SUNSHINE

23-24

June 2016

Smart-energy platform: IT to support energy awareness and support consumption reduction

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European Commission - JRC
S3P Energy: Smart Mediterraneo

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SUNSHINE

Smart UrbaN ServIces for HIgher eNergy Efficiency

Call ID: 1.1 Smart urban digital services for energy efficiency

Reference: CIP-Pilot actions 2012 325161 SUNSHINE

Started: 1st February 2013

Duration: 36 Months

Partners: 16

Coordinating institution: Fondazione Graphitech

Coordinator: Dr Raffaele De Amicis

Budget: 4,628,000.00 Euros

Motivations
Objectives
Technology Deployed and Used
Pilot Description
Conclusion

Motivations

- Nowadays we are experiencing an very important change the so-called Internet of things which brings together machines, advanced analytics, people and of course Internet

- At the proposal writing time we were quite fascinated about how technology, i.e. Internet revolution, could to transform industrial sectors alike the Energy one

- In this regard we had a very simple vision and idea …..

- Energy is the lifeblood of modern industrial society.
- We want to develop Smart digital services aiming for energy efficiency
- The simple idea is that people should know what's happening in their homes and/or in their territory…..
- And we want to provide people with information about their homes and in their territory in the simplest, most useful way possible.

Technological and Scientific Objectives

Large Scale:
City or city district

Energy assessment of buildings at urban scale for the creation of “energy maps” and their energy pre-certification;

Small Scale: Building

- Optimisation of energy consumption of heating/cooling systems based on localised weather forecasts and energy modelling of buildings;

