9 Ploiesti

The major result of Ploiesti Pilot is the implementation of a new system (EIIS), designed, developed, deployed and tested in the pilot.

The Energy Integrated Information System (EIIS) is a solution developed from scratch, offering a good opportunity not only for implementing an innovative DR technical solution in the energy domain, but also the opportunity of implementing and validating domain specific smart algorithms and intelligent domain specific business models.

The EIIS solution implemented in Ploiesti Pilot ensures all levels of “smartening the grid”:

- Smart measuring
- Modelling (smart DR algorithms, simulations, forecasting)
- Optimization
- Monitoring / Tracking and control
- Alerts and notifications.

EIIS is the only tool able to actively learn from experience and apply latest AI principles for data processing. It also offers rich sets of API, which expose data for other application, in an integrated environment. The tool was tested in the environment of Ploiesti Pilot, but ***has no restrictions on any other DSO which can use it***.

As exactly it was defined for Ploiesti Pilot, a DSO who wants to use the system should define some parameters (metadata), and then the EIIS functions will be applied.

The parameters that a DSO should specify in order to use the system are:

- DSO general parameters (name, Location, IP address, etc)
- Locations (name, address, id)
- Smart Meters (id, type, values measured, etc).

These parameters can be defined when the system is deployed or in any other moment when necessary. Parameters are defined using normal administration function (not necessary to recompile or redeploy the software, just enter some data in the UI forms).

Moreover, EIIS is horizontally scalable, as new locations and new Smart Meters can be added at any moment.

From the integration point of view there are two main aspects to address:

Firstly, the EIIS is itself an integrated system, which can be used by any DSO, and more precisely by any DSO, part of Integridy project. It can be setup for any DSO, it can be extended for locations or smart meters (smart metering infrastructure), and also can be used to offer services via API.

Secondly, the EIIS can be deployed in a container (dockerized deployment), in this way the solution could be part of a bigger toolkit, from which each final user can select the most appropriate tools.

Considering that the actual status of the pilot implementation is providing the size, complexity and TRL described in the proposal, our aim for the next period is to improve the performance of the system and enlarge its usage (size) to more Smart Meters and use more historical data for the machine learning system, and consequently improve the forecasting and What-If modules.

By combining historical data with the installed Smart Meters, we’ll also increase the TRL to 6 or even 7.

The goals and purposes of the Ploiesti Pilot are presented in the following. Excepting some minor changes concerning the usability and relevance of data in Use Case 01 and Use Case 02, no other issue has occurred.

The respective results of the updated KPIs are included in the Annex in 8.9. A few minor changes have taken place regarding the KPIs of this pilot since the previous configuration of KPIs has been concluded not to be quite suitable for the pilot. Besides, no other issues were reported.

The goals and purposes for the Ploiesti Pilot are presented here.

Table 28. Use Case DR_PL 01

Purposes and Goals	Collecting relevant data regarding the consumption of the residential area, based on the existing infrastructure. Assessing the power demand and monitoring the evolution of consumption (Real-time energy consumption management). Determining the tendencies and prognosis of the consumption (profile of the consumption curve). Optimising the consumer bill based on the prognosis of consumption, using different rates (CPP, ToU, PTR, CTP).
Postconditions	N/A
Deviations from the purposes/goals and postconditions of WP1	No data and no relevance in current situation for Energy losses and Energy losses ratio. No data and no specific program for CO2 emissions, as these are not applicable for Ploiesti Pilot. The performance of electrical infrastructure is optimized indirectly by reducing the peak times and having a uniform distribution of infrastructure loading.
Steps towards achieving goals	The EIIS (Energy Integrated Information System) was designed and developed in order to support the functionalities established in the list of requirements. For the successful implementation of the EIIS, data were collected stored and processed with the appropriate algorithms. For deployment phase cloud infrastructure is created and in order to visualise these data suitable presentation systems have been developed. Finally testing is continuously implemented. From the data usage point of view machine learning algorithms, optimization, forecasting are conducted and data loading with historical and real data.

Table 29. Use Case DR_PL 02

Purposes and Goals	Collecting relevant data regarding the consumption of the residential area, using smart meters with DR functionality. Assessing the power demand and monitoring the evolution of consumption (Real-time energy consumption management). Determining the tendencies and prognosis of the consumption (profile of the consumption curve); Statistics.

	Automated controlling of the power demand, based on the implementation of smart DR algorithms. Optimising the consumer bill based on the prognosis of consumption, using different rates (CPP, TOU, PTR, CTP).
Postconditions	N/A
Deviations from the purposes/goals and postconditions of WP1	Reducing the loss of electrical power will not be implemented. Optimising the load of power cables is achieved by reducing the peak values. No data and no relevance in current situation for Energy losses and Energy losses ratio. No data and no specific program for CO2 emissions, as these are not applicable for Ploiesti Pilot.
Steps towards achieving goals	The steps are the same as they were described for Use Case DR_PL_01, as there is a unique solution (EIIS – Energy Integrated Information System) covering all functionalities specific to all use cases (presented in this project, or future use cases).

Table 30. Use Case DR_PL 03

Purposes and Goals	Displaying / accessing relevant data regarding own consumption. Accessing the own savings in monetary unit (RON). Consumption and peak load decrease, based on the implementation of smart DR algorithms. System alerts/notifications concerning the optimisation of own consumption / costs.
Postconditions	N/A
Deviations from the purposes/goals and postconditions of WP1	N/A
Steps towards achieving goals	The steps are the same as they were described for Use Case DR_PL_01, as there is a unique solution (EIIS – Energy Integrated Information System) covering all functionalities specific to all use cases (presented in this project, or future use cases).

4.10 Thessaloniki Pilot

The goals and purposes for the Thessaloniki Pilot are presented here. Apart from a minor change regarding a reallocation of the pilot site in Use Case 03, no other issue has occurred.

The respective results of the updated KPIs are included in the Annex in 8.10. Several minor changes have taken place regarding the KPIs of this pilot, since the previous configuration of KPIs was not appropriately suited for this pilot. Other than that, no other issues have been reported.

Table 31. Use Case TH_UC01

Purposes and Goals	The main goal is to specify the most appropriate incentive-based DR program in terms of the financial or other type of beneficial factors that will encourage the end-users to change their demand pattern.
Postconditions	The performance of the smart meters will be evaluated at the residential level. The economic benefits from both peak shaving and energy consumption shifting will be optimised.
Deviations from the purposes/goals and postconditions of WP1	N/A
Steps towards achieving goals	• The residential users for DR schemes have been identified. • Preparation of a questionnaire for demographics and clients information about the DR participants. • The equipment is already installed on-site. • The respective tools applying the DR schedules have been developed. • Preliminary simulations have been conducted.

Table 32. Use Case TH_UC02

Purposes and Goals	The main goal is to specify the most appropriate incentive-based DR program in terms of the financial (or other type of) incentives that need to be offered to encourage the end-users to change their demand pattern. The BESS aims to optimise the end-users' behaviour through shaving their peak demand and minimising their electric bill. The proposed strategy of customer-controlled BESS is based on costs incurred due to peak support.
Postconditions	The performance of the home batteries will be evaluated at the residential level. The economic benefits from both peak shaving and due to energy consumption shifting will be optimised.
Deviations from the purposes/goals and postconditions of WP1	N/A
Steps towards achieving goals	• The residential users for BESS schemes have been identified. • The equipment is being installed on-site. • The respective tools applying the BESS schedules, have been developed. • Preliminary simulations have been conducted.

Table 33. Use Case TH_UC03

Purposes and Goals	The DR schemes will be deployed in the commercial building to manage the demand of the HVAC system. Installed battery management systems will achieve peak shaving, load shifting, self-

	consumption as well as to increase the financial savings of the building.
Postconditions	The economic benefits from both peak shaving and energy consumption shifting will be optimised.
Deviations from the purposes/goals and postconditions of WP1	The only deviation refers to the reallocation of the commercial building. Apart from that, the goals and postconditions remain the same.
Steps towards achieving goals	• An initial provision and procurement of the necessary equipment has been made. • The respective tools applying both the DR and the BESS schemes for the commercial building have been developed. • Preliminary simulations have been conducted.

4.11 Results of KPIs Evaluation Framework

All in all, the progress of the pilots since the original setup has not changed much, in its core, as reflected in not so big deviations regarding the goals and purposes and the final KPIs ultimately utilized.

As an example, in the case of Terni pilot, preliminary simulations show the ability of the microgrid to fulfill purposes and goals of the pilot, even if the MV feeder to which the microgrid is connected is disconnected from the main MV distribution grid. In particular, early simulations with data reflecting the real behavior of the microgrids components have demonstrated that there is room for earning money from the provision of congestion management services to the MV grid that, in its turn, can cope with system contingencies and improve power quality indexes.

All hardware components are in place and the server machine of the pilot has been properly configured and put at disposal; communication between hardware and software is being finalised. All the software tools are correctly installed in the server machine in Terni and are actually running for collecting enough historical data to be used by the optimiser components.

As another example, in case of the Barcelona pilot, development activities have been on hold since June 2019, and will be resumed once the EC confirms the amendment proposal. Consequently, there are no results to be presented.

Other than that, both goals and purposes and KPIs of the pilots seem to not have been affected severely, as the cases of Isle of Wight, St. Jean, Nicosia and Lisbon despite the major changes in those pilots, as can been also seen in 8. The updates mainly involve either internal changes, that is a KPI is still considered for that pilot, though a stakeholder has been removed or added, or it is linked to different Use Cases. An example can be made in Thessaloniki pilot, where regarding Demand flexibility Ratio (T.05), DSO and End Users have been added as stakeholders, or with respect to Demand Request Participation (T.08), this KPI seems to affect only the first Use Case and not the rest, since it refers to explicit Demand Response programs, included only in the first Use Case of Thessaloniki Pilot.

Other changes concern the replacement of various KPIs with other ones, since the initially proposed KPIs seem not to necessarily suit the pilot, such as in Xanthi pilot, where the Demand flexibility Ratio (T.05) and other related KPIs (T.06, T.07, T.08, T.09) have been removed from the original configuration, since it has been deduced that they no longer need to be associated with this pilot; whereas other KPIs such as RES Generation, RES generation Ratio, Energy Import, Energy Export and Energy Mismatch Ratio have been added since they are more suited to the pilot's goals and capabilities.

Additionally, these preliminary results have also indicated no major changes regarding the business objectives and stakeholders of the pilot ecosystem. These results will be further refined during the course of the T8.2 activities.

5.Time plan for evaluation analysis

5.1 Preparatory activities

Overall evaluation of the inteGRIDy framework and tools will be performed in the next task and in D8.2. The overall evaluation of the inteGRIDy framework and tools will apply the methodology proposed in D8.1 and will report the degree of compliance of the inteGRIDy overall pilot operation results to the identified requirements in WP1.

As presented in the following figure the timeline of the next period regarding evaluation is:

- *On April 2020 – M40*, during T8.2 each pilot partner representative should assess preliminary outcomes of chapter 4 and the results of KPIs evaluation framework in the ANNEX
- *On June 2020 – M42*, task leader should distribute among partners the ToC for D8.2 which will be based on the current D8.1 document
- *On August 2020 – M44*, pilot partners should have gathered all necessary data for the evaluation framework and select the appropriate instruments for proper KPIs presentation.
- *On December 2020 – M48*, the final version of D8.2 should be submitted to the EC.

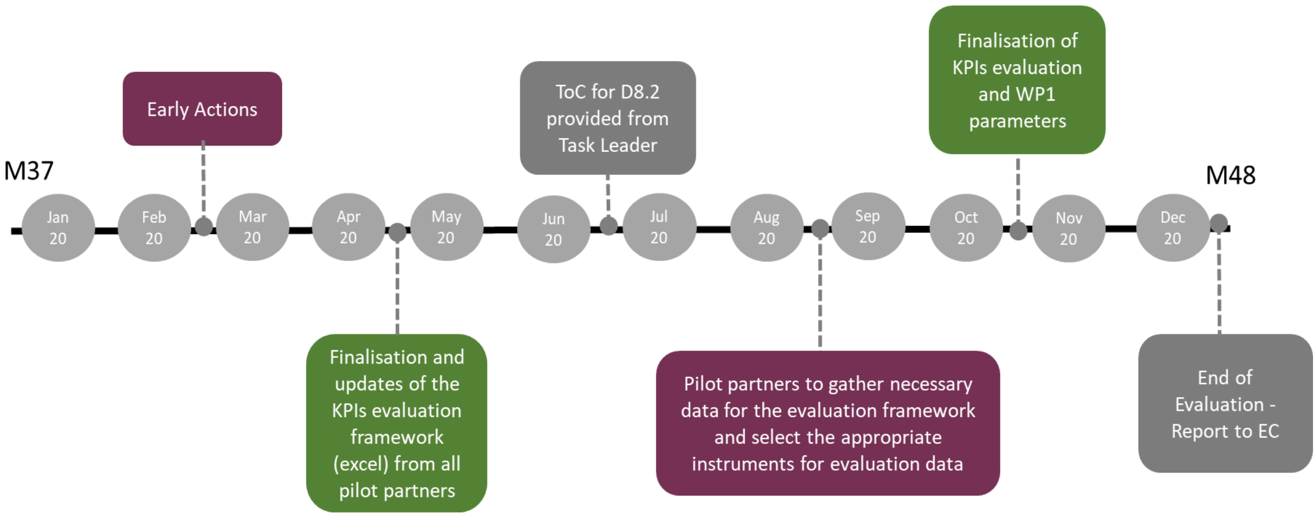

Figure 4. Timeline of M37-M48 regarding evaluation

During this year, online teleconferences will be conducted by the task leader together with pilot site representatives and technical managers for discussing issues that may occur and for providing the necessary guidelines required. These discussions should begin after the ToC distribution on M42 and should continue once a month, or more frequently if necessary. Moreover, the activities of T8.2 will be discussed in detail in face to face meetings of the project.

5.2 Presentation of consolidated results

For the presentation of evaluation framework and, more particularly, of the KPIs and the deviations from WP1, pilot site representatives and technical managers should choose a method that better complies with their pilot site requirements, use cases and available resources.

For the baseline scenario, data have been or will be gathered as described in the ANNEX of this document and will be further compared with the data that will be collected during the Smart Grid (SG) project implementation (this year). Then, these combined information will reveal the final KPI which will be compared with the measure of success defined for each KPI in the

ANNEX of this document. If the measure of success is not yet defined in this preliminary stage, then it should be clearly defined in M40 as depicted in the previous figure.

Data collection methodology varies depending on the nature of the KPI and the domain. For example for the energy, economy and environmental domain, KPIs are technical and the final measurement could be visualised through a real time dashboard, presenting data dynamically or through static diagrams. The comparison of the KPIs with the measure of success could be implemented through statistical diagrams or through a real time dashboard.

For the social domain and in particular for the explicit and implicit DR, data for the user evaluation could be gathered through algorithms, measuring for example the times that an application is accessed, or through proper questionnaires, which measure the degree of user satisfaction. Questionnaires should be ready for distribution to the relevant stakeholders on M44. These results could be visualized in statistical diagrams revealing the user satisfaction, together with a detailed explanation of the steps followed towards user engagement.

6.Conclusions

In this deliverable, the most suitable evaluation methodology for the pilots has been identified and proposed as the most appropriate course of action for the activities of T8.2, where the overall evaluation of both the inteGRIDy framework and the tools performance shall take place.

For the purpose of the evaluation, following an analysis of the available bibliography, two scenarios will basically be compared for each pilot within inteGRIDy: a Baseline Assessment, that is the situation prior to inteGRIDy, in order to have a point of reference, and the Smart Grid Project implementation, that is the results of the activities during the course of the project. The methods of retrieving data for both those scenarios have also been established.

Furthermore, to that end, the goals and purposes and KPIs, as established within the activities of WP1, have been re-examined and updated, following the adopted methodology for the evaluation process. In spite of the major changes occurring in some pilots due to several reasons, such as unexpected accidents or procedures taking longer than originally expected, goals and purposes of the pilots have not been significantly affected. The same conclusion holds when referring to the KPIs, since apart from some minor updates for better adapting to each pilot’s goals and capabilities, no other significant deviation has been shown.

Finally, a time plan for the evaluation process has been proposed in order to keep track of the various pilot and to monitor the progress towards achieving their goals within the inteGRIDy framework, as well as their respective performance towards those goals.

7.References

[ECO95] Doumeingts G., Clave F., Ducq Y. (1995) ECOGRAI — A method to design and to implement Performance Measurement Systems for industrial organizations — Concepts and application to the Maintenance function. In: Rolstadås A. (eds) Benchmarking — Theory and Practice. IFIP Advances in Information and Communication Technology. Springer, Boston, MA

[GLE07] Glenaffric Ltd (2007) Six Steps to Effective Evaluation: A handbook for programme and project managers

[GIO12] Vincenzo Giordano, Steven Bossart, Assessing Smart Grid Benefits and Impacts: EU and U.S. Initiatives, Joint Report EC JRC –US DOE, 2012

[INT17] inteGRIDy project, D1.3 Pilot Surveys requirements business scenarios

8. Annex I. Results of KPIs Evaluation Framework per pilot

8.1 Isle of Wight Pilot

8.1.1 KPIs update

Key Performance Indicators			Use Cases				Stakeholders Group			
			IOW_UC01_Building optimisation to maximise efficiency and demand flexibility, minimise costs and reduce environmental impact across the enterprise.	*IOW_UC02 - Smartening the distribution grid.*	*IOW_UC03 - Minus 7 Energy Storage System.*	*IOW_UC04 - Transport Smart Integration of Virtue EV charging systems*	**DSO**	**End Users**	**Market Operator (inc. Retailer / ESCO)**	**Policies Bodies and Governance**
ID	**Global/ Local**	**Name**	**Demand Response**							
T.01	G	Energy Consumption (Monthly, Daily...)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
T.02	G	Peak to Average Ratio (PAR)	**YES**	**YES**	**YES**	**YES**	**YES**		**YES**	
T.03	G	Self-Consumption Rate	**YES**	N/A	N/A	N/A	**YES**	**YES**	**YES**	**YES**
T.04	G	Energy Consumption Reduction (Demand Flexibility)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
T.05	G	Demand Flexibility Ratio	**YES**	**YES**	**YES**	**YES**	YES		**YES**	
T.06	G	Demand Flexibility Request	**YES**	**YES**	**YES**	**YES**	YES		**YES**	
T.07	G	Demand Flexibility Baseline (Potential)	**YES**	**YES**	**YES**	**YES**			**YES**	
T.08	G	Demand Request Participation	**YES**	**YES**	**YES**	**YES**			**YES**	**YES**

T.09	G	Demand Request Enrolment	**YES**	**YES**	**YES**	**YES**			**YES**	
T.10	G	Peak load reduction	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
T.14	L	Energy Import	**YES**	**YES**	N/A	N/A	**YES**	**YES**		
T.15	L	Energy Export	**YES**	**YES**	N/A	N/A	**YES**	**YES**		
Smartening the Distribution Grid										
T.17	L	Energy Losses	N/A	**YES**	N/A	N/A	**YES**			
T.18	L	Energy Losses Ratio	N/A	**YES**	N/A	N/A	**YES**			
T.19	L	Voltage variations	N/A	**YES**	N/A	N/A	**YES**			
Electric Vehicles										
T.28	L	EV Penetration Level	N/A	N/A	N/A	**YES**	**YES**		**YES**	**YES**
T.29	L	EV Peak Demand	N/A	N/A	N/A	**YES**	**YES**		**YES**	**YES**
T.30	L	EV demand flexibility baseline	N/A	N/A	N/A	**YES**			**YES**	
T.31	L	EV demand flexibility	N/A	N/A	N/A	**YES**			**YES**	
Battery Storage										
T.40	L	VES Demand Flexibility Baseline	N/A	N/A	**YES**	N/A		**YES**	**YES**	
T.41	L	VES Demand Flexibility	N/A	N/A	**YES**	N/A		**YES**	**YES**	
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	**YES**	**YES**	**YES**	**YES**		**YES**		
EC. 02	G	Average Cost of Energy Consumption	**YES**	**YES**	**YES**	**YES**		**YES**		YES
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	**YES**	N/A	**YES**	**YES**		**YES**		

EN. 01	G	CO2 emissions	**YES**	**YES**	**YES**	**YES**	**YES**		**YES**	
EN. 02	G	CO2 emissions Reduction	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	
EN. 05	L	Operative Temperature	**YES**	N/A	N/A	N/A		**YES**	**YES**	

8.1.2 Baseline Scenario and System Information

Key Performance Indicators			**Baseline Scenario**		
			Data Collection Methodology	***Time Intervals***	***System that the KPI refers to***
ID	**Global/ Local**	**Name**	**Demand Response**		
T.01	G	Energy Consumption (Monthly, Daily...)	Remote data collection	15 minutes 5minutes	M7 SIEMENS UK
T.02	G	Peak to Average Ratio (PAR)	Remote data collection	15 minutes 5 minutes	M7 SIEMENS UK
T.03	G	Self-Consumption Rate	Remote data collection	15 minutes	M7
T.04	G	Energy Consumption Reduction (Demand Flexibility)	Remote data collection	15 minutes	M7
T.05	G	Demand Flexibility Ratio	Remote data collection	15 minutes	M7
T.06	G	Demand Flexibility Request	Remote data collection	15 minutes	M7
T.07	G	Demand Flexibility Baseline (Potential)	Remote data collection	15 minutes	M7
T.08	G	Demand Request Participation	Remote data collection	15 minutes	M7
T.09	G	Demand Request Enrolment	Remote data collection	15 minutes	M7