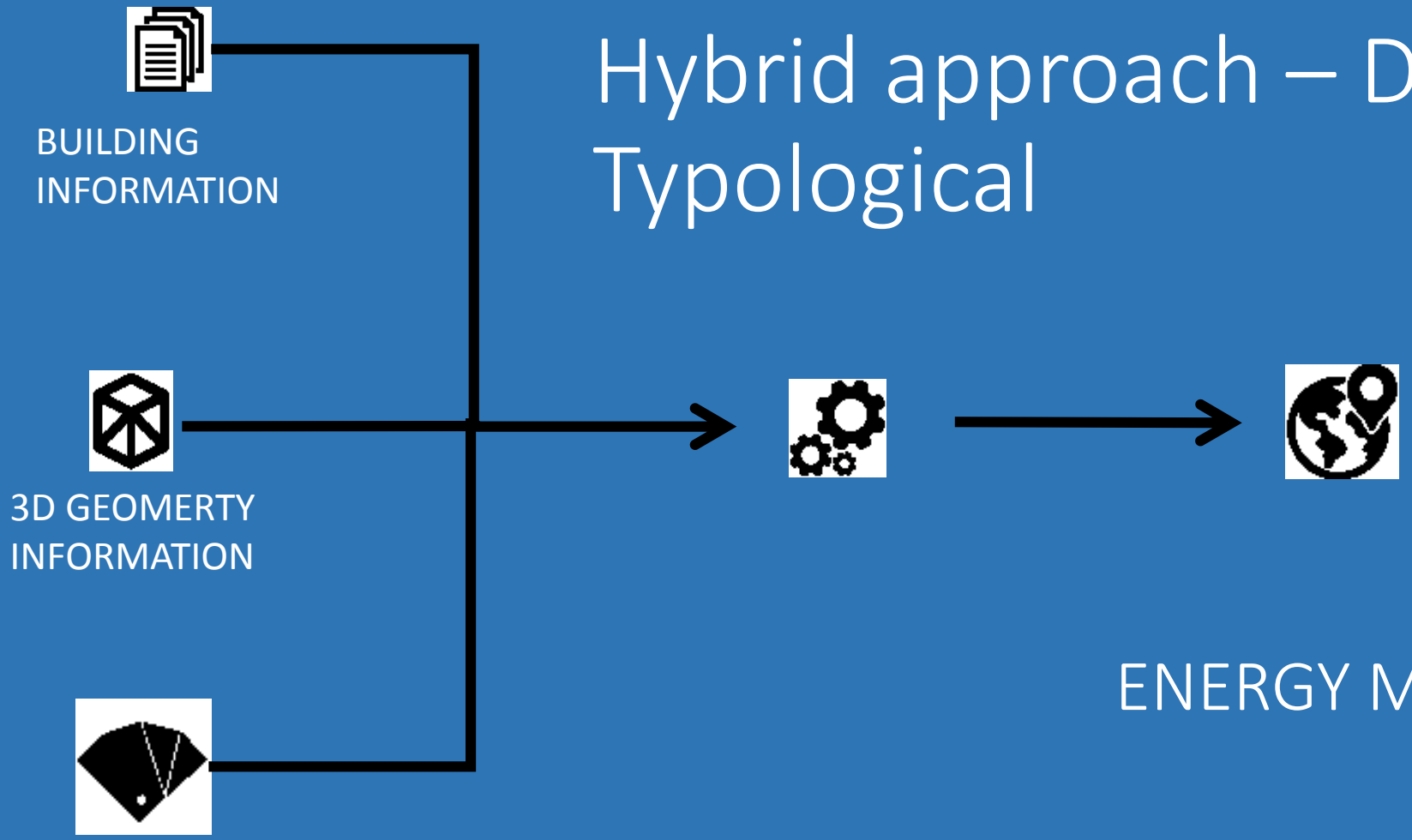
Public Lighting

- Optimisation of power consumption through remote control of public illumination levels.

Large Scale:
City or city district

How to assess on large scale energy performance of buildings ?

Hybrid approach – Deterministic-Typological



Agenzia del Territorio

Data: 04/11/2010 - Ora: 14.24.29 Fine

Visura n.: T239164 Pag: 1

Visura per soggetto

limitata ad un comune

Situazione degli atti informatizzati al 04/11/2010

Dati della richiesta	Fabbricati siti nel comune di ROMA (Codice: H501) Provincia di ROMA
Soggetto individuato	nato a ROMA il 25/11/19 C.F.:

I. Unità Immobiliari site nel Comune di ROMA(Codice H501) - Catasto dei Fabbricati

N.	DATI IDENTIFICATIVI				DATI DI CLASSAMENTO							ALTRE INFORMAZIONI	
	Sezione Urbana	Foglio	Particella	Sub	Zona Cens.	Micro Zona	Categoria	Classe	Consistenza		Rendita	Indirizzo	Data efficacia
												Dati derivanti da	
1		466		1	4		A2	3	5 vani		Euro 1.110,67 L. 1.500.000	VIA CARLO n. 107 piano: T interno: 1; DI STEFANO (ATTO PUBBLICO) del 10/02/1970 n. in atti dal 01/03/1989	
		466											

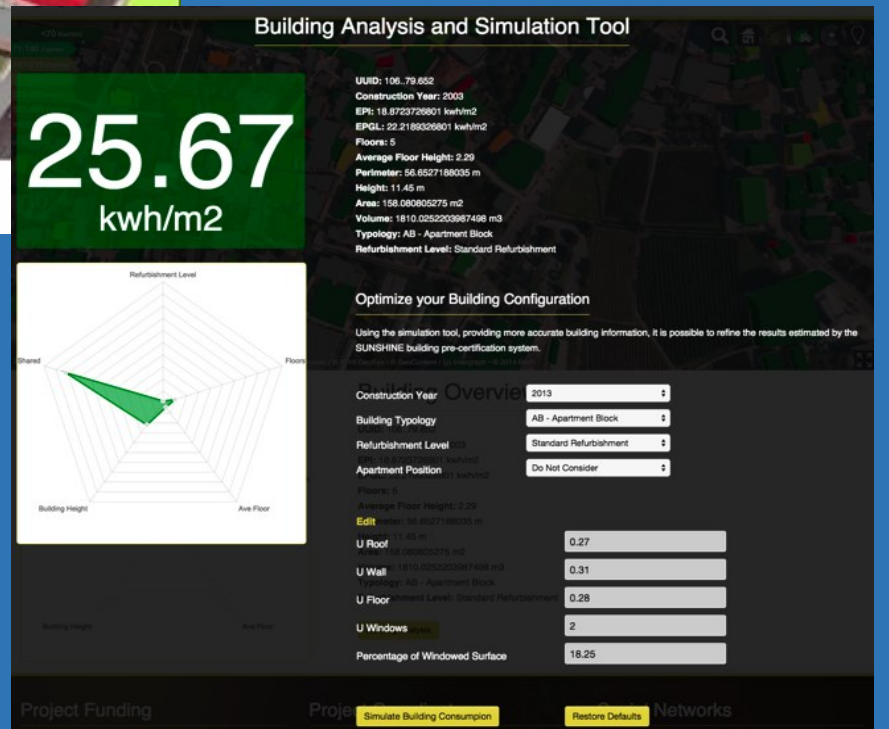
Intestazione degli immobili indicati al n. 1

N.	DATI ANAGRAFICI	CODICE FISCALE	DIRITTI E ONERI REALI
1	nato a ROMA il 25/11/19		(1) Proprieta' per 1/1
DATI DERIVANTI DA	ATTO (ATTO PUBBLICO) del 13/05/2005 Voltura n. 10203.1 in atti dal 13/05/2005 (protocollo n.) Repertorio n. / Rogante: DI SCIULLO Sede: ROMA COMPRAVENDITA		

Rilasciata da: Servizio Telematico

* Codice Fiscale Validato in Anagrafe Tributaria

	Region	Construction Year Class	Additional Classification	SFH Single-Family House	TH Terraced House	MFH Multi-Family House	AB Apartment Block
1	Middle Climatic Zone (Zona climatica media - ZONA E)	... 1900	generic	 IT.MidClim.SFH.01.Gen	 IT.MidClim.TH.01.Gen	 IT.MidClim.MFH.01.Gen	 IT.MidClim.AB.01.Gen
2	Middle Climatic Zone (Zona climatica media - ZONA E)	1901 ... 1920	generic	 IT.MidClim.SFH.02.Gen	 IT.MidClim.TH.02.Gen	 IT.MidClim.MFH.02.Gen	 IT.MidClim.AB.02.Gen
3	Middle Climatic Zone (Zona climatica media - ZONA E)	1921 ... 1945	generic	 IT.MidClim.SFH.03.Gen	 IT.MidClim.TH.03.Gen	 IT.MidClim.MFH.03.Gen	 IT.MidClim.AB.03.Gen
4	Middle Climatic Zone (Zona climatica media - ZONA E)	1946 ... 1960	generic	 IT.MidClim.SFH.04.Gen	 IT.MidClim.TH.04.Gen	 IT.MidClim.MFH.04.Gen	 IT.MidClim.AB.04.Gen
5	Middle Climatic Zone (Zona climatica media - ZONA E)	1961 ... 1975	generic	 IT.MidClim.SFH.05.Gen	 IT.MidClim.TH.05.Gen	 IT.MidClim.MFH.05.Gen	 IT.MidClim.AB.05.Gen
6	Middle Climatic Zone (Zona climatica media - ZONA E)	1976 ... 1990	generic	 IT.MidClim.SFH.06.Gen	 IT.MidClim.TH.06.Gen	 IT.MidClim.MFH.06.Gen	 IT.MidClim.AB.06.Gen
7	Middle Climatic Zone (Zona climatica media - ZONA E)	1991 ... 2005	generic	 IT.MidClim.SFH.07.Gen	 IT.MidClim.TH.07.Gen	 IT.MidClim.MFH.07.Gen	 IT.MidClim.AB.07.Gen
8	Middle Climatic Zone (Zona climatica media - ZONA E)	2006 ...	generic	 IT.MidClim.SFH.08.Gen	 IT.MidClim.TH.08.Gen	 IT.MidClim.MFH.08.Gen	 IT.MidClim.AB.08.Gen