T.10	G	Peak load reduction	Not collected	According to the time step considered in the simulation (initially 30 minutes)	UNEW
Smartening the Distribution Grid					
T.17	L	Energy Losses	Historical Data from the IoW Network that provided by SSEN (during inteGRIDy project)	At the peak load and peak generation of the IoW network	The IoW Distribution Network
T.18	L	Energy Losses Ratio	Historical Data from the IoW Network that provided by SSEN (during inteGRIDy project)	At the peak load and peak generation of the IoW network	The IoW Distribution Network
T.19	L	Voltage variations	Historical Data from the IoW Network that provided by SSEN (during inteGRIDy project)	At the peak load and peak generation of the IoW network	The IoW Distribution Network
Electric Vehicles					
T.28	L	EV Penetration Level	TBD	TBD	TBD
T.29	L	EV Peak Demand	TBD	TBD	TBD
T.30	L	EV demand flexibility baseline	TBD	TBD	TBD
T.31	L	EV demand flexibility	TBD	TBD	TBD
Battery Storage					
T.40	L	VES Demand Flexibility Baseline	Not collected	Evaluated from the simulation on daily, weekly, and monthly basis	The IoW Distribution Network model
T.41	L	VES Demand Flexibility	Not collected	Evaluated from the simulation on daily, weekly, and monthly basis	The IoW Distribution Network model
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	Remote monitoring		

EC. 02	G	Average Cost of Energy Consumption	Remote monitoring		
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	Remote monitoring		
EN. 01	G	CO_2 emissions	Remote monitoring	5 minutes	SIEMENS UK
EN. 02	G	CO_2 emissions Reduction	Remote monitoring	5 minutes	SIEMENS UK

8.1.3 *Smart Grid (SG) Project Implementation*

Key Performance Indicators			Evaluation Scenario			Revision of data
			Data Collection Methodology *- Who will collect the data?* *-What data needs to be collected?* *-Where will the data be found?* *-How will the data be obtained?*	**Evaluation Method (Questionnaire, Programs) + per Stakeholder**	**Frequency of Data Collection**	**Estimation of Threshold / Measure of success + per Stakeholder (if applicable)**
ID	**Global/ Local**	**Name**	**Demand Response**			
T.01	G	Energy Consumption (Monthly, Daily...)	Remote monitoring of sensors located in residents properties Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud	Data report	15 min intervals, summed to relevant period	
T.02	G	Peak to Average Ratio (PAR)	Remote monitoring of sensors located in residents properties	Data report	Reported when appropriate, calculated from data collected	
T.03	G	Self-Consumption Rate	Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud	Data report	Reported when appropriate, calculated from data collected	

T.04	G	Energy Consumption Reduction (Demand Flexibility)	This KPI relies on the support of the DNO. It is unlikely that this will be available for this project Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud	M7 and Siemens can report on capability	When appropriate	
T.05	G	Demand Flexibility Ratio	Calculated from the data collected Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud	Data report	When appropriate	
T.06	G	Demand Flexibility Request	Can only be supported if the DNO requests. Unlikely to be delivered in this project Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud	M7 and Siemens can report on capability	When appropriate	
T.07	G	Demand Flexibility Baseline (Potential)	Can only be supported if the DNO requests. Unlikely to be delivered in this project	M7 and Siemens can report on capability		
T.08	G	Demand Request Participation	Can only be supported if the DNO requests. Unlikely to be delivered in this project Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud	M7 and Siemens can report on capability		
T.09	G	Demand Request Enrolment	Can only be supported if the DNO requests. Unlikely to be delivered in this project	M7 and Siemens can report on capability		
T.10	G	Peak load reduction	For new build properties this can't be collected. For retrofit, we don't have the figures	Siemens can report on capability		

			Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud			
T.14	L	Energy Import	- SSEN collects the data - Load and PV profile and any installed new generations at 11kV and 33kV. - SSEN database - From SSEN under NDA	The ITE tool will compute the energy imported in the points of connection of the IoW network to mainland.	When appropriate	
T.15	L	Energy Export	- SSEN collects the data - Load and PV profile and any installed new generations at 11kV and 33kV. - SSEN database - From SSEN under NDA	The ITE tool will compute the energy exported in the points of connection of the IoW network to mainland.	When appropriate	
Smartening the Distribution Grid						
T.17	L	Energy Losses	- SSEN collects the data - Load and PV profile and any installed new generations at 11kV and 33kV. - SSEN database - From SSEN under NDA	The ITE tool will compute the energy imported in the points of connection of the IoW network to mainland.	When appropriate	
T.18	L	Energy Losses Ratio	- SSEN collects the data - Load and PV profile and any installed new generations at 11kV and 33kV. - SSEN database - From SSEN under NDA	The ITE tool will compute the energy imported in the points of connection of the IoW network to mainland.	When appropriate	
T.19	L	Voltage variations	- SSEN collects the data - Load and PV profile and any installed new generations at 11kV and 33kV. - SSEN database - From SSEN under NDA	The ITE tool will compute the energy imported in the points of connection of the IoW network to mainland.	When appropriate	
Electric Vehicles						
T.28	L	EV Penetration Level	TBD	TBD	TBD	
T.29	L	EV Peak Demand	TBD	TBD	TBD	

T.30	L	EV demand flexibility baseline	TBD	TBD	TBD	
T.31	L	EV demand flexibility	TBD	TBD	TBD	
T.40	L	VES Demand Flexibility Baseline	Not collected	Evaluated from the simulation on daily, weekly, and monthly basis	The IoW Distribution Network model	
T.41	L	VES Demand Flexibility	Not collected	Evaluated from the simulation on daily, weekly, and monthly basis	The IoW Distribution Network model	
Battery Storage						
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	M7 monitors energy delivered to the property. We know the electrical energy used and thus can calculate the cost of energy assuming an energy bill	M7 can provide a report at the requested interval	When requested	
EC. 02	G	Average Cost of Energy Consumption	M7 monitors energy delivered to the property. We know the electrical energy used and thus can calculate the cost of energy assuming an energy bill	M7 can provide a report at the requested interval		
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	M7 monitors energy delivered to the property. We know the electrical energy used and thus can calculate the cost of energy assuming an energy bill	M7 can provide a report at the requested interval		
EN. 01	G	CO2 emissions	Given energy consumption, the carbon saving can be calculated. Grid electricity has a standard carbon footprint	M7 can provide a report at the requested interval		
EN. 02	G	CO2 emissions Reduction	Can calculate the reduction based on comparison with a 'standard house' There are government figures available	M7 can provide a report at the requested interval		

8.1.4 Stakeholders engagement

Key Performance Indicators			Roles and Responsibilities
ID	**Global/ Local**	**Name**	**Demand Response**
T.01	G	Energy Consumption (Monthly, Daily...)	UNEW will provide the calculated KPI (monthly and daily energy consumption) based on the simulation results for the different considered scenarios (before and after smartening the network). The network model, for the different scenarios, will be run using the integrated Test Environment (ITE), then this KPI will be calculated by comparing and analysing the results of different scenarios. Siemens will collected and calculate data in cloud using 15 min metering data and Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud
T.02	G	Peak to Average Ratio (PAR)	UNEW will provide the calculated KPI (PAR) based on the simulation results for the different considered scenarios (before and after smartening the network). The network model, for the different scenarios, will be run using the integrated Test Environment (ITE), then this KPI will be calculated by comparing and analysing the results of different scenarios.
T.03	G	Self-Consumption Rate	UNEW will provide the calculated KPI (Self-consumption rate) based on the simulation results for the different considered scenarios (before and after smartening the network). The network model, for the different scenarios, will be run using the integrated Test Environment (ITE), then this KPI will be calculated by comparing and analysing the results of different scenarios. Siemens will collected and calculate data in cloud using 15 min metering data and Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud
T.04	G	Energy Consumption Reduction (Demand Flexibility)	UNEW will provide the calculated KPI (Energy Consumption Reduction\ Demand Flexibility) based on the simulation results for the different considered scenarios (before and after smartening the network). The network model, for the different scenarios, will be run using the integrated Test Environment (ITE), then this KPI will be calculated by comparing and analysing the results of different scenarios. Siemens will collected and calculate data in cloud using 15 min metering data and Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud

T.05	G	Demand Flexibility Ratio	UNEW will provide the calculated KPI (Demand Flexibility Ratio) based on the simulation results for the different considered scenarios (before and after smartening the network). The network model, for the different scenarios, will be run using the integrated Test Environment (ITE), then this KPI will be calculated by comparing and analysing the results of different scenarios
T.06	G	Demand Flexibility Request	UNEW will provide the calculated KPI (Demand Flexibility Request) based on the simulation results for the different considered scenarios (before and after smartening the network). The network model, for the different scenarios, will be run using the integrated Test Environment (ITE), then this KPI will be calculated by comparing and analysing the results of different scenarios. Siemens will collected and calculate data in cloud using 15 min metering data and Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud and send demand flexibility requests to the grid
T.07	G	Demand Flexibility Baseline (Potential)	UNEW will provide the calculated KPI (Demand Flexibility Baseline) based on the simulation results for the baseline scenario (before smartening the network). The network model, for the different scenarios, will be run using the integrated Test Environment (ITE), then this KPI will be calculated
T.08	G	Demand Request Participation	Other tools (potentially Siemens tool) will consider demand request and give the impact of the demand request to participate on the residential consumption. Then, the power consumption at LV will be aggregated at 11 kV. This is to consider the impact of this KPI (Demand Request Participation) on the whole network. The evaluation of this KPI can be done by running the model using the integrated Test Environment (ITE), before and after considering the demand request participation from the different consumers Siemens will collected and calculate data in cloud using 15 min metering data and Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud and send demand flexibility requests to the grid
T.09	G	Demand Request Enrolment	Other tools (potentially Siemens tool) will consider demand request, define the percentage of these requests to participate in the demand response program, and then give the impact of the demand request enrolment on the residential consumption. After that, the power consumption at LV will be aggregated at 11 kV. This is to consider the impact of this KPI (Demand Request Enrolment) on the whole network. The evaluation of this KPI can be done by running the model using the integrated Test Environment (ITE), before and after considering the demand request enrolment from the different consumers. Siemens will collected and calculate data in cloud using 15 min metering data and Siemens collected data remotely. Remote monitoring of onsite solar and onsite demand. Metering is source of record of data. Sent via CSV to cloud and send demand flexibility requests to the grid. Enrolment will be mandated by the project partners assets being enrolled

T.10	G	Peak load reduction	UNEW will provide the calculated KPI (Peak load reduction) based on the simulation results for the different considered scenarios (before and after smartening the network). The network model, for the different scenarios, will be run using the integrated Test Environment (ITE), then this KPI will be calculated by comparing and analysing the results of different scenarios
Smartening the Distribution Grid			
T.17	L	Energy Losses	UNEW will provide the calculated KPI based on the available data for the IoW network
T.18	L	Energy Losses Ratio	UNEW will provide the calculated KPI based on the available data for the IoW network
T.19	L	Voltage variations	UNEW will provide the calculated KPI based on the available data for the IoW network
Electric Vehicles			
T.28	L	EV Penetration Level	TBD
T.29	L	EV Peak Demand	TBD
T.30	L	EV demand flexibility baseline	TBD
T.31	L	EV demand flexibility	TBD
Battery Storage			
T.40	L	VES Demand Flexibility Baseline	UNEW will provide the calculate KPI (Demand flexibility) based on the storage configurations (size and type) in the baseline scenario (before smartening the network)
T.41	L	VES Demand Flexibility	UNEW will provide the calculate KPI (Demand flexibility) based on the storage configurations (size and type) after smartening the network
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	
EC. 02	G	Average Cost of Energy Consumption	
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	
EN. 01	G	CO2 emissions	

EN. 02	G	CO2 emissions Reduction	

8.2 Terni

8.2.1 KPIs update

Key Performance Indicators			Use Cases				Stakeholders Group			
			ASM_UC01 - Maximising savings and economic benefits in normal operation by optimising flexibility management	*ASM_UC02 - Power quality improvement in degraded operation by optimising flexibility management of microgrid resources*	*ASM_UC03 - Energy storage technologies*	*ASM_UC04 - Microgrid flexibility exploited for eventual EV recharging stations*	DSO	End Users	Market Operator (inc. Retailer / ESCO)	Policies Bodies and Governance
ID	**Global/ Local**	**Name**	**Demand Response**							
T.01	G	Energy Consumption (Monthly, Daily...)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**N/A**	**N/A**
T.02	G	Peak to Average Ratio (PAR)	**YES**	**YES**	**YES**	**YES**	**YES**	**N/A**	**N/A**	**N/A**
T.03	G	Self-Consumption Rate	**YES**	N/A	N/A	N/A	**YES**	**YES**	**N/A**	**N/A**
T.04	G	Energy Consumption Reduction (Demand Flexibility)	**YES**	**YES**	**YES**	**YES**	**YES**	**N/A**	**N/A**	**N/A**
T.05	G	Demand Flexibility Ratio	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**N/A**	**N/A**
T.06	G	Demand Flexibility Request	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**N/A**	**N/A**
T.07	G	Demand Flexibility Baseline (Potential)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**N/A**	**N/A**

T.08	G	Demand Request Participation	YES	YES	YES	YES	YES	YES	N/A	N/A
T.09	G	Demand Request Enrolment	YES	YES	YES	YES	YES	YES	N/A	N/A
T.10	G	Peak load reduction	YES	YES	YES	YES	YES	N/A	N/A	N/A
T.11	L	Reactive Energy Consumption	YES	N/A	N/A	N/A	YES	N/A	N/A	N/A
T.12	L	RES Generation	YES	N/A	N/A	N/A	YES	YES	N/A	N/A
T.13	L	RES Generation Ratio	YES	N/A	N/A	N/A	YES	YES	N/A	N/A
Smartening the Distribution Grid										
T.17	L	Energy Losses	N/A	YES	N/A	N/A	YES	N/A	N/A	N/A
T.18	L	Energy Losses Ratio	N/A	YES	N/A	N/A	YES	N/A	N/A	N/A
T.19	L	Voltage variations	N/A	YES	N/A	N/A	YES	N/A	N/A	N/A
T.20	L	Number of Grid Events	N/A	YES	N/A	N/A	YES	N/A	N/A	N/A
T.21	L	SAIFI	N/A	YES	N/A	N/A	YES	N/A	N/A	N/A
T.22	L	SAIDI	N/A	YES	N/A	N/A	YES	N/A	N/A	N/A
T.23	L	Power quality (power factor)	N/A	YES	N/A	N/A	YES	N/A	N/A	N/A
T.26	L	Average frequency Deviation	N/A	YES	N/A	N/A	YES	N/A	N/A	N/A
Electric Vehicles										
T.28	L	EV Penetration Level	N/A	N/A	N/A	YES	YES	N/A	N/A	N/A
T.29	L	EV Peak Demand	N/A	N/A	N/A	YES	YES	N/A	N/A	N/A
T.30	L	EV demand flexibility baseline	N/A	N/A	N/A	YES	YES	N/A	N/A	N/A

T.31	L	EV demand flexibility	N/A	N/A	N/A	YES	YES	N/A	N/A	N/A
CHP										
T.32	L	CHP Penetration Level	YES	N/A	N/A	N/A	YES	N/A	N/A	N/A
Battery Storage										
T.35	L	State of Charge (SOC)	YES	N/A	YES	N/A	YES	YES	N/A	N/A
T.36	L	Depth of Discharge (DOD)	YES	N/A	YES	N/A	YES	YES	N/A	N/A
T.37	L	Average SOC	YES	N/A	YES	N/A	YES	YES	N/A	N/A
T.38	L	Battery Demand Flexibility Baseline	YES	N/A	YES	N/A	YES	YES	N/A	N/A
T.39	L	Battery Demand Flexibility	YES	N/A	YES	N/A	YES	YES	N/A	N/A
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	YES	YES	YES	YES	YES	YES	N/A	N/A
EC. 02	G	Average Cost of Energy Consumption	YES	YES	YES	YES	YES	YES	N/A	N/A
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	YES	N/A	YES	YES	YES	YES	N/A	N/A
EC. 04	G	Average Cost of Energy Reward	YES	N/A	YES	YES	YES	YES	N/A	N/A
EC. 06	L	Average Estimation of Cost savings	YES	YES	YES	YES	YES	YES	N/A	N/A
EC. 07	L	Cost of ancillary services	N/A	YES	N/A	N/A	YES	YES	N/A	N/A
EN. 01	G	CO2 emissions	YES	YES	YES	YES	YES	YES	N/A	N/A
EN. 02	G	CO2 emissions Reduction	YES	YES	YES	YES	YES	YES	N/A	N/A

8.2.2 Baseline Scenario and System Information

Key Performance Indicators			Baseline Scenario		
			Data Collection Methodology	*Time Intervals*	*System that the KPI refers to*
ID	**Global/ Local**	**Name**	**Demand Response**		
T.01	G	Energy Consumption (Monthly, Daily...)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.02	G	Peak to Average Ratio (PAR)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.03	G	Self-Consumption Rate	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.04	G	Energy Consumption Reduction (Demand Flexibility)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.05	G	Demand Flexibility Ratio	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.06	G	Demand Flexibility Request	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.07	G	Demand Flexibility Baseline (Potential)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.08	G	Demand Request Participation	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.09	G	Demand Request Enrolment	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.10	G	Peak load reduction	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.11	L	Reactive Energy Consumption	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid

T.12	L	RES Generation	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.13	L	RES Generation Ratio	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
Smartening the Distribution Grid					
T.17	L	Energy Losses	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Distribution grid
T.18	L	Energy Losses Ratio	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Distribution grid
T.19	L	Voltage variations	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Distribution grid
T.20	L	Number of Grid Events	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Distribution grid
T.21	L	SAIFI	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Distribution grid
T.22	L	SAIDI	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Distribution grid
T.23	L	Power quality (power factor)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Distribution grid
T.26	L	Average frequency Deviation	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Distribution grid
Electric Vehicles					
T.28	L	EV Penetration Level	Simulated data	Whole period (1 year)	Distribution grid
T.29	L	EV Peak Demand	Simulated data	Whole period (1 year)	Distribution grid
T.30	L	EV demand flexibility baseline	Simulated data	Whole period (1 year)	Distribution grid
T.31	L	EV demand flexibility	Simulated data	Whole period (1 year)	Distribution grid
CHP					

T.32	L	CHP Penetration Level	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
Battery Storage					
T.35	L	State of Charge (SOC)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.36	L	Depth of Discharge (DOD)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.37	L	Average SOC	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.38	L	Battery Demand Flexibility Baseline	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
T.39	L	Battery Demand Flexibility	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
EC. 02	G	Average Cost of Energy Consumption	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
EC. 04	G	Average Cost of Energy Reward	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
EC. 06	L	Average Estimation of Cost savings	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid; Distribution grid
EC. 07	L	Cost of ancillary services	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid; Distribution grid
EN. 01	G	CO2 emissions	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid
EN. 02	G	CO2 emissions Reduction	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Microgrid

8.2.3 Smart Grid (SG) Project Implementation

Key Performance Indicators			Evaluation Scenario			Revision of data
			Data Collection Methodology *- Who will collect the data?* *-What data needs to be collected?* *-Where will the data be found?* *-How will the data be obtained?*	**Evaluation Method (Questionnaire, Programs) + per Stakeholder**	**Frequency of Data Collection**	**Estimation of Threshold / Measure of success + per Stakeholder (if applicable)**
ID	**Global/ Local**	**Name**	**Demand Response**			
T.01	G	Energy Consumption (Monthly, Daily...)	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
T.02	G	Peak to Average Ratio (PAR)	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
T.03	G	Self-Consumption Rate	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	Estimation: 70 - 90 %
T.04	G	Energy Consumption Reduction (Demand Flexibility)	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
T.05	G	Demand Flexibility Ratio	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
T.06	G	Demand Flexibility Request	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD

T.07	G	Demand Flexibility Baseline (Potential)	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
T.08	G	Demand Request Participation	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
T.09	G	Demand Request Enrolment	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
T.10	G	Peak load reduction	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
T.11	L	Reactive Energy Consumption	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
T.12	L	RES Generation	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	3 MWh
T.13	L	RES Generation Ratio	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	75 %
Smartening the Distribution Grid						
T.17	L	Energy Losses	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Every quarter-hour	TBD
T.18	L	Energy Losses Ratio	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Every quarter-hour	About 4 % of energy lost

T.19	L	Voltage variations	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Every quarter-hour	5 %
T.20	L	Number of Grid Events	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Event driven	5
T.21	L	SAIFI	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Event driven	TBD
T.22	L	SAIDI	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Event driven	TBD
T.23	L	Power quality (power factor)	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Event driven	90 %
T.26	L	Average frequency Deviation	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Every quarter-hour	
Electric Vehicles						
T.28	L	EV Penetration Level	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Simulated data	TBD
T.29	L	EV Peak Demand	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Simulated data	TBD
T.30	L	EV demand flexibility baseline	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Simulated data	TBD
T.31	L	EV demand flexibility	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Simulated data	TBD
CHP						

T.32	L	CHP Penetration Level	- ASM will collect the data - Metrics from SCADA - ASM database	Program performing the evaluation over the specified period	Every quarter-hour	TBD
Battery Storage						
T.35	L	State of Charge (SOC)	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Algorithm that estimates SOC	Every quarter-hour	Battery specifications
T.36	L	Depth of Discharge (DOD)	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Algorithm that estimates DOD	Every quarter-hour	Battery specifications
T.37	L	Average SOC	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Algorithm that estimates average SOC over the specified period	Every quarter-hour	Battery specifications
T.38	L	Battery Demand Flexibility Baseline	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
T.39	L	Battery Demand Flexibility	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services - Economic data	Program performing the evaluation over the specified period	Every quarter-hour	TBD
EC. 02	G	Average Cost of Energy Consumption	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services - Economic data	Program performing the evaluation over the specified period	Every quarter-hour	TBD
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services - Economic data	Program performing the evaluation over the specified period	Every quarter-hour	TBD

EC. 04	G	Average Cost of Energy Reward	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services - Economic data	Program performing the evaluation over the specified period	Every quarter-hour	TBD
EC. 06	L	Average Estimation of Cost savings	- ASM will collect the data - Metrics from RTUs and price of energy - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
EC. 07	L	Cost of ancillary services	- ASM will collect the data - Metrics from RTUs and price of energy - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
EN. 01	G	CO2 emissions	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD
EN. 02	G	CO2 emissions Reduction	- ASM will collect the data - Metrics from RTUs - ASM database - MQTT services	Program performing the evaluation over the specified period	Every quarter-hour	TBD

8.2.4 Stakeholders engagement

Key Performance Indicators			Roles and Responsibilities
ID	**Global/ Local**	**Name**	**Demand Response**
T.01	G	Energy Consumption (Monthly, Daily...)	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.02	G	Peak to Average Ratio (PAR)	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.