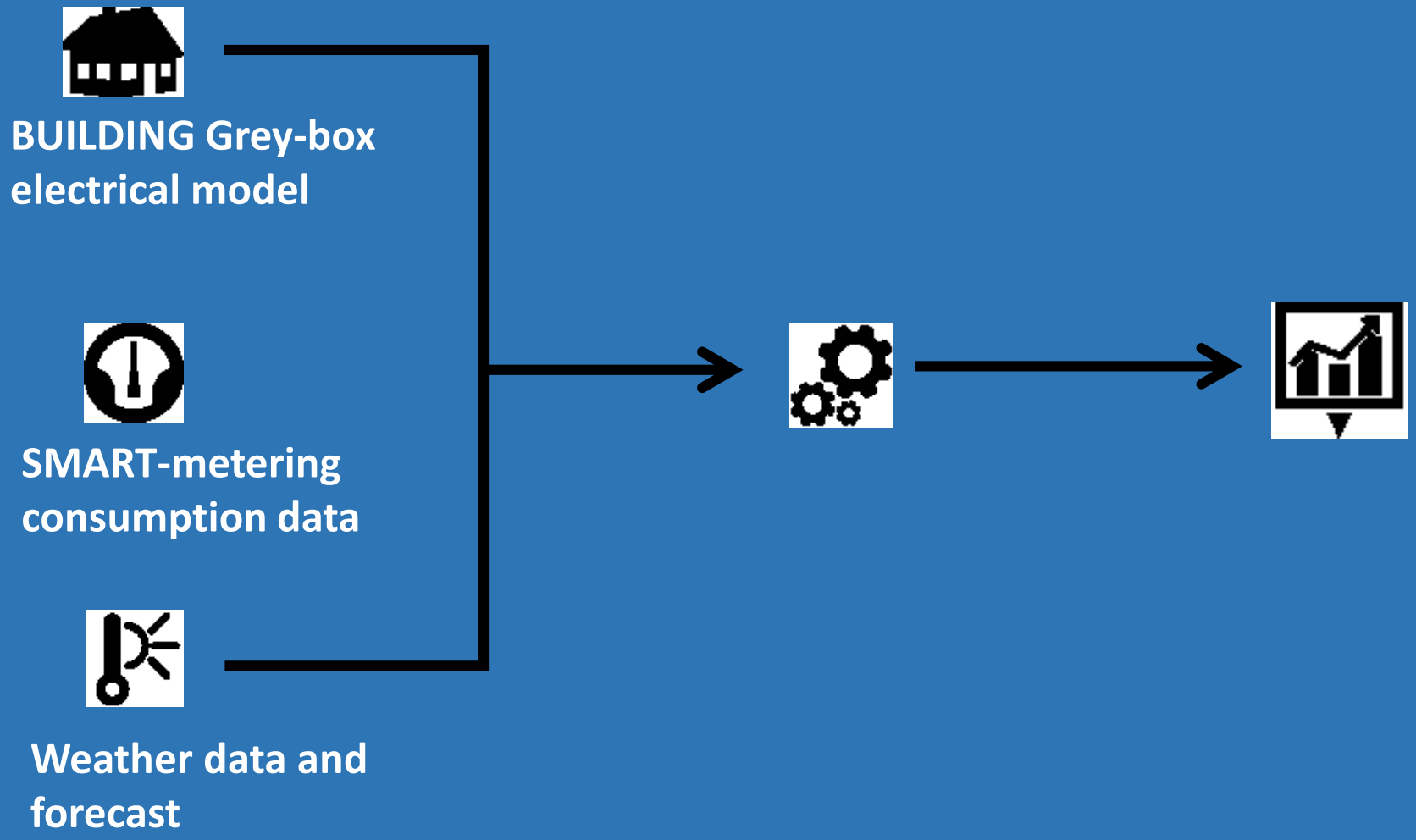
http://sunshine.graphitech-projects.com

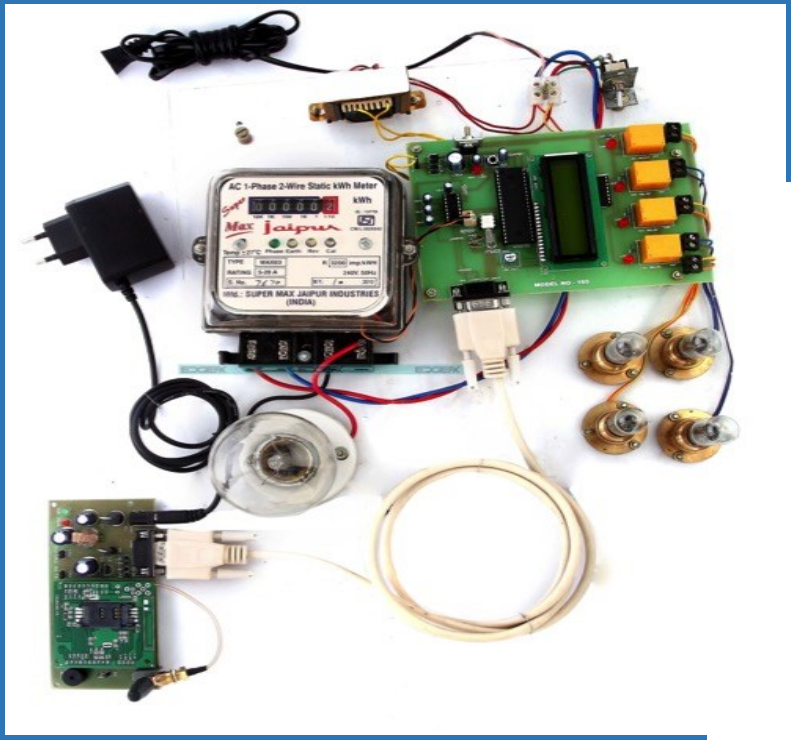
Small Scale: Building

- Several HVAC system are not fully automated (climatic system);
- Manual set up is still needed;