T.03	G	Self-Consumption Rate	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.04	G	Energy Consumption Reduction (Demand Flexibility)	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.05	G	Demand Flexibility Ratio	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.06	G	Demand Flexibility Request	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.07	G	Demand Flexibility Baseline (Potential)	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.08	G	Demand Request Participation	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.09	G	Demand Request Enrolment	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.10	G	Peak load reduction	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.11	L	Reactive Energy Consumption	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.12	L	RES Generation	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.13	L	RES Generation Ratio	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
Smartening the Distribution Grid			
T.17	L	Energy Losses	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.18	L	Energy Losses Ratio	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.

T.19	L	Voltage variations	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.20	L	Number of Grid Events	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.21	L	SAIFI	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.22	L	SAIDI	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.23	L	Power quality (power factor)	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.26	L	Average frequency Deviation	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
Electric Vehicles			
T.28	L	EV Penetration Level	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.29	L	EV Peak Demand	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.30	L	EV demand flexibility baseline	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.31	L	EV demand flexibility	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
CHP			
T.32	L	CHP Penetration Level	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
Battery Storage			
T.35	L	State of Charge (SOC)	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.

T.36	L	Depth of Discharge (DOD)	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.37	L	Average SOC	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.38	L	Battery Demand Flexibility Baseline	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
T.39	L	Battery Demand Flexibility	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
EC. 02	G	Average Cost of Energy Consumption	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
EC. 04	G	Average Cost of Energy Reward	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
EC. 06	L	Average Estimation of Cost savings	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
EC. 07	L	Cost of ancillary services	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
EN. 01	G	CO2 emissions	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.
EN. 02	G	CO2 emissions Reduction	Microgrid is engaged providing its flexibility; DSO collects and provides all measurements for calculating the KPI.

8.3 San Severino

8.3.1 KPIs update

Key Performance Indicators			Use Cases			Stakeholders Group			
			ASS_UC01 - Demand Response	*ASS_UC02 - Smartening the Distribution Grid*	*ASS_UC03 - Energy Storage Technologies*	DSO	End Users	Market Operator (inc. Retailer / ESCO)	Policies Bodies and Governance
ID	Global/ Local	Name	Demand Response						
T.01	G	Energy Consumption (Monthly, Daily...)	YES	YES	YES	YES	YES	YES	YES
T.02	G	Peak to Average Ratio (PAR)	YES	YES	YES	YES	YES	YES	YES
T.03	G	Self-Consumption Rate	YES	N/A	YES	YES	YES	YES	YES
T.04	G	Energy Consumption Reduction (Demand Flexibility)	YES	YES	YES	YES	YES	YES	YES
T.05	G	Demand Flexibility Ratio	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.06	G	Demand Flexibility Request	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.07	G	Demand Flexibility Baseline (Potential)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.08	G	Demand Request Participation	YES	N/A	YES	YES	YES	YES	YES
T.09	G	Demand Request Enrolment	YES	N/A	YES	YES	YES	YES	YES

T.10	G	Peak load reduction	YES	YES	YES	YES	YES	YES	YES
T.11	L	Reactive Energy Consumption	N/A	N/A	N/A				
T.12	L	RES Generation	YES	YES	YES	YES	YES	YES	YES
T.13	L	RES Generation Ratio	YES	YES	YES	YES	YES	YES	YES
Smartening the Distribution Grid									
T.17	L	Energy Losses	N/A	YES	N/A	YES	N/A	N/A	N/A
T.18	L	Energy Losses Ratio	N/A	YES	N/A	YES	N/A	N/A	N/A
T.19	L	Voltage variations	N/A	YES	N/A	YES	YES	N/A	N/A
T.20	L	Number of Grid Events	N/A	YES	N/A	YES	N/A	N/A	N/A
T.21	L	SAIFI	N/A	YES	N/A	YES	N/A	N/A	N/A
T.22	L	SAIDI	N/A	YES	N/A	YES	N/A	N/A	N/A
T.23	L	Power quality (power factor)	N/A	YES	N/A	YES	N/A	N/A	N/A
T.24	L	THD / harmonics distortions	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.25	L	Reduction in time required for fault awareness, localization and isolation	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.26	L	Average frequency Deviation	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.27	L	Reaction time improvement for providing primary control reserve	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Battery Storage									
T.35	L	State of Charge (SOC)	N/A	N/A	YES	N/A	YES	N/A	N/A

T.36	L	Depth of Discharge (DOD)	N/A	N/A	**YES**	**N/A**	**YES**	**N/A**	**N/A**
T.37	L	Average SOC	N/A	N/A	**YES**	**N/A**	**YES**	**N/A**	**N/A**
T.38	L	Battery Demand Flexibility Baseline	**YES**	N/A	**YES**	**YES**	**YES**	**N/A**	**N/A**
T.39	L	Battery Demand Flexibility	**YES**	N/A	**YES**	**YES**	**YES**	**N/A**	**N/A**
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	**YES**	**YES**	**YES**	**N/A**	**YES**	**YES**	**YES**
EC. 02	G	Average Cost of Energy Consumption	**YES**	**YES**	**YES**	**N/A**	**YES**	**YES**	**YES**
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	**YES**	N/A	**YES**	**N/A**	**YES**	**YES**	**YES**
EC. 04	G	Average Cost of Energy Reward	**YES**	N/A	**YES**	**N/A**	**YES**	**YES**	**YES**
EC. 06	L	Average Estimation of Cost savings	**YES**	**YES**	**YES**	**N/A**	**YES**	**YES**	**YES**
EC. 07	L	Cost of ancillary services	N/A	**YES**	N/A	**N/A**	**YES**	**YES**	**YES**
EN. 01	G	CO2 emissions	**YES**	**YES**	**YES**	**N/A**	**YES**	**YES**	**YES**
EN. 02	G	CO2 emissions Reduction	**YES**	**YES**	**YES**	**N/A**	**YES**	**YES**	**YES**
Explicit DR									
S.0 1	L	Number of people changing their behaviour	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S.0 2	L	Number of times social app is accessed	N/A	N/A	N/A	N/A	N/A	N/A	N/A

S.03	L	Demand response campaign penetration in buildings	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S.04	L	Degree of user satisfaction from DR services	N/A	N/A	N/A	N/A	N/A	N/A	N/A

8.3.2 Baseline Scenario and System Information

Key Performance Indicators			Baseline Scenario		
			Data Collection Methodology	Time Intervals	System that the KPI refers to
ID	Global/ Local	Name	Demand Response		
T.01	G	Energy Consumption (Monthly, Daily...)	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS and through power meters on the MV network interfaced to the ASSEM SCADA	Whole period (1 year)	Residential buildings / MV distribution network
T.02	G	Peak to Average Ratio (PAR)	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS and through power meters on the MV network interfaced to the ASSEM SCADA	Whole period (1 year)	Residential buildings / MV distribution network
T.03	G	Self-Consumption Rate	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
T.04	G	Energy Consumption Reduction (Demand Flexibility)	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in	Whole period (1 year)	Residential buildings / MV distribution network

			Zhero ESS and through power meters on the MV network interfaced to the ASSEM SCADA		
T.08	G	Demand Request Participation	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
T.09	G	Demand Request Enrolment	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
T.10	G	Peak load reduction	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS and through power meters on the MV network interfaced to the ASSEM SCADA	Whole period (1 year)	Residential buildings / MV distribution network
T.12	L	RES Generation	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS and through power meters on the MV network interfaced to the ASSEM SCADA	Whole period (1 year)	Residential buildings / MV distribution network
T.13	L	RES Generation Ratio	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS and through power meters on the MV network interfaced to the ASSEM SCADA	Whole period (1 year)	Residential buildings / MV distribution network
Smartening the Distribution Grid					
T.17	L	Energy Losses	Data collected by SCADA of ASSEM	Whole period (1 year)	Distribution grid
T.18	L	Energy Losses Ratio	Data collected by SCADA of ASSEM	Whole period (1 year)	Distribution grid
T.19	L	Voltage variations	Data collected by SCADA of ASSEM	Whole period (1 year)	Distribution grid
T.20	L	Number of Grid Events	Data collected by SCADA of ASSEM	Whole period (1 year)	Distribution grid

T.21	L	SAIFI	Data collected by SCADA of ASSEM	Whole period (1 year)	Distribution grid
T.22	L	SAIDI	Data collected by SCADA of ASSEM	Whole period (1 year)	Distribution grid
T.23	L	Power quality (power factor)	Data collected by SCADA of ASSEM	Whole period (1 year)	Distribution grid
Battery Storage					
T.35	L	State of Charge (SOC)	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
T.36	L	Depth of Discharge (DOD)	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
T.37	L	Average SOC	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
T.38	L	Battery Demand Flexibility Baseline	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
T.39	L	Battery Demand Flexibility	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
T.40	L	VES Demand Flexibility Baseline	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	N/A	N/A
T.41	L	VES Demand Flexibility	Through E@W software component able to get/set data of the Zhero System by using of the	N/A	N/A

			UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS		
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
EC. 02	G	Average Cost of Energy Consumption	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
EC. 04	G	Average Cost of Energy Reward	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
EC. 05	L	Demand Price Elasticity (Self Elasticity)	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	N/A	N/A
EC. 06	L	Average Estimation of Cost savings	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
EC. 07	L	Cost of ancillary services	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings

EN. 01	G	CO_2 emissions	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings
EN. 02	G	CO_2 emissions Reduction	Through E@W software component able to get/set data of the Zhero System by using of the UNE Zhero ESS Web Service's RESTful APIs to retrieve data from energy meters available in Zhero ESS	Whole period (1 year)	Residential buildings

8.3.3 Smart Grid (SG) Project Implementation

Key Performance Indicators			Evaluation Scenario			Revision of data
			Data Collection Methodology *- Who will collect the data?* *-What data needs to be collected?* *-Where will the data be found?* *-How will the data be obtained?*	**Evaluation Method (Questionnaire, Programs) + per Stakeholder**	**Frequency of Data Collection**	**Estimation of Threshold / Measure of success + per Stakeholder (if applicable)**
ID	**Global/ Local**	**Name**	**Demand Response**			
T.01	G	Energy Consumption (Monthly, Daily...)	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	Increase in self-consumption (percentage to be defined) when the "behind-the-meter services" mode of the ESS enabled
T.02	G	Peak to Average Ratio (PAR)	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	KPI reducing when the "behind-the-meter services" mode of the ESS enabled
T.03	G	Self-Consumption Rate	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server;	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	Increase in self-consumption (percentage to be defined) when the

			UNE webserver - RESTful Web Services / SCADA			"behind-the-meter services" mode of the ESS enabled
T.04	G	Energy Consumption Reduction (Demand Flexibility)	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	Energy absorbed from the grid reducing (percentage to be defined) when the "behind-the-meter services" mode of the ESS enabled
T.08	G	Demand Request Participation	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	User's actual participation according the ESS availability in expected to be over a given thresold (TBD)
T.09	G	Demand Request Enrolment	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	User's actual participation according the ESS availability in expected to be over a given thresold (TBD)
T.10	G	Peak load reduction	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	Peak load from the grid reducing (percentage to be defined) when the "behind-the-meter services" mode of the ESS enabled or when the grid configuration is properly adjusted (eg. Reducing peak load on a MV line)
T.12	L	RES Generation	- ASSEM will collect the data - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes)	RES production should not be limited by the provision of ancillary services by residential users or

						the distribution grid management
T.13	L	RES Generation Ratio	- ASSEM will collect the data - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes)	RES production should not be limited by the provision of ancillary services by residential users or the distribution grid management
T.16	L	Energy Mismatch Ratio	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	N/A	N/A	N/A
Smartening the Distribution Grid						
T.17	L	Energy Losses	- ASSEM will collect the data - Measures from SCADA - Oracle database deployed on ASSEM server -All the measurements collected by field equipment are managed by the SCADA deployed at the DSO control center and mirrored on an ORACLE DB, adopted as data repository for the Tools.	evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Energy losses are expected to improve through the grid reconfiguration (threshold TBD)
T.18	L	Energy Losses Ratio	- ASSEM will collect the data - Measures from SCADA - Oracle database deployed on ASSEM server -All the measurements collected by field equipment are managed by the SCADA deployed at the DSO control center and mirrored on an ORACLE DB, adopted as data repository for the Tools.	evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Energy losses are expected to improve through the grid reconfiguration (threshold TBD)
T.19	L	Voltage variations	- ASSEM will collect the data - Measures from SCADA - Oracle database deployed on ASSEM server -All the measurements collected by field equipment are managed by the SCADA deployed at the DSO control center and mirrored	evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Voltage variations are expected to improve through the grid reconfiguration (threshold TBD)

			on an ORACLE DB, adopted as data repository for the Tools.			
T.20	L	Number of Grid Events	- ASSEM will collect the data - Measures from SCADA - Oracle database deployed on ASSEM server -All the measurements collected by field equipment are managed by the SCADA deployed at the DSO control center and mirrored on an ORACLE DB, adopted as data repository for the Tools.	evaluation over a specified period through specific software component	Collection of each event	Grid events are monitored to evaluate how the grid reconfiguration impact on network operation (eg. switch maneuvers to be performed). No thresolds will be defined.
T.21	L	SAIFI	- ASSEM will collect the data - Measures from SCADA - Oracle database deployed on ASSEM server -All the measurements collected by field equipment are managed by the SCADA deployed at the DSO control center and mirrored on an ORACLE DB, adopted as data repository for the Tools.	evaluation over a specified period through specific software component	Collection of each event	Continuity of service is supposed not to be negatively impacted by grid reconfiguration. The threshold for success are indexes evaluated in the past on the network.
T.22	L	SAIDI	- ASSEM will collect the data - Measures from SCADA - Oracle database deployed on ASSEM server -All the measurements collected by field equipment are managed by the SCADA deployed at the DSO control center and mirrored on an ORACLE DB, adopted as data repository for the Tools.	evaluation over a specified period through specific software component	Collection of each event	Continuity of service is supposed not to be negatively impacted by grid reconfiguration. The thresold for success are indexes evaluated in the past on the network.
T.23	L	Power quality (power factor)	- ASSEM will collect the data - Measures from SCADA - Oracle database deployed on ASSEM server -All the measurements collected by field equipment are managed by the SCADA deployed at the DSO control center and mirrored on an ORACLE DB, adopted as data repository for the Tools.	evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Power factor is supposed not to be negatively impacted by grid reconfiguration. The thresold for success are the values evaluated in the past on the network.
Battery Storage						

T.35	L	State of Charge (SOC)	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	SoC is monitored in order to evaluate the impact of ancillary services and behind-the-meter provision on it. No threshold to be defined.
T.36	L	Depth of Discharge (DOD)	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	DoD is monitored in order to evaluate the impact of ancillary services and behind-the-meter provision on it. No threshold to be defined.
T.37	L	Average SOC	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	SoC is monitored in order to evaluate the impact of ancillary services and behind-the-meter provision on it. No threshold to be defined.
T.38	L	Battery Demand Flexibility Baseline	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	User's actual participation according the ESS availability in expected to be over a given thresold (TBD)
T.39	L	Battery Demand Flexibility	- ASSEM will collect the data of overall MV grid, UNE will collect aggregated data of ESS - Measures from Zhero ESS and power meters - Oracle database deployed on ASSEM server; UNE webserver - RESTful Web Services / SCADA	Ex-post evaluation of the KPI over a specified time period	Settable frequency (every 1-5 minutes) for Oracle db; 15 minutes for UNE Sql db.	User's actual participation according the ESS availability in expected to be over a given thresold (TBD)
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	- ASSEM will collect the data - Measures from Zhero ESS - Oracle database deployed on ASSEM server - RESTful Web Services	Evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Given the increase in self-consumption when the "behind-the-meter services" mode of the ESS enabled, the cost of energy is expected to decrease

						(percentage to be defined)
EC. 02	G	Average Cost of Energy Consumption	- ASSEM will collect the data - Measures from Zhero ESS - Oracle database deployed on ASSEM server - RESTful Web Services	Evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Given the increase in self-consumption when the "behind-the-meter services" mode of the ESS enabled, the cost of energy is expected to decrease (percentage to be defined)
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	- ASSEM will collect the data - Measures from Zhero ESS - Oracle database deployed on ASSEM server - RESTful Web Services	Evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Cost of Energy reward is monitored in order to evaluate the impact on it of ancillary services. No threshold to be defined.
EC. 04	G	Average Cost of Energy Reward	- ASSEM will collect the data - Measures from Zhero ESS - Oracle database deployed on ASSEM server - RESTful Web Services	Evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Average Cost of Energy reward is monitored in order to evaluate the impact on it of ancillary services. No threshold to be defined.
EC. 05	L	Demand Price Elasticity (Self Elasticity)	N/A	N/A	Settable frequency (every 1-5 minutes)	Demand Price Elasticity (Self Elasticity)
EC. 06	L	Average Estimation of Cost savings	- ASSEM will collect the data - Measures from Zhero ESS - Oracle database deployed on ASSEM server - RESTful Web Services	Evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Average Cost savings are monitored in order to evaluate the impact on it of ancillary services. No threshold to be defined.

EC. 07	L	Cost of ancillary services	- ASSEM will collect the data - Measures from Zhero ESS - Oracle database deployed on ASSEM server - RESTful Web Services	Evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Cost of ancillary services are monitored in order to evaluate the impact on it of ancillary services. No threshold to be defined.
EN. 01	G	CO2 emissions	- ASSEM will collect the data - Measures from Zhero ESS - Oracle database deployed on ASSEM server - RESTful Web Services	Evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Given the increase in self-consumption when the "behind-the-meter services" mode of the ESS enabled and the reduction in grid's energy losses, the cost of energy is expected to decrease (percentage to be defined)
EN. 02	G	CO2 emissions Reduction	- ASSEM will collect the data - Measures from Zhero ESS - Oracle database deployed on ASSEM server - RESTful Web Services	Evaluation over a specified period through specific software component	Settable frequency (every 1-5 minutes)	Given the increase in self-consumption when the "behind-the-meter services" mode of the ESS enabled and the reduction in grid's energy losses, the cost of energy is expected to decrease (percentage to be defined)

8.3.4 Stakeholders engagement

Key Performance Indicators			Roles and Responsibilities
ID	Global/ Local	Name	Demand Response
T.01	G	Energy Consumption (Monthly, Daily...)	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market). DSO checks the network's operating perfomance according the measurements collected on the MV grid.
T.02	G	Peak to Average Ratio (PAR)	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market). DSO checks the network's operating perfomance according the measurements collected on the MV grid.
T.03	G	Self-Consumption Rate	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market).
T.04	G	Energy Consumption Reduction (Demand Flexibility)	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market). DSO checks the network's operating perfomance according the measurements collected on the MV grid.
T.08	G	Demand Request Participation	Prosumers engaged through the provision of their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market).
T.09	G	Demand Request Enrolment	Prosumers engaged through the provision of their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market).

T.10	G	Peak load reduction	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market). DSO checks the network's operating perfomance according the measurements collected on the MV grid.
T.12	L	RES Generation	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market). DSO checks the network's operating perfomance according the measurements collected on the MV grid.
T.13	L	RES Generation Ratio	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market). DSO checks the network's operating perfomance according the measurements collected on the MV grid.
Smartening the Distribution Grid			
T.17	L	Energy Losses	DSO collects all measurements for calculating the KPI and checks the network's operating perfomance according to the KPI obtained.
T.18	L	Energy Losses Ratio	DSO collects all measurements for calculating the KPI and checks the network's operating perfomance according to the KPI obtained.
T.19	L	Voltage variations	DSO collects all measurements for calculating the KPI and checks the network's operating perfomance according to the KPI obtained.
T.20	L	Number of Grid Events	DSO collects all measurements for calculating the KPI and checks the network's operating perfomance according to the KPI obtained.
T.21	L	SAIFI	DSO collects all measurements for calculating the KPI and checks the network's operating perfomance according to the KPI obtained.
T.22	L	SAIDI	DSO collects all measurements for calculating the KPI and checks the network's operating perfomance according to the KPI obtained.
T.23	L	Power quality (power factor)	DSO collects all measurements for calculating the KPI and checks the network's operating perfomance according to the KPI obtained.
Battery Storage			
T.35	L	State of Charge (SOC)	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network.

			ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market).
T.36	L	Depth of Discharge (DOD)	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market).
T.37	L	Average SOC	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market).
T.38	L	Battery Demand Flexibility Baseline	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market).
T.39	L	Battery Demand Flexibility	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network. ESS managed by MV-DNMT to provide ancillary services to network (in future, to be offered by Aggregators on the market).
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network, DSO manages dispersed energy storage and collects and provides all measurements for calculating the KPI
EC. 02	G	Average Cost of Energy Consumption	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network, DSO manages dispersed energy storage and collects and provides all measurements for calculating the KPI
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network, DSO manages dispersed energy storage and collects and provides all measurements for calculating the KPI
EC. 04	G	Average Cost of Energy Reward	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network, DSO manages dispersed energy storage and collects and provides all measurements for calculating the KPI
EC. 06	L	Average Estimation of Cost savings	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network, DSO manages dispersed energy storage and collects and provides all measurements for calculating the KPI

EC. 07	L	Cost of ancillary services	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network, DSO manages dispersed energy storage and collects and provides all measurements for calculating the KPI
EN. 01	G	CO2 emissions	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network, DSO manages dispersed energy storage and collects and provides all measurements for calculating the KPI
EN. 02	G	CO2 emissions Reduction	Prosumers engaged through the maximization of self-consumption and providing their flexibility to the network, DSO manages dispersed energy storage and collects and provides all measurements for calculating the KPI

8.4 Barcelona

8.4.1 KPIs update

Key Performance Indicators			Use Cases					Stakeholders Group			
			BCN_UCA_01 – Optimization of swimming pool control	*BCN_UCA_02 Usage of the swimming pool as a thermal storage system*	*BCN_UCB_01 Stacking battery functionalities*	*BCN_UCB_02 Smartening the distribution grid: services to the grid*	*BCN_UCC_01 Usage of battery system in case of grid outages*	**DSO**	**End Users**	**Market Operator (inc. Retailer / ESCO)**	**Policies Bodies and Governance**
ID	**Global/ Local**	**Name**			**Demand Response**						
T.01	G	Energy Consumption (Monthly, Daily...)	YES	YES	YES	YES	YES	YES	YES	YES	YES
T.02	G	Peak to Average Ratio (PAR)	YES	YES	YES	N/A	N/A	YES	YES	YES	YES
T.03	G	Self-Consumption Rate	YES	N/A	N/A	N/A	N/A	YES	YES	YES	YES

T.04	G	Energy Consumption Reduction (Demand Flexibility)	N/A	YES	YES	YES	N/A	YES	YES	YES	YES
T.05	G	Demand Flexibility Ratio	N/A	YES	YES	YES	N/A	YES	YES	YES	YES
T.06	G	Demand Flexibility Request	N/A	YES	YES	YES	N/A	YES	YES	YES	YES
T.07	G	Demand Flexibility Baseline (Potential)	N/A	YES	YES	YES	N/A	YES	YES	YES	N/A
T.09	G	Demand Request Enrolment	N/A	YES	YES	YES	N/A	YES	YES	YES	N/A
T.10	G	Peak load reduction	N/A	YES	YES	N/A	N/A	YES	YES	YES	N/A
T.12	L	RES Generation	YES	N/A	N/A	YES	N/A	N/A	YES	N/A	YES
T.13	L	RES Generation Ratio	YES	N/A	N/A	YES	N/A	N/A	YES	N/A	N/A
Smartening the Distribution Grid											
T.21	L	SAIFI	N/A	N/A	N/A	N/A	YES	YES	YES	N/A	N/A
T.22	L	SAIDI	N/A	N/A	N/A	N/A	YES	YES	YES	N/A	N/A
Battery Storage											
T.35	L	State of Charge (SOC)	N/A	N/A	YES	N/A	YES	N/A	YES	YES	N/A
T.36	L	Depth of Discharge (DOD)	N/A	N/A	YES	N/A	YES	N/A	YES	YES	N/A
T.37	L	Average SOC	N/A	N/A	YES	N/A	YES	N/A	YES	YES	N/A
T.38	L	Battery Demand Flexibility Baseline	N/A	N/A	YES	N/A	N/A	N/A	YES	YES	N/A

T.39	L	Battery Demand Flexibility	N/A	N/A	YES	N/A	N/A	N/A	YES	YES	N/A
T.40	L	VES Demand Flexibility Baseline	N/A	YES	N/A	N/A	N/A	N/A	YES	YES	N/A
T.41	L	VES Demand Flexibility	N/A	YES	N/A	N/A	N/A	N/A	YES	YES	N/A
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	YES	YES	YES	YES	N/A	N/A	YES	YES	N/A
EC. 02	G	Average Cost of Energy Consumption	YES	YES	YES	YES	N/A	N/A	YES	YES	N/A
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	N/A	YES	N/A	YES	N/A	N/A	YES	YES	N/A
EC. 04	G	Average Cost of Energy Reward	N/A	YES	N/A	YES	N/A	N/A	YES	YES	N/A
EC. 06	L	Average Estimation of Cost savings	YES	YES	YES	YES	N/A	N/A	YES	YES	N/A
EC. 07	L	Cost of ancillary services	N/A	N/A	YES	N/A	N/A	N/A	YES	YES	N/A
EN. 01	G	CO2 emissions	YES	YES	YES	YES	N/A	YES	YES	YES	YES
EN. 02	G	CO2 emissions Reduction	YES	YES	YES	YES	N/A	N/A	YES	YES	YES
EN. 03	L	Thermal Comfort	YES	YES	N/A	N/A	N/A	N/A	YES	N/A	N/A
EN. 06	L	Thermal Comfort Deviation	YES	YES	N/A	N/A	N/A	N/A	YES	N/A	N/A

8.4.2 Baseline Scenario and System Information

Key Performance Indicators			Baseline Scenario		
			Data Collection Methodology	*Time Intervals*	*System that the KPI refers to*
ID	**Global/ Local**	**Name**	**Demand Response**		
T.01	G	Energy Consumption (Monthly, Daily...)	Historical Data from CHESS SET UP project	Whole period (6months)	Swimming pool system
T.02	G	Peak to Average Ratio (PAR)	Historical Data from CHESS SET UP project	Whole period (6months)	Swimming pool system
T.03	G	Self-Consumption Rate	Historical Data from CHESS SET UP project	Whole period (6months)	Swimming pool system
T.04	G	Energy Consumption Reduction (Demand Flexibility)	N/A	Whole period (6months)	Swimming pool system
T.05	G	Demand Flexibility Ratio	N/A	Whole period (6months)	Swimming pool system
T.06	G	Demand Flexibility Request	N/A	Whole period (6months)	Swimming pool system
T.07	G	Demand Flexibility Baseline (Potential)	N/A	Whole period (6months)	Swimming pool system
T.09	G	Demand Request Enrolment	N/A	Whole period (6months)	Swimming pool system
T.10	G	Peak load reduction	N/A	Whole period (6months)	Swimming pool system
T.12	L	RES Generation	Historical Data from CHESS SET UP project	Whole period (6months)	PV system
T.13	L	RES Generation Ratio	Historical Data from CHESS SET UP project	Whole period (6months)	PV system
Smartening the Distribution Grid					
T.21	L	SAIFI	N/A	Whole period (6months)	Battery management system
T.22	L	SAIDI	N/A	Whole period (6months)	Battery management system
Battery Storage					

T.35	L	State of Charge (SOC)	N/A	Whole period (6months)	Battery management system
T.36	L	Depth of Discharge (DOD)	N/A	Whole period (6months)	Battery management system
T.37	L	Average SOC	N/A	Whole period (6months)	Battery management system
T.38	L	Battery Demand Flexibility Baseline	N/A	Whole period (6months)	Battery management system
T.39	L	Battery Demand Flexibility	N/A	Whole period (6months)	Battery management system
T.40	L	VES Demand Flexibility Baseline	N/A	Whole period (6months)	Swimming pool system
T.41	L	VES Demand Flexibility	N/A	Whole period (6months)	Swimming pool system
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	Data collected during the course of the inteGRIDy project	Whole period (6months)	Swimming pool system
EC. 02	G	Average Cost of Energy Consumption	Data collected during the course of the inteGRIDy project	Whole period (6months)	Swimming pool system
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	Data collected during the course of the inteGRIDy project	Whole period (6months)	Swimming pool system
EC. 04	G	Average Cost of Energy Reward	Data collected during the course of the inteGRIDy project	Whole period (6months)	Swimming pool system
EC. 06	L	Average Estimation of Cost savings	Data collected during the course of the inteGRIDy project	Whole period (6months)	Swimming pool system
EC. 07	L	Cost of ancillary services	Data collected during the course of the inteGRIDy project	Whole period (6months)	Swimming pool system
EN. 01	G	CO2 emissions	Data collected during the course of the inteGRIDy project	Whole period (6months)	Swimming pool system
EN. 02	G	CO2 emissions Reduction	Data collected during the course of the inteGRIDy project	Whole period (6months)	Swimming pool system
EN. 03	L	Thermal Comfort	Data collected during the course of the inteGRIDy project	Whole period (6months)	Swimming pool system
EN. 06	L	Thermal Comfort Deviation	Data collected during the course of the inteGRIDy project	Whole period (6months)	Swimming pool system

8.4.3 Smart Grid (SG) Project Implementation

Key Performance Indicators			Evaluation Scenario			Revision of data
			Data Collection Methodology - *Who will collect the data?* *-What data needs to be collected?* *-Where will the data be found?* *-How will the data be obtained?*	**Evaluation Method (Questionnaire, Programs) + per Stakeholder**	**Frequency of Data Collection**	**Estimation of Threshold / Measure of success + per Stakeholder (if applicable)**
ID	**Global/ Local**	**Name**	**Demand Response**			
T.01	G	Energy Consumption (Monthly, Daily...)	- AIGUASOL/TEES will collect the data - Metrics from energy meters - SCADA database - ModBus interface	Program that counts the energy consumption of the sport centre depending on the values of the smart meters	15 min	Estimation of the overall reduction: 15%
T.02	G	Peak to Average Ratio (PAR)	- AIGUASOL/TEES will collect the data - Metrics from energy meters - SCADA database - ModBus interface	Program that counts the energy consumption of the sport centre depending on the values of the smart meters, finding the peak energy consumption and the average	15 min	Estimation of the overall reduction: 5%
T.03	G	Self-Consumption Rate	- AIGUASOL/TEES will collect the data - Metrics from energy meters - SCADA database - ModBus interface	Program that counts the energy self-consumption of the sport centre depending on the values of the smart meters, finding the energy consumption and the RES Generation.	15 min	Estimation: 3%
T.04	G	Energy Consumption Reduction (Demand Flexibility)	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that counts the energy consumption of the sport centre depending on the values of the smart meters, compares with the baseline and gives as output the difference of the two	15 min	TBD
T.05	G	Demand Flexibility Ratio	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that gives the division of the demand flexibility and baseline energy consumption	15 min	TBD

T.06	G	Demand Flexibility Request	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that gives the difference between baseline energy consumption and requested (proposed) energy consumption from DR components	15 min	TBD
T.07	G	Demand Flexibility Baseline (Potential)	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that gives the difference between baseline energy consumption and potential energy consumption.	15 min	TBD
T.09	G	Demand Request Enrolment	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that gives the division between Demand Flexibility and Demand Flexibility Request	15 min	Highest possible
T.10	G	Peak load reduction	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that gives the difference between peak load of baseline assessment and peak load after the inteGRIDy solution	15 min	5% peak reduction
T.12	L	RES Generation	- AIGUASOL/TEES will collect the data - Metrics from AC buses energy meters - Inverter internal memory - ModBus interface	Program that counts the RES generation of the sport centre depending on the values of the smart meters.	15 min	5-10 kWp
T.13	L	RES Generation Ratio	- AIGUASOL/TEES will collect the data - Metrics from AC buses energy meters - Inverter internal memory - ModBus interface	Program that gives the division of the RES generation and the nominal generation capacity	15 min	5-10 kWp
Smartening the Distribution Grid						
T.21	L	SAIFI	- AIGUASOL/TEES will collect the data - Metrics from AC buses energy meters - Inverter internal memory - ModBus interface	Program that counts the average number of interruptions	15 min	Lowest possible
T.22	L	SAIDI	- AIGUASOL/TEES will collect the data - Metrics from AC buses energy meters - Inverter internal memory - ModBus interface	Program that counts the average duration of the interruptions	15 min	Lowest possible
Battery Storage						

T.35	L	State of Charge (SOC)	- AIGUASOL/TEES will collect the data - Battery Voltage from Battery meters - Inverter internal memory - ModBus interface	Algoritms that calculates the rate of the remaining capacity of the battery and the rated capacity	15 min	10% - 90% (battery specifications)
T.36	L	Depth of Discharge (DOD)	- AIGUASOL/TEES will collect the data - Battery Voltage from Battery meters - Inverter internal memory - ModBus interface	Algoritms that calculates the 1-SOC	15 min	10% (battery specifications)
T.37	L	Average SOC	- AIGUASOL/TEES will collect the data - Battery Voltage from Battery meters - Inverter internal memory - ModBus interface	Program that calculates the average SOC and compares it with the high and low SOC	15 min	Sunlight battery specifications
T.38	L	Battery Demand Flexibility Baseline	- AIGUASOL/TEES will collect the data - Battery Voltage from Battery meters - Inverter internal memory - ModBus interface	Program that calculates the difference between energy consumption dedicated to battery charging prior to inteGRIDy project and potential energy consumption	15 min	Sunlight battery specifications
T.39	L	Battery Demand Flexibility	- AIGUASOL/TEES will collect the data - Battery Voltage from Battery meters - Inverter internal memory - ModBus interface	Program that calculates the difference between energy consumption dedicated to battery charging prior to inteGRIDy project and actual Energy consumption dedicated to Batteries charging	15 min	Sunlight battery specifications
T.40	L	VES Demand Flexibility Baseline	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that calculates the difference between energy consumption dedicated toVES charging prior to inteGRIDy project and potential energy consumption	15 min	TBD
T.41	L	VES Demand Flexibility	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that calculates the difference between energy consumption dedicated to VES charging prior to inteGRIDy project and actual Energy consumption dedicated to Batteries charging	15 min	TBD

EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that calculates the multiplication of the energy consumption of the sport centre depending on the values of the smart meters and its cost	15 min	TBD
EC. 02	G	Average Cost of Energy Consumption	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that counts the energy consumption of the sport centre depending on the values of the smart meters and its cost and gives the rate of the cost/energy consumption	15 min	TBD
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that calculates the multiplication of the demand flexibility and the price proposed	15 min	TBD
EC. 04	G	Average Cost of Energy Reward	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that calculates the rate of cost energy reward and of demand flexibility	15 min	TBD
EC. 06	L	Average Estimation of Cost savings	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that calculates the energy savings of the stakeholders, during the control operation	15 min	TBD
EC. 07	L	Cost of ancillary services	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that calculates the energy savings of the stakeholders due peak shaving.	15 min	TBD
EN. 01	G	CO2 emissions	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that calculates the CO2 emissions based on the energy consumption	15 min	Will be evaluated with EN.02
EN. 02	G	CO2 emissions Reduction	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that calculates the CO2 emissions based on the energy consumption reduction	15 min	Estimation of 15% decrease
EN. 03	L	Thermal Comfort	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW	Program that calculates the end user thermal comfort depending	15 min	http://comfort.cbe.berkeley.edu/

			- RESTful service	on the values of the temperature sensors		
EN. 06	L	Thermal Comfort Deviation	- AIGUASOL/TEES will collect the data - Metrics from energy meters - RKW - RESTful service	Program that calculates the thermal confort deviation depending on the values of the values of the temperature sensors and the commonly accepted standards	15 min	Lowest Possible

8.4.4 Stakeholders engagement

Key Performance Indicators			Roles and Responsibilities
ID	**Global/ Local**	**Name**	**Demand Response**
T.01	G	Energy Consumption (Monthly, Daily...)	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.02	G	Peak to Average Ratio (PAR)	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.03	G	Self-Consumption Rate	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.04	G	Energy Consumption Reduction (Demand Flexibility)	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.05	G	Demand Flexibility Ratio	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.06	G	Demand Flexibility Request	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI

T.07	G	Demand Flexibility Baseline (Potential)	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.09	G	Demand Request Enrolment	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.10	G	Peak load reduction	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.12	L	RES Generation	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.13	L	RES Generation Ratio	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
Smartening the Distribution Grid			
T.21	L	SAIFI	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.22	L	SAIDI	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
Battery Storage			
T.35	L	State of Charge (SOC)	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.36	L	Depth of Discharge (DOD)	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.37	L	Average SOC	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.38	L	Battery Demand Flexibility Baseline	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.39	L	Battery Demand Flexibility	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
T.40	L	VES Demand Flexibility Baseline	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI

T.41	L	VES Demand Flexibility	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
EC. 02	G	Average Cost of Energy Consumption	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
EC. 04	G	Average Cost of Energy Reward	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
EC. 06	L	Average Estimation of Cost savings	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
EC. 07	L	Cost of ancillary services	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
EN. 01	G	CO2 emissions	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
EN. 02	G	CO2 emissions Reduction	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
EN. 03	L	Thermal Comfort	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI
EN. 06	L	Thermal Comfort Deviation	- TEES/AIGUASOL will provide essential data for the calculation of the KPI - AIGUASOL will provide the calculated KPI

8.5 St. Jean

8.5.1 KPIs update

Key Performance Indicators			Use Cases			Stakeholders Group			
			INN_UC01 - Explicit Demand Response in residential and commercial premises	*INN_UC02 - Demand Flexibility analysis and forecasting*	*INN_UC_03 - Energy storage technologies*	DSO	End Users	Market Operator (inc. Retailer / ESCO)	Policies Bodies and Governance
ID	**Global/ Local**	**Name**	**Demand Response**						
T.01	G	Energy Consumption (Monthly, Daily...)	YES	YES	YES	YES	YES	YES	YES
T.02	G	Peak to Average Ratio (PAR)	YES	YES	YES	YES	YES	YES	YES
T.04	G	Energy Consumption Reduction (Demand Flexibility)	YES	YES	YES	YES	YES	YES	N/A
T.05	G	Demand Flexibility Ratio	YES	YES	YES	YES	YES	YES	N/A
T.06	G	Demand Flexibility Request	YES	YES	YES	YES	YES	N/A	N/A
T.07	G	Demand Flexibility Baseline (Potential)	YES	YES	YES	YES	YES	N/A	N/A
T.08	G	Demand Request Participation	YES	YES	YES	YES	YES	N/A	N/A
T.09	G	Demand Request Enrolment	YES	YES	YES	YES	YES	N/A	N/A
T.10	G	Peak load reduction	YES	YES	YES	YES	YES	YES	YES

Battery Storage									
T.40	L	VES Demand Flexibility Baseline	N/A	YES	YES	YES	YES	N/A	N/A
T.41	L	VES Demand Flexibility	N/A	YES	YES	YES	YES	N/A	N/A
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	YES	YES	YES	YES	YES	YES	N/A
EC. 02	G	Average Cost of Energy Consumption	YES	YES	YES	YES	YES	YES	N/A
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	YES	YES	YES	YES	YES	YES	N/A
EC. 04	G	Average Cost of Energy Reward	YES	YES	YES	YES	YES	YES	N/A
EC. 06	L	Average Estimation of Cost savings	YES	YES	YES	YES	YES	YES	N/A
EN. 01	G	CO2 emissions	YES	YES	YES	YES	YES	N/A	YES
EN. 02	G	CO2 emissions Reduction	YES	YES	YES	YES	YES	N/A	YES
EN. 03	L	Thermal Comfort	YES	YES	YES	YES	YES	N/A	N/A
EN. 04	L	Visual Comfort	YES	YES	N/A	YES	YES	N/A	N/A
Explicit DR									
S.0 3	L	Demand response campaign penetration in buildings	YES	YES	YES	YES	YES	N/A	N/A
S.0 4	L	Degree of user satisfaction from DR services	YES	YES	N/A	YES	YES	N/A	N/A

8.5.2 Baseline Scenario and System Information

Key Performance Indicators			Baseline Scenario		
			Data Collection Methodology	*Time Intervals*	*System that the KPI refers to*
ID	**Global/ Local**	**Name**	**Demand Response**		
T.01	G	Energy Consumption (Monthly, Daily...)	Total energy consumption data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings
T.02	G	Peak to Average Ratio (PAR)	Total energy consumption data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings
T.04	G	Energy Consumption Reduction (Demand Flexibility)	Total energy consumption, individual load energy consumption, operational status of water heater, HVAC and lighting systems, and indoor ambient data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings
T.05	G	Demand Flexibility Ratio	Total energy consumption, individual load energy consumption, operational status of water heater, HVAC and lighting systems, and indoor ambient data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings
T.06	G	Demand Flexibility Request	Collection of total energy consumption data at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings
T.07	G	Demand Flexibility Baseline (Potential)	Total energy consumption, individual load energy consumption, operational status of water heater, HVAC and lighting systems, and indoor ambient data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings
T.08	G	Demand Request Participation	Total energy consumption, individual load energy consumption, operational status of water heater, HVAC and lighting systems, and indoor ambient data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings

T.09	G	Demand Request Enrolment	Total energy consumption, individual load energy consumption, operational status of water heater, HVAC and lighting systems, and indoor ambient data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings
T.10	G	Peak load reduction	-Collection of total energy consumption data at the premises of the end-users. -Historical data regarding the pilot user consumption before the project	Whole period (1 year)	Residential and Commercial buildings
Battery Storage					
T.40	L	VES Demand Flexibility Baseline	Total energy consumption, individual load energy consumption, operational status of water heater, HVAC and lighting systems, and indoor ambient data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings
T.41	L	VES Demand Flexibility	Total energy consumption, individual load energy consumption, operational status of water heater, HVAC and lighting systems, and indoor ambient data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	-Total energy consumption collected at the premises of the end-users. - Financial information to be provided by SOREA	Whole period (1 year)	Residential and Commercial buildings
EC. 02	G	Average Cost of Energy Consumption	-Total energy consumption collected at the premises of the end-users. - Financial information to be provided by SOREA	Whole period (1 year)	Residential and Commercial buildings
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	Total energy consumption, individual load energy consumption, operational status of water heater, HVAC and lighting systems, and indoor ambient data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings
EC. 04	G	Average Cost of Energy Reward	Total energy consumption, individual load energy consumption, operational status of water heater, HVAC and lighting systems, and indoor ambient data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings

EC. 06	L	Average Estimation of Cost savings	Total energy consumption, individual load energy consumption, operational status of water heater, HVAC and lighting systems, and indoor ambient data collected at the premises of the end-users	Whole period (1 year)	Residential and Commercial buildings
EN. 01	G	CO_2 emissions	-Total energy consumption collected at the premises of the end-users. SOREA will provide the relative cost information - Data related to the CO_2 emissions to be provided by SOREA	Whole period (1 year)	Residential and Commercial buildings
EN. 02	G	CO_2 emissions Reduction	-Total energy consumption collected at the premises of the end-users. SOREA will provide the relative cost information - Data related to the CO_2 emissions to be provided by SOREA	Whole period (1 year)	Residential and Commercial buildings
EN. 03	L	Thermal Comfort	Total and individual load energy consumption, operational status of HVAC conditions and indoor ambient data collected at the premises of the end-users.	Whole period (1 year)	Residential and Commercial buildings
EN. 04	L	Visual Comfort	Total and individual load energy consumption, operational status of lighting conditions and indoor ambient data collected at the premises of the end-users.	Whole period (1 year)	Residential and Commercial buildings
Explicit DR					
S.03	L	Demand response campaign penetration in buildings	Total energy consumption collected at the premises of the end-users.	Whole period (1 year)	Residential and Commercial buildings
S.04	L	Degree of user satisfaction from DR services	Either through face two face sessions or by using an on-line platform for the qustionnaire distribution	Whole period (1 year)	Residential and Commercial buildings

8.5.3 *Smart Grid (SG) Project Implementation*

Key Performance Indicators			Evaluation Scenario			Revision of data
			Data Collection Methodology *- Who will collect the data?* *-What data needs to be collected?* *-Where will the data be found?* *-How will the data be obtained?*	**Evaluation Method (Questionnaire, Programs) + per Stakeholder**	**Frequency of Data Collection**	**Estimation of Threshold / Measure of success + per Stakeholder (if applicable)**
ID	**Global/ Local**	**Name**	**Demand Response**			
T.01	G	Energy Consumption (Monthly, Daily...)	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	The KPI is calculated and visualised per asset through the visualisation and analytics tool (Visual Analytics Engine - VAE) developed by TREK.	Currently the collection of energy consumption data is event driven	N/A
T.02	G	Peak to Average Ratio (PAR)	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	KPI calculated through a dedicated algorithm	- Currently the collection of energy consumption data is event driven - KPI calculated for the entire portfolio for a specified period (month, year)	A rough estimation of the PAR reduction at the pilot sites is about 20% upon implementation of the developed tool.
T.04	G	Energy Consumption Reduction (Demand Flexibility)	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Multi-sensors installed to monitor the indoor conditions at the user premises. - Temperature meter installed to monitor the water heater temperature - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to the water heater, lighting and HVAC systems at the end-user's premises to measure and control	The demand flexibility is individually calculated for each end-user by the Demand Side Energy Profiling (DSEP) tool developed by TREK. The KPI is visualised throught the VAE interface for specific assets.	- Currently the collection of energy consumption data is event driven - KPI calculated upon request for a user defined period	Within the context of the St Jean pilot activities, the demand flexibility is context-aware and calculated per asset. For the estimation of a measure of success scenario see T.05 below

			individual loads, and monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the DR signals.. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises			
T.05	G	Demand Flexibility Ratio	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Multi-sensors installed to monitor the indoor conditions at the user premises. - Temperature meter installed to monitor the water heater temperature - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to the water heater, lighting and HVAC systems at the end-user's premises to measure and control individual loads, and monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the DR signals.. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	The demand flexibility is individually calculated for each end-user by the Demand Side Energy Profiling (DSEP) tool developed by TREK. The KPI is calculated through a dedicated algorithm	- Currently the collection of energy consumption data is event driven - KPI calculated for the entire portfolio or group of assets upon request per a user defined period	A rough estimation for the success threshold is a reduction of about 4-8%
T.06	G	Demand Flexibility Request	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	KPI calculated through the visualization and analytics tool (Visual Analytics Engine - VAE) developed by TREK and provided to the DSO (SOREA).	- Currently the collection of energy consumption data is event driven - KPI calculated upon request for the entire portfolio for a user defined period	Remains to be defined
T.07	G	Demand Flexibility Baseline (Potential)	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Multi-sensors installed to monitor the indoor	The demand flexibility is individually calculated for each end-user by the Demand Side Energy Profiling (DSEP) tool developed by TREK. The KPI is	- Currently the collection of energy consumption data is event driven - KPI calculated for the entire portfolio upon request per group of asset for a user defined period	The success threshold is estimated in comparison to the baseline consumption

			conditions at the user premises. - Temperature meter installed to monitor the water heater temperature - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to the water heater, lighting and HVAC systems at the end-user's premises to measure and control individual loads, and monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the DR signals.. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	calculated throught the VAE tool for specific assets.		calculated based on the collected data for each category of the asset classification. Target value remains to be defined
T.08	G	Demand Request Participation	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Multi-sensors installed to monitor the indoor conditions at the user premises. - Temperature meter installed to monitor the water heater temperature - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to the water heater, lighting and HVAC systems at the end-user's premises to measure and control individual loads, and monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the DR signals.. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	The KPI is calculated throught the VAE tool	- Currently the collection of energy consumption data is event driven - KPI calculated for the entire portfolio upon event (applied DR action)	The higher the participation the more successful the implemented DR strategy
T.09	G	Demand Request Enrolment	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Multi-sensors installed to monitor the indoor	The ratio is calculated by the VAE tool	- Currently the collection of energy consumption data is event driven - The request participation is selected by the DSO based on the feedback received from the DSS of the VAE. - The demand	The ratio threshold is estimated to at least 50% for the campaign to be considered succesful

			conditions at the user premises. - Temperature meter installed to monitor the water heater temperature - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to the water heater, lighting and HVAC systems at the end-user's premises to measure and control individual loads, and monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the DR signals.. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises		flexibility baseline is calcualted upon request by the VAE tool	
T.10	G	Peak load reduction	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	Calculation through a dedicated algorithm	Calculated upon request for a specified period	A rough estimation of the PAR reduction at the pilot sites is about 20% upon implementation of the developed tool.
Battery Storage						
T.40	L	VES Demand Flexibility Baseline	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Multi-sensors installed to monitor the indoor conditions at the user premises. - Temperature meter installed to monitor the water heater temperature - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to the water heater, lighting and HVAC systems at the end-user's premises to measure and control individual loads, and monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the	The demand flexibility potential is individually calculated for each end-user in respect to their comfort boundaries and VES capabilities by the Demand Side Energy Profiling (DSEP) tool developed by TREK.	- Currently the collection of energy consumption data is event driven - KPI calculated per asset for a user defined period	The VES capacity, depending on the building typology and the water heater capacity at the premises of the pilot users, is calculated by the modelling mechanism of the DSEP tool developed by TREK. As the tool has not yet been deployed, no estimation of this KPI is available yet.

			DR signals.. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises			
T.41	L	VES Demand Flexibility	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Multi-sensors installed to monitor the indoor conditions at the user premises. - Temperature meter installed to monitor the water heater temperature - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to the water heater, lighting and HVAC systems at the end-user's premises to measure and control individual loads, and monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the DR signals.. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	The flexibility offered due to the VES capabilities of each individual end-user against their estimated flexibility is calculated by the Demand Side Energy Profiling (DSEP) tool developed by TREK.	- Currently the collection of energy consumption data is event driven - KPI calculated per asset for a user defined period	The higher the load reduction achieved in respect to the available demand flexibility due to VES per end-user the higher the success of the KPI. However, an estimation of the success threshold cannot be provided at this point as the DSEP tool has not been deployed yet
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	KPI calculated through the Visual Analytics Engine - VAE developed by TREK and provided to the DSO (SOREA).	- Currently the collection of energy consumption data is event driven	To be decided
EC. 02	G	Average Cost of Energy Consumption	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	KPI calculated by a dedicated algorithm based on information received from the VAE analytics	- Currently the collection of energy consumption data is event driven	To be decided

EC. 03	G	Cost of Energy reward (based on contractual Agreement)	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Multi-sensors installed to monitor the indoor conditions at the user premises. - Temperature meter installed to monitor the water heater temperature - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to the water heater, lighting and HVAC systems at the end-user's premises to measure and control individual loads, and monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the DR signals.. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	The calculation of the demand flexibility of the end users will be conducted by the Demand Side Energy Profiling (DSEP) tool developed by TREK. The KPI will be calculated by a dedicated algorithm	upon request (monthly, daily...)	To be decided
EC. 04	G	Average Cost of Energy Reward	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Multi-sensors installed to monitor the indoor conditions at the user premises. - Temperature meter installed to monitor the water heater temperature - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to the water heater, lighting and HVAC systems at the end-user's premises to measure and control individual loads, and monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the DR signals.. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	The calculation of the demand flexibility of the end users will be conducted by the Demand Side Energy Profiling (DSEP) tool developed by TREK. The KPI will be calculated by a dedicated algorithm	upon request	To be decided

EC. 06	L	Average Estimation of Cost savings	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Multi-sensors installed to monitor the indoor conditions at the user premises. - Temperature meter installed to monitor the water heater temperature - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to the water heater, lighting and HVAC systems at the end-user's premises to measure and control individual loads, and monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the DR signals.. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	The demand flexibility potential is individually calculated for each end-userby the Demand Side Energy Profiling (DSEP) tool developed by TREK. The KPI is calculated by the VAE tool.	upon request	To be decided
EN. 01	G	CO2 emissions	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	The KPI will be calculated and visualised using the analytics and visualisation functionalities of the VAE tool.	- Energy consumption data collected on an event-base - KPI calculated upon request for a user defined period	N/A
EN. 02	G	CO2 emissions Reduction	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	The KPI will be calculated and evaluated using the analytics and visualisation functionalities of the VAE tool.	- Energy consumption data collected on an event-base - KPI calculated upon request for a user defined period	Estimated 10% reduction
EN. 03	L	Thermal Comfort	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption	The thermal comfort profiles will be extracted from the DSEP tool developed by TREK	- Energy consumption data collected on an event-base - KPI updated on an event-base	As the thermal comfort is calculated based on the DSEP tool developed by TREK is based on a

			- Multi-sensors to monitor the indoor conditions at the user premises. - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to specific devices at the end-user premises to measure and control individual loads. - Actuators installed at the HVAC system at the end-user's premises to monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the DR signals. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises			bayesian algorithm calculating the comfort and discomfort probability, the threshold of thermal comfort is considered to be 50%, below which the discomfort probability becomes higher.
EN. 04	L	Visual Comfort	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Multi-sensors to monitor the indoor conditions at the user premises. - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Smart meters and switches installed to specific devices at the end-user premises to measure and control individual loads. - Actuators installed at the lighting system at the end-user's premises to monitor the operational status of the devices for the calculation of the demand flexibility and the implementation of the DR signals. - Collected data uploaded and stored at the database deployed to the dedicated cloud server at TREK's premises	The visual comfort profiles will be extracted by the DSEP tool developed by TREK	- Energy consumption data collected on an event-base - KPI updated on an event-base	As the visual comfort is calculated based on the DSEP tool developed by TREK is based on a bayesian algorithm calculating the comfort and discomfort probability, the threshold of visual comfort is considered to be 50%, below which the discomfort probability becomes higher.
Explicit DR						
S.03	L	Demand response campaign penetration in buildings	- SOREA is the partner responsible for the pilot installations - Smart meters installed directly to the mains electrical conductor at each pilot site to measure the total energy consumption - Collected data uploaded and stored at the	Indirectly by evaluating the energy consumption reduction of individual end-users over the duration of the project	Once at the end of the project	As high a percentage as possible

			database deployed to the dedicated cloud server at TREK's premises			
S.04	L	Degree of user satisfaction from DR services	- SOREA is the partner responsible for collectng the end-user feedback - Collected information will be stored locally at the premises of SOREA	Questionnaires distributed to the end-users	Once at the end of the project	Over 50% of the pilot users

8.5.4 Stakeholders engagement

Key Performance Indicators			Roles and Responsibilities
ID	**Global/ Local**	**Name**	**Demand Response**
T.01	G	Energy Consumption (Monthly, Daily...)	-The end users are enganged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.02	G	Peak to Average Ratio (PAR)	-The end users are enganged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.04	G	Energy Consumption Reduction (Demand Flexibility)	-The end users are enganged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.05	G	Demand Flexibility Ratio	-The end users are enganged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.06	G	Demand Flexibility Request	-The end users are enganged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility

T.07	G	Demand Flexibility Baseline (Potential)	-The end users are engaged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.08	G	Demand Request Participation	-The end users are engaged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.09	G	Demand Request Enrolment	-The end users are engaged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.10	G	Peak load reduction	-The end users are engaged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
Battery Storage			
T.40	L	VES Demand Flexibility Baseline	-The end users are engaged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.41	L	VES Demand Flexibility	-The end users are engaged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	-The end users are engaged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
EC. 02	G	Average Cost of Energy Consumption	-The end users are engaged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	-The end users are engaged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
EC. 04	G	Average Cost of Energy Reward	-The end users are engaged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
EC. 06	L	Average Estimation of Cost savings	-The end users are engaged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility

EN. 01	G	CO2 emissions	-The end users are enganged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
EN. 02	G	CO2 emissions Reduction	-The end users are enganged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
EN. 03	L	Thermal Comfort	-The end users are enganged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
EN. 04	L	Visual Comfort	-The end users are enganged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
Explicit DR			
S.03	L	Demand response campaign penetration in buildings	-The end users are enganged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility
S.04	L	Degree of user satisfaction from DR services	-The end users are enganged through the explicit DR programs they participate. -The DSO (SOREA) will provide metrics for the calculation of the KPIs and utilise the end users' DR flexibility

8.6 Nicosia-Cyprus

8.6.1 KPIs update

Key Performance Indicators			Use Cases		Stakeholders Group			
			UCY_UC01 - University campus microgrid test case	*UCY_UC02 - Prosumers Use Case*	DSO	End Users	Market Operator (inc. Retailer / ESCO)	Policies Bodies and Governance
ID	**Global/ Local**	**Name**	**Demand Response**					
T.01	G	Energy Consumption (Monthly, Daily...)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
T.02	G	Peak to Average Ratio (PAR)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
T.03	G	Self-Consumption Rate	**YES**	**YES**	**YES**	**YES**	**YES**	N/A
T.04	G	Energy Consumption Reduction (Demand Flexibility)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
T.05	G	Demand Flexibility Ratio	**YES**	**YES**	**YES**	**YES**	**YES**	N/A
T.06	G	Demand Flexibility Request	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
T.07	G	Demand Flexibility Baseline (Potential)	**YES**	**YES**	**YES**	YES	**YES**	N/A
T.08	G	Demand Request Participation	**YES**	**YES**	N/A	YES	**YES**	**YES**
T.09	G	Demand Request Enrolment	**YES**	**YES**	N/A	YES	**YES**	**YES**

T.10	G	Peak load reduction	**YES**	**YES**	YES	N/A	**YES**	**YES**
T.12	L	RES Generation	N/A	**YES**	N/A	N/A	N/A	N/A
T.13	L	RES Generation Ratio	**YES**	**YES**	N/A	N/A	N/A	N/A
Battery Storage								
T.35	L	State of Charge (SOC)	**YES**	N/A	N/A	**N/A**	**N/A**	N/A
T.36	L	Depth of Discharge (DOD)	**YES**	N/A	N/A	**N/A**	**N/A**	N/A
T.37	L	Average SOC	**YES**	N/A	N/A	**N/A**	**N/A**	N/A
T.38	L	Battery Demand Flexibility Baseline	**YES**	N/A	N/A	**N/A**	**N/A**	N/A
T.39	L	Battery Demand Flexibility	**YES**	N/A	N/A	**N/A**	**N/A**	N/A
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	**YES**	**YES**	N/A	**YES**	**YES**	**YES**
EC. 02	G	Average Cost of Energy Consumption	**YES**	**YES**	N/A	**YES**	**YES**	**YES**
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	N/A	**YES**	N/A	**N/A**	**N/A**	N/A
EC. 04	G	Average Cost of Energy Reward	N/A	**YES**	N/A	**N/A**	**N/A**	N/A
EC. 06	L	Average Estimation of Cost savings	**YES**	**YES**	N/A	N/A	N/A	N/A
EC. 07	L	Cost of ancillary services	**YES**	N/A	N/A	N/A	N/A	N/A
EN. 01	G	CO2 emissions	**YES**	**YES**	**YES**	N/A	**YES**	N/A
EN. 02	G	CO2 emissions Reduction	**YES**	**YES**	**YES**	**YES**	**YES**	N/A
Explicit DR								

S.0 1	L	Number of people changing their behaviour	N/A	**YES**	**YES**	**YES**	**YES**	**YES**
S.0 2	L	Number of times social app is accessed	N/A	**YES**	N/A	N/A	**YES**	N/A
S.0 3	L	Demand response campaign penetration in buildings	N/A	**YES**	YES	YES	**YES**	YES
S.0 4	L	Degree of user satisfaction from DR services	N/A	**YES**	N/A	**YES**	**YES**	N/A

8.6.2 Baseline Scenario and System Information

Key Performance Indicators			**Baseline Scenario**		
			Data Collection Methodology	***Time Intervals***	***System that the KPI refers to***
ID	**Global/ Local**	**Name**	**Demand Response**		
T.01	G	Energy Consumption (Monthly, Daily...)	Historical Data (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.02	G	Peak to Average Ratio (PAR)	Historical Data (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.03	G	Self-Consumption Rate	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
T.04	G	Energy Consumption Reduction (Demand Flexibility)	Historical Data (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.05	G	Demand Flexibility Ratio	Historical Data (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.06	G	Demand Flexibility Request	Historical Data (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings

T.07	G	Demand Flexibility Baseline (Potential)	Historical Data (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.08	G	Demand Request Participation	Historical Data (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.09	G	Demand Request Enrolment	Historical Data (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.10	G	Peak load reduction	Historical Data (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.12	L	RES Generation	N/A	N/A	N/A
T.13	L	RES Generation Ratio	N/A	N/A	N/A
Battery Storage					
T.35	L	State of Charge (SOC)	N/A	Whole period (1 year)	Residential and Commercial buildings
T.36	L	Depth of Discharge (DOD)	N/A	Whole period (1 year)	Residential and Commercial buildings
T.37	L	Average SOC	N/A	Whole period (1 year)	Residential and Commercial buildings
T.38	L	Battery Demand Flexibility Baseline	N/A	N/A	N/A
T.39	L	Battery Demand Flexibility	N/A	N/A	N/A
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	Historical Data (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
EC. 02	G	Average Cost of Energy Consumption	Historical Data (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
EC. 04	G	Average Cost of Energy Reward	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
EC. 06	L	Average Estimation of Cost savings	N/A	N/A	N/A

EC. 07	L	Cost of ancillary services	N/A	N/A	N/A
EN. 01	G	CO2 emissions	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
EN. 02	G	CO2 emissions Reduction	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
Explicit DR					
S.01	L	Number of people changing their behaviour	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential buildings
S.02	L	Number of times social app is accessed	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential buildings
S.03	L	Demand response campaign penetration in buildings	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential buildings
S.04	L	Degree of user satisfaction from DR services	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential buildings

8.6.3 Smart Grid (SG) Project Implementation

Key Performance Indicators			Evaluation Scenario			Revision of data
			Data Collection Methodology *- Who will collect the data?* *-What data needs to be collected?* *-Where will the data be found?* *-How will the data be obtained?*	**Evaluation Method (Questionnaire, Programs) + per Stakeholder**	**Frequency of Data Collection**	**Estimation of Threshold / Measure of success + per Stakeholder (if applicable)**
ID	**Global/ Local**	**Name**	**Demand Response**			
T.01	G	Energy Consumption (Monthly, Daily...)	-EAC will collect the data -Metrics from EAC energy meters -EAC database -RESTful services	Smart meters		Estimation of the overall reduction Residential: 2% reduction Commercial: 5% reduction

T.02	G	Peak to Average Ratio (PAR)	-EAC will collect the data -Metrics from EAC energy meters -EAC database -RESTful services	Smart meters		Estimation of the overall reduction Residential: 2% reduction Commercial: 5% reduction
T.03	G	Self-Consumption Rate	-EAC will collect the data -Metrics from EAC energy meters -EAC database -RESTful services	Smart meters		Estimation: 20-50%
T.04	G	Energy Consumption Reduction (Demand Flexibility)	-EAC will collect the data -Metrics from EAC energy meters -EAC database -RESTful services	Smart meters		For measure of success we need percentage in order to compare with baseline scenario. See T.05
T.05	G	Demand Flexibility Ratio	-EAC will collect the data -Metrics from EAC energy meters -EAC database -RESTful services	Questionnaire		Estimation: max 7% from similar projects
T.06	G	Demand Flexibility Request	Energy consumption request from manager of smart meters	Smart meters		TBD
T.07	G	Demand Flexibility Baseline (Potential)	Energy consumption request from manager of smart meters	Questionnaire		TBD
T.08	G	Demand Request Participation	Energy consumption request from manager of smart meters	Program that gives the division between Demand Flexibility and Demand Flexibility Request		Highest possible
T.09	G	Demand Request Enrolment	Energy consumption request from manager of smart meters	Program that gives the division between Demand Flexibility and Demand Flexibility Request		Highest possible
T.10	G	Peak load reduction	-EAC will collect the data -Metrics from EAC energy meters -EAC database -RESTful services	Smart meters		4% peak reduction
T.12	L	RES Generation	N/A	N/A		N/A

T.13	L	RES Generation Ratio	N/A	N/A		N/A
Battery Storage						
T.35	L	State of Charge (SOC)	Smart meters	Algoritms that calculates the rate of the remaining capacity of the battery and the rated capacity		10% - 90% (battery specifications)
T.36	L	Depth of Discharge (DOD)	Smart meters	Algoritms that calculates the 1-SOC		10% (battery specifications)
T.37	L	Average SOC	Smart meters	Program that calculates the average SOC and compares it with the high and low SOC		Sunlight battery specifications
T.38	L	Battery Demand Flexibility Baseline	N/A	N/A		N/A
T.39	L	Battery Demand Flexibility	N/A	N/A		N/A
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	-EAC will collect the data -Metrics from EAC energy meters -EAC database -RESTful services	Smart meters		TBD
EC. 02	G	Average Cost of Energy Consumption	-EAC will collect the data -Metrics from EAC energy meters -EAC database -RESTful services	Smart meters		TBD
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	-EAC will collect the data -Metrics from EAC energy meters and price of energy -EAC database -RESTful services	Smart meters		TBD
EC. 04	G	Average Cost of Energy Reward	-EAC will collect the data -Metrics from EAC energy meters -EAC database -RESTful services	Smart meters		TBD
EC. 06	L	Average Estimation of Cost savings	N/A	N/A		N/A
EC. 07	L	Cost of ancillary services	N/A	N/A		N/A

EN. 01	G	CO_2 emissions	-EAC will collect the data -EAC database -RESTful services	Program that calculates the CO_2 emissions based on the energy consumption		Will be evaluated with EN.02
EN. 02	G	CO_2 emissions Reduction	-EAC will collect the data -EAC database -RESTful services	Program that calculates the CO_2 emissions based on the energy consumption reduction		Estimation of 20% decrease
Explicit DR						
S.01	L	Number of people changing their behaviour	-EAC will collect the data -EAC database -RESTful services	Questionnaire		Highest possible number
S.02	L	Number of times social app is accessed	-EAC will collect the data -EAC database -RESTful services	Questionnaire		Highest possible number
S.03	L	Demand response campaign penetration in buildings	-EAC will collect the data -EAC database -RESTful services	Questionnaire		Highest possible percentage
S.04	L	Degree of user satisfaction from DR services	-EAC will collect the data -EAC database -RESTful services	Questionnaire		Highest possible percentage

8.6.4 Stakeholders engagement

Key Performance Indicators			**Roles and Responsibilities**
ID	**Global/ Local**	**Name**	**Demand Response**
T.01	G	Energy Consumption (Monthly, Daily...)	-End users enganged through DR (both explicit and implicit) program -MO(EAC) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.02	G	Peak to Average Ratio (PAR)	-End users enganged through DR (both explicit and implicit) program -MO(EAC) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.03	G	Self-Consumption Rate	-MO(EAC) in collaboration with the Technology provider (CERTH) will provide essential metrics for the calculation of the KPIs and utilise the BESSs portfolio

T.04	G	Energy Consumption Reduction (Demand Flexibility)	-End users enganged through DR (both explicit and implicit) program -MO(EAC) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.05	G	Demand Flexibility Ratio	-End users enganged through DR (both explicit and implicit) program -MO(EAC) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.06	G	Demand Flexibility Request	-End users enganged through DR (both explicit and implicit) program -MO(EAC) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.07	G	Demand Flexibility Baseline (Potential)	-End users enganged through DR (both explicit and implicit) program -MO(EAC) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.08	G	Demand Request Participation	-End users enganged through DR (both explicit and implicit) program -MO(EAC) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.09	G	Demand Request Enrolment	-End users enganged through DR (both explicit and implicit) program -MO(EAC) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.10	G	Peak load reduction	-End users enganged through DR (both explicit and implicit) program -MO(EAC) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.12	L	RES Generation	N/A
T.13	L	RES Generation Ratio	N/A
Battery Storage			
T.35	L	State of Charge (SOC)	-MO(EAC) in collaboration with the Technology provider (CERTH) will provide essential metrics for the calculation of the KPIs and utilise the BESSs portfolio
T.36	L	Depth of Discharge (DOD)	-MO(EAC) in collaboration with the Technology provider (CERTH) will provide essential metrics for the calculation of the KPIs and utilise the BESSs portfolio
T.37	L	Average SOC	-MO(EAC) in collaboration with the Technology provider (CERTH) will provide essential metrics for the calculation of the KPIs and utilise the BESSs portfolio
T.38	L	Battery Demand Flexibility Baseline	N/A

T.39	L	Battery Demand Flexibility	N/A
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	-MO(EAC) will provide essential metrics for the calculation of the KPI.
EC. 02	G	Average Cost of Energy Consumption	-MO(EAC) will provide essential metrics for the calculation of the KPI.
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	-MO(EAC) will provide essential metrics for the calculation of the KPI.
EC. 04	G	Average Cost of Energy Reward	-MO(EAC) will provide essential metrics for the calculation of the KPI.
EC. 06	L	Average Estimation of Cost savings	N/A
EC. 07	L	Cost of ancillary services	N/A
EN. 01	G	CO2 emissions	-MO(EAC) in collaboration with the Technology Provider (CERTH) will provide essential metrics for the calculation of the KPI.
EN. 02	G	CO2 emissions Reduction	-MO(EAC) in collaboration with the Technology Provider (CERTH) will provide essential metrics for the calculation of the KPI.
Explicit DR			
S.01	L	Number of people changing their behaviour	-MO(EAC) will provide essential metrics for the calculation of the KPI.
S.02	L	Number of times social app is accessed	-MO(EAC) will provide essential metrics for the calculation of the KPI.
S.03	L	Demand response campaign penetration in buildings	-MO(EAC) will provide essential metrics for the calculation of the KPI.
S.04	L	Degree of user satisfaction from DR services	-MO(EAC) will provide essential metrics for the calculation of the KPI.

8.7 Lisbon

8.7.1 KPIs update

Key Performance Indicators			Use Cases			Stakeholders Group			
			LIS_UC01 - Demand Response	*LIS_UC02 - Energy Storage in Ice Tanks*	*LIS_UC03 - EV charging management system integrating dynamic tariffs*	**DSO**	**End Users**	**Market Operator (inc. Retailer / ESCO)**	**Policies Bodies and Governance**
ID	**Global/ Local**	**Name**	**Demand Response**						
T.01	G	Energy Consumption (Monthly, Daily...)	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.02	G	Peak to Average Ratio (PAR)	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.03	G	Self-Consumption Rate	**YES**	N/A	N/A	N/A	**YES**	N/A	N/A
T.04	G	Energy Consumption Reduction (Demand Flexibility)	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.05	G	Demand Flexibility Ratio	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.06	G	Demand Flexibility Request	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.07	G	Demand Flexibility Baseline (Potential)	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.08	G	Demand Request Participation	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.09	G	Demand Request Enrolment	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A

T.10	G	Peak load reduction	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.11	L	Reactive Energy Consumption	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.12	L	RES Generation	**YES**	N/A	N/A	N/A	**YES**	N/A	N/A
T.13	L	RES Generation Ratio	**YES**	N/A	N/A	N/A	**YES**	N/A	N/A
Electric Vehicles									
T.28	L	EV Penetration Level	N/A	N/A	**YES**	N/A	**YES**	N/A	N/A
T.29	L	EV Peak Demand	N/A	N/A	**YES**	N/A	**YES**	N/A	N/A
T.30	L	EV demand flexibility baseline	N/A	N/A	**YES**	N/A	**YES**	N/A	N/A
T.31	L	EV demand flexibility	N/A	N/A	**YES**	N/A	**YES**	N/A	N/A
Battery Storage									
T.40	L	VES Demand Flexibility Baseline	N/A	**YES**	N/A	N/A	YES	N/A	N/A
T.41	L	VES Demand Flexibility	N/A	**YES**	N/A	N/A	YES	N/A	N/A
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	**YES**	**YES**	**YES**	N/A	YES	N/A	N/A
EC. 02	G	Average Cost of Energy Consumption	**YES**	**YES**	**YES**	N/A	YES	N/A	N/A
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	**YES**	**YES**	**YES**	N/A	YES	N/A	N/A
EC. 04	G	Average Cost of Energy Reward	**YES**	**YES**	**YES**	N/A	YES	N/A	N/A
EN. 01	G	CO2 emissions	**YES**	**YES**	**YES**	N/A	YES	N/A	N/A
EN. 02	G	CO2 emissions Reduction	**YES**	**YES**	**YES**	N/A	YES	N/A	N/A

EN. 03	L	Thermal Comfort	**YES**	**YES**	**YES**	N/A	YES	N/A	N/A
EN. 05	L	Operative Temperature	**YES**	**YES**	**YES**	N/A	YES	N/A	N/A
Explicit DR									
S.0 3	L	Demand response campaign penetration in buildings	**YES**	**YES**	**YES**	N/A	YES	N/A	N/A
Implicit DR									
S.0 5	L	Number of people changing their behaviour	**YES**	N/A	N/A	N/A	**YES**	N/A	N/A
S.0 6	L	Degree of user satisfaction from DR services	**YES**	N/A	N/A	N/A	**YES**	N/A	N/A
S.0 7	L	Penetration of dynamic energy tariffs in tertiary buildings	**YES**	N/A	N/A	N/A	**YES**	**YES**	N/A

8.7.2 Baseline Scenario and System Information

Key Performance Indicators			**Baseline Scenario**		
			Data Collection Methodology	***Time Intervals***	***System that the KPI refers to***
ID	**Global/ Local**	**Name**	**Demand Response**		
T.01	G	Energy Consumption (Monthly, Daily...)	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.02	G	Peak to Average Ratio (PAR)	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.03	G	Self-Consumption Rate	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building

T.04	G	Energy Consumption Reduction (Demand Flexibility)	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.05	G	Demand Flexibility Ratio	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.06	G	Demand Flexibility Request	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.07	G	Demand Flexibility Baseline (Potential)	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.08	G	Demand Request Participation	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.09	G	Demand Request Enrolment	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.10	G	Peak load reduction	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.11	L	Reactive Energy Consumption	Historical Data from VPS (kWh in 15 min intervals, during the course of inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	
T.12	L	RES Generation		Whole period (1 year) in time intervals of 15 min	Administrative Building
T.13	L	RES Generation Ratio		Whole period (1 year) in time intervals of 15 min	Administrative Building
Electric Vehicles					
T.28	L	EV Penetration Level	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.29	L	EV Peak Demand	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.30	L	EV demand flexibility baseline	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building
T.31	L	EV demand flexibility	Historical Data from VPS (kWh in 15 min intervals, prior to inteGRIDy project)	Whole period (1 year) in time intervals of 15 min	Administrative Building

Battery Storage					
T.40	L	VES Demand Flexibility Baseline		Whole period (1 year) in time intervals of 15 min	Administrative Building
T.41	L	VES Demand Flexibility		Whole period (1 year) in time intervals of 15 min	Administrative Building
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)		Whole period (1 year) in time intervals of 15 min	Administrative Building
EC. 02	G	Average Cost of Energy Consumption		Whole period (1 year) in time intervals of 15 min	Administrative Building
EC. 03	G	Cost of Energy reward (based on contractual Agreement)		Whole period (1 year) in time intervals of 15 min	Administrative Building
EC. 04	G	Average Cost of Energy Reward		Whole period (1 year) in time intervals of 15 min	Administrative Building
EN. 01	G	CO_2 emissions	Historical Data from VPS (kWh in 15 min intervals) and CO_2 emission factor from the Lisbon Energy Matrix	Whole period (1 year) in time intervals of 15 min	Administrative Building
EN. 02	G	CO_2 emissions Reduction	Historical Data from VPS (kWh in 15 min intervals) and CO_2 emission factor from the Lisbon Energy Matrix	Whole period (1 year) in time intervals of 15 min	Administrative Building
EN. 03	L	Thermal Comfort	N/A	Whole period (1 year) in time intervals of 15 min	Administrative Building
EN. 05	L	Operative Temperature		Whole period (1 year) in time intervals of 15 min	Administrative Building
Explicit DR					
S.03	L	Demand response campaign penetration in buildings		Whole period (1 year)	Administrative Building
Implicit DR					
S.05	L	Number of people changing their behaviour		Whole period (1 year)	Administrative Building
S.06	L	Degree of user satisfaction from DR services		Whole period (1 year)	Administrative Building
S.07	L	Penetration of dynamic energy tariffs in tertiary buildings		Whole period (1 year)	Administrative Building

8.7.3 Smart Grid (SG) Project Implementation

Key Performance Indicators			Evaluation Scenario			Revision of data
			Data Collection Methodology *- Who will collect the data?* *-What data needs to be collected?* *-Where will the data be found?* *-How will the data be obtained?*	**Evaluation Method (Questionnaire, Programs) + per Stakeholder**	**Frequency of Data Collection**	**Estimation of Threshold / Measure of success + per Stakeholder (if applicable)**
ID	**Global/ Local**	**Name**	**Demand Response**			
T.01	G	Energy Consumption (Monthly, Daily...)	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -	EMS (Kisense) that counts the energy consumption of the building depending on the values of the smart meters	15min interval	
T.02	G	Peak to Average Ratio (PAR)	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -	EMS (Kisense) that counts the energy consumption of the building depending on the values of the smart meters, finding the peak energy consumption and the average	15min interval	
T.03	G	Self-Consumption Rate	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -	EMS (Kisense) that counts the energy consumption of the building depending on the values of the smart meters, finding the building energy consumption and the DER Generation.	15min interval	
T.04	G	Energy Consumption Reduction (Demand Flexibility)	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -	EMS (Kisense) that counts the energy consumption of the building depending on the values of the smart meters, compares with the baseline and gives as output the difference of the two	15min interval	
T.05	G	Demand Flexibility Ratio	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -	EMS (Kisense) that gives the division of the demand flexibility and baseline energy consumption	15min interval	
T.06	G	Demand Flexibility Request	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers)	EMS (Kisense) that gives the difference between baseline	15min interval	

			- Kisense -	energy consumption and requested (proposed) energy consumption from DR components developed from VPS		
T.07	G	Demand Flexibility Baseline (Potential)	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -	EMS (Kisense) that gives the difference between baseline energy consumption and potential energy consumption. Potential energy consumption is a realistic value of the requested (proposed) energy consumption from DR components developed from VPS depending on previous experience.	15min interval	
T.08	G	Demand Request Participation	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -	EMS (Kisense) that gives the division between Demand Flexibility and Demand Flexibility Request	15min interval	
T.09	G	Demand Request Enrolment	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -		15min interval	
T.10	G	Peak load reduction	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -	EMS (Kisense) that gives the difference between peak load of baseline assessment and peak load after the inteGRIDy solution	15min interval	
T.11	L	Reactive Energy Consumption	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -	EMS (Kisense) that counts the energy consumption of the buildings depending on the values of the smart meters	15min interval	
T.12	L	RES Generation				
T.13	L	RES Generation Ratio				
Electric Vehicles						
T.28	L	EV Penetration Level	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers)		15min interval	

			- Kisense -			
T.29	L	EV Peak Demand	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -		15min interval	
T.30	L	EV demand flexibility baseline	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -		15min interval	
T.31	L	EV demand flexibility	- VPS will collect the data via Kisense - Metrics from VPS energy meters (data loggers) - Kisense -		15min interval	
Battery Storage						
T.40	L	VES Demand Flexibility Baseline				
T.41	L	VES Demand Flexibility				
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)				
EC. 02	G	Average Cost of Energy Consumption				
EC. 03	G	Cost of Energy reward (based on contractual Agreement)				
EC. 04	G	Average Cost of Energy Reward				
EN. 01	G	CO2 emissions	- VPS will collect the data (kWh) via Kisense and ENOVA will calculate the emissions using CO2 emission factor from the Lisbon Energy Matrix - Metrics from VPS energy meters (data loggers) - Kisense -			
EN. 02	G	CO2 emissions Reduction	- VPS will collect the data (kWh) via Kisense and ENOVA will calculate the emissions using CO2 emission factor from the Lisbon Energy Matrix			

			- Metrics from VPS energy meters (data loggers) - Kisense -			
EN. 03	L	Thermal Comfort	N/A			
EN. 05	L	Operative Temperature				
Explicit DR						
S.03	L	Demand response campaign penetration in buildings		Questionnaire		
Implicit DR						
S.05	L	Number of people changing their behaviour		Questionnaire		
S.06	L	Degree of user satisfaction from DR services		Questionnaire		
S.07	L	Penetration of dynamic energy tariffs in tertiary buildings		Questionnaire		

8.7.4 Stakeholders engagement

Key Performance Indicators			**Roles and Responsibilities**
ID	**Global/ Local**	**Name**	**Demand Response**
T.01	G	Energy Consumption (Monthly, Daily...)	End users will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not.
T.02	G	Peak to Average Ratio (PAR)	End users will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not.

T.03	G	Self-Consumption Rate	End users will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not.
T.04	G	Energy Consumption Reduction (Demand Flexibility)	End users will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not.
T.05	G	Demand Flexibility Ratio	End users will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not.
T.06	G	Demand Flexibility Request	End users will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not.
T.07	G	Demand Flexibility Baseline (Potential)	End users will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not.
T.08	G	Demand Request Participation	End users will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not.
T.09	G	Demand Request Enrolment	End users will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not.
T.10	G	Peak load reduction	End users will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not.
T.11	L	Reactive Energy Consumption	End users will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not.
T.12	L	RES Generation	
T.13	L	RES Generation Ratio	
Electric Vehicles			
T.28	L	EV Penetration Level	Fleet department will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not. Example: Through dynamic tariffs it is possible to exploit the tariff changes during time periods. Kisense will sugest what time period suits the best in economic point of view.
T.29	L	EV Peak Demand	Fleet department will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not. Example: Through dynamic tariffs it is possible to exploit the tariff changes during time periods. Kisense will sugest what time period suits the best in economic point of view.
T.30	L	EV demand flexibility baseline	Fleet department will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not. Example: Through dynamic tariffs it is possible to

			exploit the tariff changes during time periods. Kisense will sugest what time period suits the best in economic point of view.
T.31	L	EV demand flexibility	Fleet department will receive a suggestion given by the Kisense platform. The building management engineers have the option to accept and implement it or not. Example: Through dynamic tariffs it is possible to exploit the tariff changes during time periods. Kisense will sugest what time period suits the best in economic point of view.
Battery Storage			
T.40	L	VES Demand Flexibility Baseline	
T.41	L	VES Demand Flexibility	
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	
EC. 02	G	Average Cost of Energy Consumption	
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	
EC. 04	G	Average Cost of Energy Reward	
EN. 01	G	CO2 emissions	
EN. 02	G	CO2 emissions Reduction	
EN. 03	L	Thermal Comfort	The building user will start to accept the DR programs only if these programs do not intervene his comfort (for example when the HVAC is programmed in the way to adapt 100% to the user preferences.
EN. 05	L	Operative Temperature	
EN. 06	L	Thermal Comfort Deviation	The building user will start to accept the DR programs only if these programs do not intervene his comfort (for example when the HVAC is programmed in the way to adapt 100% to the user preferences.
Explicit DR			

S.01	L	Number of people changing their behaviour	The building users have the option to adapt the recommendations of Kisense about the consumption. For example, through the respecting of the programmed optimised use of HVAC (with the optimised working periods and intensity), instead of making changes in the system (changing the intensity etc)
S.02	L	Number of times social app is accessed	There must be regularly published the information in order to increase the user awareness. For example, the avoided CO2 through the DR/renewable production; the avoided costs achieved through the usage of the dynamic tariffs etc
S.03	L	Demand response campaign penetration in buildings	There must be regularly published the information in order to increase the user awareness. For example, the avoided CO2 through the DR/renewable production; the avoided costs achieved through the usage of the dynamic tariffs etc
S.04	L	Degree of user satisfaction from DR services	The building user will start to accept the DR programs only if these programs do not intervene his comfort (for example when the HVAC is programmed in the way to adapt 100% to the user preferences.
Implicit DR			
S.05	L	Number of people changing their behaviour	The building users have the option to adapt the recommendations of Kisense about the consumption. For example, through the respecting of the programmed optimised use of HVAC (with the optimised working periods and intensity), instead of making changes in the system (changing the intensity etc)
S.06	L	Degree of user satisfaction from DR services	The building user will start to accept the DR programs only if these programs do not intervene his comfort (for example when the HVAC is programmed in the way to adapt 100% to the user preferences.
S.07	L	Penetration of dynamic energy tariffs in tertiary buildings	The tertiary buidlings administration must have a good knowledge about the Electricity wholesale market (OMIE) dynamics , in order to being able to analyse if the Indexed energy tariff is advantageous for its business. For example, the dynamic tariff is always lower in the weekend, during the night. Usually, in spring and winter (because of the higher wind and hydro production) the dynamic tariff is lower as well.

8.8 Xanthi

8.8.1 KPIs update

Key Performance Indicators			Use Cases			Stakeholders Group			
			SUN_UC01 - Monitoring, supervision and optimisation based decision-making for Smart Distribution Grid	*SUN_UC02 - Flexible local and virtual central storage management strategies*	*SUN_UC03 - Supervisory EV charging and optimum profiling*	DSO	End Users	Market Operator (inc. Retailer / ESCO)	Policies Bodies and Governance
ID	**Global/ Local**	**Name**	**Demand Response**						
T.01	G	Energy Consumption (Monthly, Daily...)	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.02	G	Peak to Average Ratio (PAR)	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.03	G	Self-Consumption Rate	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.04	G	Energy Consumption Reduction (Demand Flexibility)	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.05	G	Demand Flexibility Ratio	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.06	G	Demand Flexibility Request	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.07	G	Demand Flexibility Baseline (Potential)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.08	G	Demand Request Participation	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.09	G	Demand Request Enrolment	N/A	N/A	N/A	N/A	N/A	N/A	N/A

T.10	G	Peak load reduction	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.11	L	Reactive Energy Consumption	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.12	L	RES Generation	**YES**	**YES**	N/A	N/A	**YES**	N/A	N/A
T.13	L	RES Generation Ratio	**YES**	**YES**	N/A	N/A	**YES**	N/A	N/A
T.14	L	Energy Import	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
T.15	L	Energy Export	**YES**	**YES**	N/A	N/A	**YES**	N/A	N/A
T.16	L	Energy Mismatch Ratio	**YES**	**YES**	N/A	N/A	**YES**	N/A	N/A
Smartening the Distribution Grid									
T.19	L	Voltage variations	N/A	N/A	N/A	N/A	N/A	N/A	N/A
T.20	L	Number of Grid Events	**YES**	YES	N/A	N/A	**YES**	N/A	N/A
T.21	L	SAIFI	**YES**	N/A	N/A	N/A	**YES**	N/A	N/A
T.22	L	SAIDI	**YES**	N/A	N/A	N/A	**YES**	N/A	N/A
T.26	L	Average frequency Deviation	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Electric Vehicles									
T.28	L	EV Penetration Level	N/A	N/A	**N/A**	N/A	N/A	N/A	N/A
T.29	L	EV Peak Demand	N/A	N/A	**YES**	N/A	**YES**	N/A	N/A
Battery Storage									
T.35	L	State of Charge (SOC)	YES	**YES**	N/A	N/A	**YES**	N/A	N/A
T.36	L	Depth of Discharge (DOD)	YES	**YES**	N/A	N/A	**YES**	N/A	N/A
T.37	L	Average SOC	YES	**YES**	N/A	N/A	**YES**	N/A	N/A
T.38	L	Battery Demand Flexibility Baseline	N/A	**NO**	N/A	N/A	N/A	N/A	N/A

T.39	L	Battery Demand Flexibility	N/A	**NO**	N/A	N/A	N/A	N/A	N/A
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	**YES**	**NO**	**NO**	N/A	**YES**	N/A	N/A
EC. 02	G	Average Cost of Energy Consumption	**YES**	**NO**	**NO**	N/A	**YES**	N/A	N/A
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	N/A	**NO**	**NO**	N/A	N/A	N/A	N/A
EC. 04	G	Average Cost of Energy Reward	N/A	**NO**	**NO**	N/A	N/A	N/A	N/A
EC. 06	L	Average Estimation of Cost savings	**NO**	**NO**	**NO**	N/A	N/A	N/A	N/A
EC. 07	L	Cost of ancillary services	**NO**	N/A	N/A	N/A	N/A	N/A	N/A
EN. 01	G	CO2 emissions	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
EN. 02	G	CO2 emissions Reduction	**YES**	**YES**	**YES**	N/A	**YES**	N/A	N/A
EN. 03	L	Thermal Comfort	**NO**	**NO**	**NO**	N/A	N/A	N/A	N/A

8.8.2 Baseline Scenario and System Information

Key Performance Indicators			Baseline Scenario		
			Data Collection Methodology	*Time Intervals*	*System that the KPI refers to*
ID	**Global/ Local**	**Name**	**Demand Response**		
T.01	G	Energy Consumption (Monthly, Daily...)	Historical Data from Microgrid (kWh) (during inteGRIDy project)	Whole period (1 year)	On all three nodes

T.02	G	Peak to Average Ratio (PAR)	Historical Data from Microgrid (kWh) (during inteGRIDy project)	Whole period (1 year)	On all three nodes
T.04	G	Energy Consumption Reduction (Demand Flexibility)	Historical Data from Microgrid (kWh) (during inteGRIDy project)	Whole period (1 year)	On all three nodes
T.12	L	RES Generation	Historical Data from Microgrid (kWh) (during inteGRIDy project)	Whole period (1 year)	On all three nodes
T.13	L	RES Generation Ratio	Historical Data from Microgrid (kWh) (during inteGRIDy project)	Whole period (1 year)	On all three nodes
T.14	L	Energy Import	Historical Data from Microgrid (kWh) (during inteGRIDy project)	Whole period (1 year)	On all three nodes
T.15	L	Energy Export	Historical Data from Microgrid (kWh) (during inteGRIDy project)	Whole period (1 year)	On all three nodes
T.16	L	Energy Mismatch Ratio	Historical Data from Microgrid (kWh) (during inteGRIDy project)	Whole period (1 year)	On all three nodes
Smartening the Distribution Grid					
T.20	L	Number of Grid Events	Event Data from Microgrid (Monitoring devices/SCADA)	Whole period (1 year)	On all three nodes
T.21	L	SAIFI	Historical Data from Microgrid (kWh) (during inteGRIDy project)	Whole period (1 year)	On all three nodes
T.22	L	SAIDI	Historical Data from Microgrid (kWh) (during inteGRIDy project)	Whole period (1 year)	On all three nodes
Electric Vehicles					
T.29	L	EV Peak Demand	Historical Data from Microgrid (kWh) (during inteGRIDy project)	Whole period (1 year)	Node 3
Battery Storage					
T.35	L	State of Charge (SOC)	Historical Data from Microgrid (during inteGRIDy project)	Whole period (1 year)	On all three nodes
T.36	L	Depth of Discharge (DOD)	Historical Data from Microgrid (during inteGRIDy project)	Whole period (1 year)	On all three nodes

T.37	L	Average SOC	Historical Data from Microgrid (during inteGRIDy project)	Whole period (1 year)	On all three nodes
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	Historical Data from Microgrid (during inteGRIDy project)	Whole period (1 year)	Diesel generator operation on all three nodes
EC. 02	G	Average Cost of Energy Consumption	Historical Data from Microgrid (during inteGRIDy project)	Whole period (1 year)	Diesel generator operation on all three nodes
EN. 01	G	CO2 emissions	Historical Data from Microgrid (during inteGRIDy project)	Whole period (1 year)	Diesel generator operation on all three nodes
EN. 02	G	CO2 emissions Reduction	Historical Data from Microgrid (during inteGRIDy project)	Whole period (1 year)	Diesel generator operation on all three nodes

8.8.3 *Smart Grid (SG) Project Implementation*

Key Performance Indicators			**Evaluation Scenario**			**Revision of data**
			Data Collection Methodology *- Who will collect the data?* *-What data needs to be collected?* *-Where will the data be found?* *-How will the data be obtained?*	**Evaluation Method (Questionnaire, Programs) + per Stakeholder**	**Frequency of Data Collection**	**Estimation of Threshold / Measure of success + per Stakeholder (if applicable)**
ID	**Global/ Local**	**Name**	**Demand Response**			
T.01	G	Energy Consumption (Monthly, Daily...)	- Sunlight will collect the data - Metrics from AC buses energy meters - Microgrid SCADA database - OPC-Direct historian access	Program that counts the energy consumption in the nodes depending on the meters on AC lines		Estimation of the overall energy consumption of the auxiliary devices: 2% reduction
T.02	G	Peak to Average Ratio (PAR)	- Sunlight will collect the data - Metrics from AC buses energy meters - Microgrid SCADA database - OPC-Direct historian access	Program that divides the peak energy consumption with the average energy consumption		2% reduction
T.04	G	Energy Consumption Reduction (Demand Flexibility)	- Sunlight will collect the data - Metrics from AC buses energy meters - Microgrid SCADA database - OPC-Direct historian access	Program that counts the energy consumption in each node of the grid, depending on the values of the energy meters, compares with		2% reduction

				the baseline and gives as output the difference of the two		
T.12	L	RES Generation	- Sunlight will collect the data - Metrics from RES energy meters - Microgrid SCADA database - OPC-Direct historian access	Program that counts the energy production in each node depending on the RES energy meters		Highest possible RES generation
T.13	L	RES Generation Ratio	- Sunlight will collect the data - Metrics from RES energy meters - Microgrid SCADA database - OPC-Direct historian access	Program that counts the energy production in each node depending on the RES energy meters		Highest possible RES generation
T.14	L	Energy Import	- Sunlight will collect the data - Metrics from energy exchange meters - Microgrid SCADA database - OPC-Direct historian access	Program that counts the energy imported at each node depending on energy exchange meters		The optimal amount in order for the nodes to operate properly
T.15	L	Energy Export	- Sunlight will collect the data - Metrics from energy exchange meters - Microgrid SCADA database - OPC-Direct historian access	Program that counts the energy exported from each node depending on energy exchange meters		The optimal amount in order for the nodes to operate properly
T.16	L	Energy Mismatch Ratio	- Sunlight will collect the data - Metrics from energy exchange meters - Microgrid SCADA database - OPC-Direct historian access	Program that uses the energy import/export metrics in order to provide the KPI		he optimal amount in order for the nodes to operate properly (maximum possible)
Smartening the Distribution Grid						
T.20	L	Number of Grid Events	- Sunlight will collect the data - Events from monitoring devices - Microgrid SCADA database/monitoring devices and programs - OPC-Direct historian access/microgrid operator	Program that adds the occurred events/ event booklet		Daily/weekly/monthly/ annually event occurance Alarms: minimum possible Other events: as much as needed
T.21	L	SAIFI	- Sunlight will collect the data - Metrics from energy interruptions - Microgrid SCADA database - OPC-Direct historian access	Program that counts the average interruptions		Reduction 2-5%
T.22	L	SAIDI	- Sunlight will collect the data - Metrics from energy interruptions	Program that counts the average interruption duration		Reduction 2-5%

			- Microgrid SCADA database - OPC-Direct historian access			
Electric Vehicles						
T.29	L	EV Peak Demand	- Sunlight will collect the data - Metrics from EV energy meters - Microgrid SCADA database - OPC-Direct historian access	Program that counts the peak energy consumption for charging the EV		EV peak demand shifting during the day
Battery Storage						
T.35	L	State of Charge (SOC)	- Sunlight will collect the data - Battery voltage from battery meters - Microgrid SCADA database - OPC-Direct historian access	Algorithmthat calculates the SOC from the battery capacity, given the battery voltage		40-80%
T.36	L	Depth of Discharge (DOD)	- Sunlight will collect the data - Battery voltage from battery meters - Microgrid SCADA database - OPC-Direct historian access	Program that calculates the 1-SOC		maximum 60%
T.37	L	Average SOC	- Sunlight will collect the data - Battery voltage from battery meters - Microgrid SCADA database - OPC-Direct historian access	Program that calculates average of battery SOC		65 -75%
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	- Sunlight will collect the data - Diesel generator operation metrics - Microgrid SCADA database - OPC-Direct historian access	Program that calculates the product of Diesel Generator energy production by the Diesel Generator operational cost		Minimum (ideally zero)
EC. 02	G	Average Cost of Energy Consumption	- Sunlight will collect the data - Diesel generator operation metrics - Microgrid SCADA database - OPC-Direct historian access	Program that calculates the average cost of Diesel Generator'senergy production		Minimum possible (ideally zero)
EN. 01	G	CO2 emissions	- Sunlight will collect the data - Diesel generator operation metrics - Microgrid SCADA database - OPC-Direct historian access	Program that calculates the product of the Diesel Generator's energy production by the CO2 emissions of the operation		Minimum possible (ideally zero)
EN. 02	G	CO2 emissions Reduction	- Sunlight will collect the data - Diesel generator operation metrics - Microgrid SCADA database - OPC-Direct historian access	Program that calculates the product of the reduction of the Diesel Generator's energy		maximum possible

				production by the CO2 emissions of the operation		

8.8.4 Stakeholders engagement

Key Performance Indicators			Roles and Responsibilities
ID	**Global/ Local**	**Name**	**Demand Response**
T.01	G	Energy Consumption (Monthly, Daily...)	-Sunlight/Grid operator will provide essential metrics for the calculation of the KPIs and manage the controlable loads -CERTH/CPERI will provide the calculated KPIs
T.02	G	Peak to Average Ratio (PAR)	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
T.04	G	Energy Consumption Reduction (Demand Flexibility)	-Sunlight/Grid operator will provide essential metrics for the calculation of the KPI -CERTH/CPERI will provide the calculated KPIs
T.12	L	RES Generation	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
T.13	L	RES Generation Ratio	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
T.14	L	Energy Import	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
T.15	L	Energy Export	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
T.16	L	Energy Mismatch Ratio	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
Smartening the Distribution Grid			

T.20	L	Number of Grid Events	-Sunlight/Grid operator will provide essential data for the calculation of the KPI
T.21	L	SAIFI	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
T.22	L	SAIDI	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
Electric Vehicles			
T.29	L	EV Peak Demand	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
Battery Storage			
T.35	L	State of Charge (SOC)	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
T.36	L	Depth of Discharge (DOD)	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
T.37	L	Average SOC	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
EC. 02	G	Average Cost of Energy Consumption	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
EN. 01	G	CO2 emissions	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI
EN. 02	G	CO2 emissions Reduction	-Sunlight/Grid operator will provide essential data for the calculation of the KPI -CERTH/CPERI will provide the calculated KPI

8.9 Ploiesti

8.9.1 KPIs update

Key Performance Indicators			Use Cases			Stakeholders Group			
			DR_PL 01 - Implementing HES 1 (Head End System 1) – DSO perspective	*DR_PL 02 - Implementing HES 2 (Head End System 2) – DSO perspective*	*DR_PL 03 - Implementing HES 2 (Head End System 2) – Consumer perspective*	DSO	End Users	Market Operator (inc. Retailer / ESCO)	Policies Bodies and Governance
ID	Global/ Local	Name	Demand Response						
T.01	G	Energy Consumption (Monthly, Daily...)	YES	YES	YES	YES	YES	YES	YES
T.02	G	Peak to Average Ratio (PAR)	YES	YES	YES	YES	YES	YES	YES
T.03	G	Self-Consumption Rate	YES	YES	YES	YES	YES	YES	YES
T.04	G	Energy Consumption Reduction (Demand Flexibility)	YES	YES	YES	YES	YES	YES	YES
T.05	G	Demand Flexibility Ratio	YES	YES	YES	YES	YES	YES	N/A
T.06	G	Demand Flexibility Request	YES	YES	YES	YES	YES	YES	YES
T.07	G	Demand Flexibility Baseline (Potential)	YES	YES	YES	YES	YES	YES	N/A
T.08	G	Demand Request Participation	YES	YES	YES	YES	YES	YES	N/A
T.11	L	Reactive Energy Consumption	YES	YES	YES	YES	N/A	N/A	YES

EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	**YES**	**YES**	**YES**	**N/A**	**YES**	**YES**	**YES**
EC. 02	G	Average Cost of Energy Consumption	**YES**	**YES**	**YES**	**N/A**	**YES**	**YES**	**YES**
Explicit DR									
S.0 1	L	Number of people changing their behaviour	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
S.0 4	L	Degree of user satisfaction from DR services	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
Implicit DR									
S.0 5	L	Number of people changing their behaviour	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
S.0 6	L	Degree of user satisfaction from DR services	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**

8.9.2 Baseline Scenario and System Information

Key Performance Indicators			**Baseline Scenario**		
			Data Collection Methodology	***Time Intervals***	***System that the KPI refers to***
ID	**Global/ Local**	**Name**	**Demand Response**		
T.01	G	Energy Consumption (Monthly, Daily...)	Historical data	Whole period (1 year)	Residential and Commercial buildings
T.02	G	Peak to Average Ratio (PAR)	Historical data	Whole period (1 year)	Residential and Commercial buildings
T.03	G	Self-Consumption Rate	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings

T.04	G	Energy Consumption Reduction (Demand Flexibility)	Historical data	Whole period (1 year)	Residential and Commercial buildings
T.05	G	Demand Flexibility Ratio	Historical data	Whole period (1 year)	Residential and Commercial buildings
T.06	G	Demand Flexibility Request	Historical data	Whole period (1 year)	Residential and Commercial buildings
T.07	G	Demand Flexibility Baseline (Potential)	Historical data	Whole period (1 year)	Residential and Commercial buildings
T.08	G	Demand Request Participation	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
T.09	G	Demand Request Enrolment			
T.10	G	Peak load reduction	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
T.11	L	Reactive Energy Consumption	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
EC. 02	G	Average Cost of Energy Consumption	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
Explicit DR					
S.01	L	Number of people changing their behaviour	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
S.04	L	Degree of user satisfaction from DR services	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
Implicit DR					
S.05	L	Number of people changing their behaviour	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
S.06	L	Degree of user satisfaction from DR services	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings

8.9.3 Smart Grid (SG) Project Implementation

Key Performance Indicators			Evaluation Scenario			Revision of data
			Data Collection Methodology *- Who will collect the data?* *-What data needs to be collected?* *-Where will the data be found?* *-How will the data be obtained?*	**Evaluation Method (Questionnaire, Programs) + per Stakeholder**	**Frequency of Data Collection**	**Estimation of Threshold / Measure of success + per Stakeholder (if applicable)**
ID	**Global/ Local**	**Name**	**Demand Response**			
T.01	G	Energy Consumption (Monthly, Daily...)	- Electrica will collect the data - Metrics from Smart Meters - Electrica and EIIS databases - RESTful services and Offline (csv)	Program that counts the energy consumption of the buildings depending on the values of the smart meters	Offline once per year, Online at 1 hour time interval	Estimation of the overall energy consumption reduction (residential and commercial); High degree of energy management efficiency (DSO). The values will be rated during the field trials stage.
T.02	G	Peak to Average Ratio (PAR)	- Electrica will collect the data - Metrics from Smart Meters - Electrica and EIIS databases - RESTful services and Offline (csv)	Program that counts the energy consumption of the buildings depending on the values of the smart meters, finding the peak energy consumption and the average	Offline once per year, Online at 1 hour time interval	Estimation of the overall energy consumption reduction (residential and commercial); High degree of energy management efficiency (DSO). The values will be rated during the field trials stage.
T.03	G	Self-Consumption Rate	- Electrica will collect the data - Metrics from Smart Meters - Electrica and EIIS databases - RESTful services and Offline (csv)	Program that counts the energy consumption of the buildings depending on the values of the smart meters, finding the building energy consumption and the DER Generation	Offline once per year, Online at 1 hour time interval	Estimation of the overall energy consumption reduction (residential and commercial); High degree of energy management efficiency (DSO). The values will be rated

						during the field trials stage.
T.04	G	Energy Consumption Reduction (Demand Flexibility)	- Electrica will collect the data - Metrics from Smart Meters - Electrica and EIIS databases - RESTful services and Offline (csv)	Program that counts the energy consumption of the buildings depending on the values of the smart meters, compares with the baseline and gives as output the difference of these two (actual versus baseline)	Offline once per year, Online at 1 hour time interval	The value will be rated during the field trials stage.
T.05	G	Demand Flexibility Ratio	- Electrica will collect the data - Metrics from Smart Meters - Electrica and EIIS databases - RESTful services and Offline (csv)	Program that gives the division of the demand flexibility and baseline energy consumption	Offline once per year, Online at 1 hour time interval	The value will be rated during the field trials stage.
T.06	G	Demand Flexibility Request	- Electrica will collect the data - Metrics from Smart Meters - Electrica and EIIS databases - RESTful services and Offline (csv)	Program that gives the difference between baseline energy consumption and requested (proposed) energy consumption from DR components developed by SIVECO	Offline once per year, Online at 1 hour time interval	This estimation of threshold will be rated during the field trials stage.
T.07	G	Demand Flexibility Baseline (Potential)	- Electrica will collect the data - Metrics from Smart Meters - Electrica and EIIS databases - RESTful services and Offline (csv)	Program that gives the difference between baseline energy consumption and potential energy consumption. Potential energy consumption is a realistic value of the requested (proposed) energy consumption from DR components developed by SIVECO depending on previous experience	Offline once per year, Online at 1 hour time interval	This estimation of threshold will be rated during the field trials stage.
T.08	G	Demand Request Participation	- Electrica will collect the data - Metrics from Smart Meters - Electrica and EIIS databases - RESTful services and Offline (csv)	Program that gives the division between Demand Flexibility and Demand Flexibility Request		Highest possible
T.11	L	Reactive Energy Consumption	- Electrica will collect the data - Metrics from Smart Meters - Electrica and EIIS databases - RESTful services and Offline (csv)	Program that gives the total reactive energy consumption, over a given time period T		The estimation of total reactive energy consumption (optimal / range) will be rated during the field trials stage.

EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	- Electrica will collect the data - Metrics from Smart Meters - Electrica and EIIS databases - RESTful services and Offline (csv) - Economic data (tariffs / prices)	Program that calculates the multiplication of the energy consumption of the buildings depending on the values from the smart meters and its cost	Online daily	The estimation of the retailer cost of energy (optimal / range) will be rated during the field trials stage.
EC. 02	G	Average Cost of Energy Consumption	- Electrica will collect the data - Metrics from Smart Meters - Electrica and EIIS databases - RESTful services and Offline (csv) - Economic data (tariffs / prices)	Program that counts the energy consumption of the buildings depending on the values from the smart meters and its cost and gives the rate of the cost/energy consumption	Online daily	The estimation of the average cost of energy consumption will be rated during the field trials stage.
Explicit DR						
S.01	L	Number of people changing their behaviour	- Electrica in collaboration with SIVECO will collect the data based on the specific actions regarding the Stakeholders engagement strategy (WP9)	Questionnaires; mailing campaigns; newsletters; events	Based on planning specific to Stakeholders engagement strategy (WP9)	Based on measuring KPIs specific to Stakeholders engagement strategy (WP9) (Highest possible number)
S.04	L	Degree of user satisfaction from DR services	- Electrica in collaboration with SIVECO will collect the data based on the specific actions regarding the Stakeholders engagement strategy (WP9)	Questionnaires; mailing campaigns; newsletters; events	Based on planning specific to Stakeholders engagement strategy (WP9)	Based on measuring KPIs specific to Stakeholders engagement strategy (WP9) (Highest possible percentage)
Implicit DR						
S.05	L	Number of people changing their behaviour	- Electrica in collaboration with SIVECO will collect the data based on the specific actions regarding the Stakeholders engagement strategy (WP9)	Questionnaires; mailing campaigns; newsletters; events	Based on planning specific to Stakeholders engagement strategy (WP9)	Based on measuring KPIs specific to Stakeholders engagement strategy (WP9) (Highest possible number)
S.06	L	Degree of user satisfaction from DR services	- Electrica in collaboration with SIVECO will collect the data based on the specific actions regarding the Stakeholders engagement strategy (WP9)	Questionnaires; mailing campaigns; newsletters; events	Based on planning specific to Stakeholders engagement strategy (WP9)	Based on measuring KPIs specific to Stakeholders engagement strategy (WP9) (Highest possible percentage)

8.9.4 Stakeholders engagement

Key Performance Indicators			Roles and Responsibilities
ID	Global/ Local	Name	Demand Response
T.01	G	Energy Consumption (Monthly, Daily...)	End users engaged through DR (both explicit and implicit programs) Electrica and SIVECO will provide essential metrics for the calculation of the KPI and utilize the end user's DR flexibility.
T.02	G	Peak to Average Ratio (PAR)	End users engaged through DR (both explicit and implicit programs) Electrica and SIVECO will provide essential metrics for the calculation of the KPI and utilize the end user's DR flexibility.
T.03	G	Self-Consumption Rate	Electrica in collaboration with SIVECO wil provide essential metrics for the calculation of the KPI.
T.04	G	Energy Consumption Reduction (Demand Flexibility)	End users engaged through DR (both explicit and implicit programs) Electrica in collaboration with SIVECO will provide essential metrics for the calculation of the KPI and utilize the end user's DR flexibility.
T.05	G	Demand Flexibility Ratio	End users engaged through DR (both explicit and implicit programs) Electrica in collaboration with SIVECO will provide essential metrics for the calculation of the KPI and utilize the end user's DR flexibility.
T.06	G	Demand Flexibility Request	End users engaged through DR (both explicit and implicit program) Electrica in collaboration with SIVECO will provide essential metrics for the calculation of the KPI and utilize the end user's DR flexibility.
T.07	G	Demand Flexibility Baseline (Potential)	End users engaged through DR (both explicit and implicit programs) Electrica in collaboration with SIVECO will provide essential metrics for the calculation of the KPI and utilize the end user's DR flexibility.
T.08	G	Demand Request Participation	End users engaged through DR (both explicit and implicit programs) Electrica in collaboration with SIVECO will provide essential metrics for the calculation of the KPI and utilize the end user's DR flexibility.

T.11	L	Reactive Energy Consumption	End users engaged through DR (both explicit and implicit programs) Electrica in collaboration with SIVECO will provide essential metrics for the calculation of the KPI and utilize the end user's DR flexibility.
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	Electrica in collaboration with SIVECO wil provide essential metrics for the calculation of the KPI.
EC. 02	G	Average Cost of Energy Consumption	Electrica in collaboration with SIVECO wil provide essential metrics for the calculation of the KPI.
Explicit DR			
S.01	L	Number of people changing their behaviour	Electrica in collaboration with SIVECO wil provide essential metrics for the calculation of the KPI.
S.04	L	Degree of user satisfaction from DR services	Electrica in collaboration with SIVECO wil provide essential metrics for the calculation of the KPI.
Implicit DR			
S.05	L	Number of people changing their behaviour	Electrica in collaboration with SIVECO wil provide essential metrics for the calculation of the KPI.
S.06	L	Degree of user satisfaction from DR services	Electrica in collaboration with SIVECO wil provide essential metrics for the calculation of the KPI.

8.10 Thessaloniki

8.10.1 KPIs update

Key Performance Indicators			Use Cases			Stakeholders Group			
			TH_UC01 - Demand Response in residential buildings with smart meters	*TH_UC02 - Demand Response in residential buildings with BESS*	*TH_UC03 - Demand Response in Commercial Building with BESS*	DSO	End Users	Market Operator (inc. Retailer / ESCO)	Policies Bodies and Governance
ID	**Global/ Local**	**Name**	**Demand Response**						
T.01	G	Energy Consumption (Monthly, Daily...)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
T.02	G	Peak to Average Ratio (PAR)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
T.03	G	Self-Consumption Rate	N/A	**YES**	**YES**	**YES**	**YES**	**YES**	N/A
T.04	G	Energy Consumption Reduction (Demand Flexibility)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
T.05	G	Demand Flexibility Ratio	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	N/A
T.06	G	Demand Flexibility Request	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**
T.07	G	Demand Flexibility Baseline (Potential)	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	N/A
T.08	G	Demand Request Participation	**YES**	**NO**	**NO**	N/A	**YES**	**YES**	**YES**
T.09	G	Demand Request Enrolment	**YES**	**NO**	**NO**	N/A	**YES**	**YES**	**YES**

T.10	G	Peak load reduction	**YES**	**YES**	**YES**	**YES**	N/A	**YES**	**YES**
		Battery Storage							
T.35	L	State of Charge (SOC)	N/A	**YES**	**YES**	N/A	**YES**	**YES**	N/A
T.36	L	Depth of Discharge (DOD)	N/A	**YES**	**YES**	N/A	**YES**	**YES**	N/A
T.37	L	Average SOC	N/A	**YES**	**YES**	N/A	**YES**	**YES**	N/A
T.38	L	Battery Demand Flexibility Baseline	N/A	**YES**	**YES**	N/A	**YES**	**YES**	N/A
T.39	L	Battery Demand Flexibility	N/A	**YES**	**YES**	N/A	**YES**	**YES**	N/A
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	**YES**	**YES**	**YES**	N/A	**YES**	**YES**	**YES**
EC. 02	G	Average Cost of Energy Consumption	**YES**	**YES**	**YES**	N/A	**YES**	**YES**	**YES**
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	**?**	**?**	**?**	N/A	**?**	**?**	N/A
EC. 04	G	Average Cost of Energy Reward	**YES**	**YES**	**YES**	N/A	**YES**	**YES**	N/A
EC. 05	L	Demand Price Elasticity (Self Elasticity)	**YES**	**YES**	**YES**	N/A	**YES**	**YES**	**YES**
EN. 01	G	CO2 emissions	**YES**	**YES**	**YES**	**YES**	N/A	**YES**	N/A
EN. 02	G	CO2 emissions Reduction	**YES**	**YES**	**YES**	**YES**	**YES**	**YES**	N/A
EN. 03	L	Thermal Comfort	**YES**	**YES**	**YES**	N/A	**YES**	**YES**	N/A
EN. 05	L	Operative Temperature	**YES**	**YES**	**YES**	N/A	**YES**	**YES**	N/A
		Explicit DR							

S.01	L	Number of people changing their behaviour	YES	NO	NO	YES	YES	YES	YES
S.02	L	Number of times social app is accessed	YES	NO	NO	N/A	N/A	YES	N/A
S.03	L	Demand response campaign penetration in buildings	YES	NO	NO	YES	YES	YES	YES
S.04	L	Degree of user satisfaction from DR services	YES	NO	NO	N/A	YES	YES	N/A
Implicit DR									
S.05	L	Number of people changing their behaviour	YES	NO	YES	YES	YES	YES	YES
S.06	L	Degree of user satisfaction from DR services	YES	NO	YES	N/A	YES	YES	N/A
S.07	L	Penetration of dynamic energy tariffs in tertiary buildings	NO	NO	YES	YES	YES	YES	YES

8.10.2 Baseline Scenario and System Information

Key Performance Indicators			**Baseline Scenario**		
			Data Collection Methodology	***Time Intervals***	***System that the KPI refers to***
ID	**Global/ Local**	**Name**	**Demand Response**		
T.01	G	Energy Consumption (Monthly, Daily...)	Historical Data from W+V (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.02	G	Peak to Average Ratio (PAR)	Historical Data from W+V (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings

T.03	G	Self-Consumption Rate	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
T.04	G	Energy Consumption Reduction (Demand Flexibility)	Historical Data from W+V (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.05	G	Demand Flexibility Ratio	Historical Data from W+V (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.06	G	Demand Flexibility Request	Historical Data from W+V (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.07	G	Demand Flexibility Baseline (Potential)	Historical Data from W+V (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.08	G	Demand Request Participation	Historical Data from W+V (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
T.09	G	Demand Request Enrolment	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
T.10	G	Peak load reduction	Historical Data from W+V (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
Battery Storage					
T.35	L	State of Charge (SOC)	N/A	Whole period (1 year)	Residential and Commercial buildings
T.36	L	Depth of Discharge (DOD)	N/A	Whole period (1 year)	Residential and Commercial buildings
T.37	L	Average SOC	N/A	Whole period (1 year)	Residential and Commercial buildings
T.38	L	Battery Demand Flexibility Baseline	N/A	Whole period (1 year)	Residential and Commercial buildings
T.39	L	Battery Demand Flexibility	N/A	Whole period (1 year)	Residential and Commercial buildings
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	Historical Data from W+V (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings

EC. 02	G	Average Cost of Energy Consumption	Historical Data from W+V (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
EC. 04	G	Average Cost of Energy Reward	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
EC. 05	L	Demand Price Elasticity (Self Elasticity)	Historical Data from W+V (kWh prior to inteGRIDy project)	Whole period (1 year)	Residential and Commercial buildings
EN. 01	G	CO2 emissions	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
EN. 02	G	CO2 emissions Reduction	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
EN. 03	L	Thermal Comfort	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
EN. 04	L	Visual Comfort	N/A	N/A	N/A
EN. 05	L	Operative Temperature	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential and Commercial buildings
Explicit DR					
S.01	L	Number of people changing their behaviour	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential buildings
S.02	L	Number of times social app is accessed	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential buildings
S.03	L	Demand response campaign penetration in buildings	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential buildings
S.04	L	Degree of user satisfaction from DR services	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential buildings
Implicit DR					
S.05	L	Number of people changing their behaviour	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential buildings

S.06	L	Degree of user satisfaction from DR services	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Residential buildings
S.07	L	Penetration of dynamic energy tariffs in tertiary buildings	Data Collected during the course of the inteGRIDy Project	Whole period (1 year)	Commercial buildings

8.10.3 Smart Grid (SG) Project Implementation

Key Performance Indicators			Evaluation Scenario			Revision of data
			Data Collection Methodology *- Who will collect the data?* *-What data needs to be collected?* *-Where will the data be found?* *-How will the data be obtained?*	**Evaluation Method (Questionnaire, Programs) + per Stakeholder**	**Frequency of Data Collection**	**Estimation of Threshold / Measure of success + per Stakeholder (if applicable)**
ID	**Global/ Local**	**Name**	**Demand Response**			
T.01	G	Energy Consumption (Monthly, Daily...)	-W+V will collect the data -Metrics from W+V energy meters -W+V database -RESTful services	Program that counts the energy consumption of the buildings depending on the values of the smart meters		Estimation of the overall reduction Residential: 2% reduction Commercial: 5% reduction
T.02	G	Peak to Average Ratio (PAR)	-W+V will collect the data -Metrics from W+V energy meters -W+V database -RESTful services	Program that counts the energy consumption of the buildings depending on the values of the smart meters, finding the peak energy consumption and the average		Estimation of the overall reduction Residential: 2% reduction Commercial: 5% reduction
T.03	G	Self-Consumption Rate	-W+V will collect the data -Metrics from W+V energy meters -W+V database -RESTful services	Program that counts the energy consumption of the buildings depending on the values of the smart meters, finding the building energy consumption and the DER Generation.		Estimation: 20-50%
T.04	G	Energy Consumption Reduction (Demand Flexibility)	-W+V will collect the data -Metrics from W+V energy meters	Program that counts the energy consumption of the buildings depending on the values of the smart meters, compares with the		For measure of success we need percentage in order to compare with

			-W+V database -RESTful services	baseline and gives as output the difference of the two		baseline scenario. See T.05
T.05	G	Demand Flexibility Ratio	-W+V will collect the data -Metrics from W+V energy meters -W+V database -RESTful services	Program that gives the division of the demand flexibility and baseline energy consumption		Estimation: max 7% from similar projects
T.06	G	Demand Flexibility Request	-Energy consumption request from CERTH databases -RESTful services	Program that gives the difference between baseline energy consumption and requested (proposed) energy consumption from DR components developed from CERTH		TBD
T.07	G	Demand Flexibility Baseline (Potential)	-Energy consumption request from CERTH databases -RESTful services	Program that gives the difference between baseline energy consumption and potential energy consumption. Potential energy consumption is a realistic value of the requested (proposed) energy consumption from DR components developed from CERTH depending on previous experience.		TBD
T.08	G	Demand Request Participation	-Energy consumption request from CERTH databases and W+V databases -RESTful services	Program that gives the division between Demand Flexibility and Demand Flexibility Request		Highest possible
T.09	G	Demand Request Enrolment	-Energy consumption request from CERTH databases and W+V databases -RESTful services			Highest possible
T.10	G	Peak load reduction	-W+V will collect the data -Metrics from W+V energy meters -W+V database -RESTful services	Program that gives the difference between peak load of baseline assessment and peak load after the inteGRIDy solution		4% peak reduction
Battery Storage						
T.35	L	State of Charge (SOC)	-CERTH will collect the data -Metrics from Gavazzi energy meters -CERTH database -RESTful services	Algoritms that calculates the rate of the remaining capacity of the battery and the rated capacity		10% - 90% (battery specifications)

T.36	L	Depth of Discharge (DOD)	-CERTH will collect the data -Metrics from Gavazzi energy meters -CERTH database -RESTful services	Algoritms that calculates the 1-SOC		10% (battery specifications)
T.37	L	Average SOC	-CERTH will collect the data -Metrics from Gavazzi energy meters -CERTH database -RESTful services	Program that calculates the average SOC and compares it with the high and low SOC		Sunlight battery specifications
T.38	L	Battery Demand Flexibility Baseline	-CERTH and W+V will collect the data -Metrics from Gavazzi energy meters and W+V meters -CERTH + W+V database -RESTful services	Program that calculates the difference between energy consumption dedicated to battery charging prior to inteGRIDy project and potential energy consumption		Sunlight battery specifications
T.39	L	Battery Demand Flexibility	-CERTH and W+V will collect the data -Metrics from Gavazzi energy meters and W+V meters -CERTH + W+V database -RESTful services	Program that calculates the difference between energy consumption dedicated to battery charging prior to inteGRIDy project and actual Energy consumption dedicated to Batteries charging		Sunlight battery specifications
T.40	L	VES Demand Flexibility Baseline	N/A	N/A		N/A
T.41	L	VES Demand Flexibility	N/A	N/A		N/A
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	-W+V will collect the data -Metrics from W+V energy meters -W+V database -RESTful services -Ecocomic data	Program that calculates the multiplication of the energy consumption of the buildings depending on the values of the smart meters and its cost		TBD
EC. 02	G	Average Cost of Energy Consumption	-W+V will collect the data -Metrics from W+V energy meters -W+V database -RESTful services -Ecocomic data	Program that counts the energy consumption of the buildings depending on the values of the smart meters and its cost and gives the rate of the cost/energy consumption		TBD
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	-W+V will collect the data -Metrics from W+V energy meters and price of energy	Program that calculates the multiplication of the demand flexibility and the price proposed		TBD

			-W+V database -RESTful services	between W+V and facility managers		
EC. 04	G	Average Cost of Energy Reward	-W+V will collect the data -Metrics from W+V energy meters -W+V database -RESTful services	Program that calculates the rate of cost energy reward and of demand flexibility		TBD
EC. 05	L	Demand Price Elasticity (Self Elasticity)	-W+V will collect the data -Metrics from W+V energy meters and price of energy -W+V database -RESTful services	Program that calculates the reduction of the demand flexibility as a reference to the total cost of energy consumption.		TBD
EN. 01	G	CO2 emissions	-W+V will collect the data -W+V database -RESTful services	Program that calculates the CO2 emissions based on the energy consumption		Will be evaluated with EN.02
EN. 02	G	CO2 emissions Reduction	-W+V will collect the data -W+V database -RESTful services	Program that calculates the CO2 emissions based on the energy consumption reduction		Estimation of 20% decrease
EN. 03	L	Thermal Comfort	-W+V will collect the data -Metrics from W+V sensors -W+V database -RESTful services	Program that calculates the end user thermal comfort based on the user profiling model		http://comfort.cbe.berkeley.edu/
EN. 04	L	Visual Comfort	N/A	N/A		N/A
EN. 05	L	Operative Temperature	-W+V will collect the data -Metrics from SUNLIGHT sensors on BESS -W+V database -RESTful services	Temperature sensor communicating with the BMS		http://comfort.cbe.berkeley.edu/
Explicit DR						
S.01	L	Number of people changing their behaviour	-W+V will collect the data -W+V database -RESTful services	Questionnaire		Highest possible number
S.02	L	Number of times social app is accessed	-W+V will collect the data -W+V database -RESTful services	Questionnaire		Highest possible number

S.03	L	Demand response campaign penetration in buildings	-W+V will collect the data -W+V database -RESTful services	Questionnaire		Highest possible percentage
S.04	L	Degree of user satisfaction from DR services	-W+V will collect the data -W+V database -RESTful services	Questionnaire		Highest possible percentage
Implicit DR						
S.05	L	Number of people changing their behaviour	-W+V will collect the data -W+V database -RESTful services	Questionnaire		Highest possible number
S.06	L	Degree of user satisfaction from DR services	-W+V will collect the data -W+V database -RESTful services	Questionnaire		Highest possible percentage
S.07	L	Penetration of dynamic energy tariffs in tertiary buildings	-W+V will collect the data -W+V database -RESTful services	Questionnaire		Highest possible percentage

8.10.4 Stakeholders engagement

Key Performance Indicators			**Roles and Responsibilities**
ID	**Global/ Local**	**Name**	**Demand Response**
T.01	G	Energy Consumption (Monthly, Daily...)	-End users enganged through DR (both explicit and implicit) program -MO(W+V) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.02	G	Peak to Average Ratio (PAR)	-End users enganged through DR (both explicit and implicit) program -MO(W+V) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility

T.03	G	Self-Consumption Rate	-MO(W+V) in collaboration with the Technology provider (CERTH) will provide essential metrics for the calculation of the KPIs and utilise the BESSs portfolio
T.04	G	Energy Consumption Reduction (Demand Flexibility)	-End users enganged through DR (both explicit and implicit) program -MO(W+V) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.05	G	Demand Flexibility Ratio	-End users enganged through DR (both explicit and implicit) program -MO(W+V) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.06	G	Demand Flexibility Request	-End users enganged through DR (both explicit and implicit) program -MO(W+V) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.07	G	Demand Flexibility Baseline (Potential)	-End users enganged through DR (both explicit and implicit) program -MO(W+V) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.08	G	Demand Request Participation	-End users enganged through DR (both explicit and implicit) program -MO(W+V) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.09	G	Demand Request Enrolment	-End users enganged through DR (both explicit and implicit) program -MO(W+V) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
T.10	G	Peak load reduction	-End users enganged through DR (both explicit and implicit) program -MO(W+V) will provide essential metrics for the calculation of the KPIs and utilise the end users' DR flexibility
Battery Storage			
T.35	L	State of Charge (SOC)	-MO(W+V) in collaboration with the Technology provider (CERTH) will provide essential metrics for the calculation of the KPIs and utilise the BESSs portfolio
T.36	L	Depth of Discharge (DOD)	-MO(W+V) in collaboration with the Technology provider (CERTH) will provide essential metrics for the calculation of the KPIs and utilise the BESSs portfolio
T.37	L	Average SOC	-MO(W+V) in collaboration with the Technology provider (CERTH) will provide essential metrics for the calculation of the KPIs and utilise the BESSs portfolio
T.38	L	Battery Demand Flexibility Baseline	-MO(W+V) in collaboration with the Technology provider (CERTH) will provide essential metrics for the calculation of the KPIs and utilise the BESSs portfolio

T.39	L	Battery Demand Flexibility	-MO(W+V) in collaboration with the Technology provider (CERTH) will provide essential metrics for the calculation of the KPIs and utilise the BESSs portfolio
EC. 01	G	Retailer Cost of Energy (Monthly, Daily...)	-MO(W+V) will provide essential metrics for the calculation of the KPI.
EC. 02	G	Average Cost of Energy Consumption	-MO(W+V) will provide essential metrics for the calculation of the KPI.
EC. 03	G	Cost of Energy reward (based on contractual Agreement)	-MO(W+V) will provide essential metrics for the calculation of the KPI.
EC. 04	G	Average Cost of Energy Reward	-MO(W+V) will provide essential metrics for the calculation of the KPI.
EC. 05	L	Demand Price Elasticity (Self Elasticity)	-MO(W+V) will provide essential metrics for the calculation of the KPI.
EN. 01	G	CO2 emissions	-MO(W+V) in collaboration with the Technology Provider (CERTH) will provide essential metrics for the calculation of the KPI.
EN. 02	G	CO2 emissions Reduction	-MO(W+V) in collaboration with the Technology Provider (CERTH) will provide essential metrics for the calculation of the KPI.
EN. 03	L	Thermal Comfort	-MO(W+V) in collaboration with the Technology Provider (CERTH) will provide essential metrics for the calculation of the KPI.
EN. 05	L	Operative Temperature	-MO(W+V) in collaboration with the Technology Provider (SUNLIGHT) will provide essential metrics for the calculation of the KPI.
Explicit DR			
S.01	L	Number of people changing their behaviour	-MO(W+V) will provide essential metrics for the calculation of the KPI.
S.02	L	Number of times social app is accessed	-MO(W+V) will provide essential metrics for the calculation of the KPI.
S.03	L	Demand response campaign penetration in buildings	-MO(W+V) will provide essential metrics for the calculation of the KPI.
S.04	L	Degree of user satisfaction from DR services	-MO(W+V) will provide essential metrics for the calculation of the KPI.
Implicit DR			
S.05	L	Number of people changing their behaviour	-MO(W+V) will provide essential metrics for the calculation of the KPI.
S.06	L	Degree of user satisfaction from DR services	-MO(W+V) will provide essential metrics for the calculation of the KPI.

S.07	L	Penetration of dynamic energy tariffs in tertiary buildings	-MO(W+V) will provide essential metrics for the calculation of the KPI.

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