- Hard to access different systems in one platform

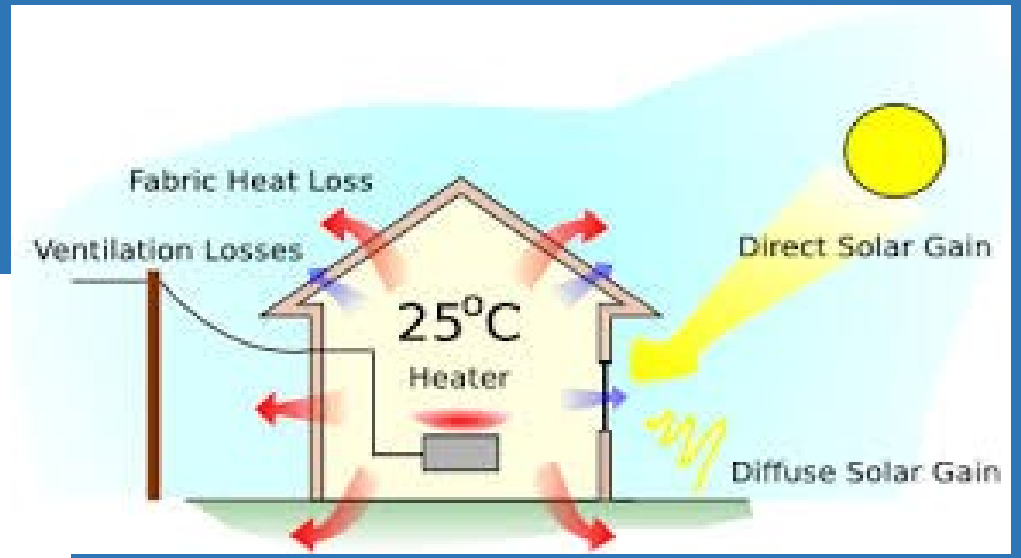
How to support energy manager to optimize consumption using IT technologies?

Optimisation of energy consumption of buildings





Automatic Energy meters

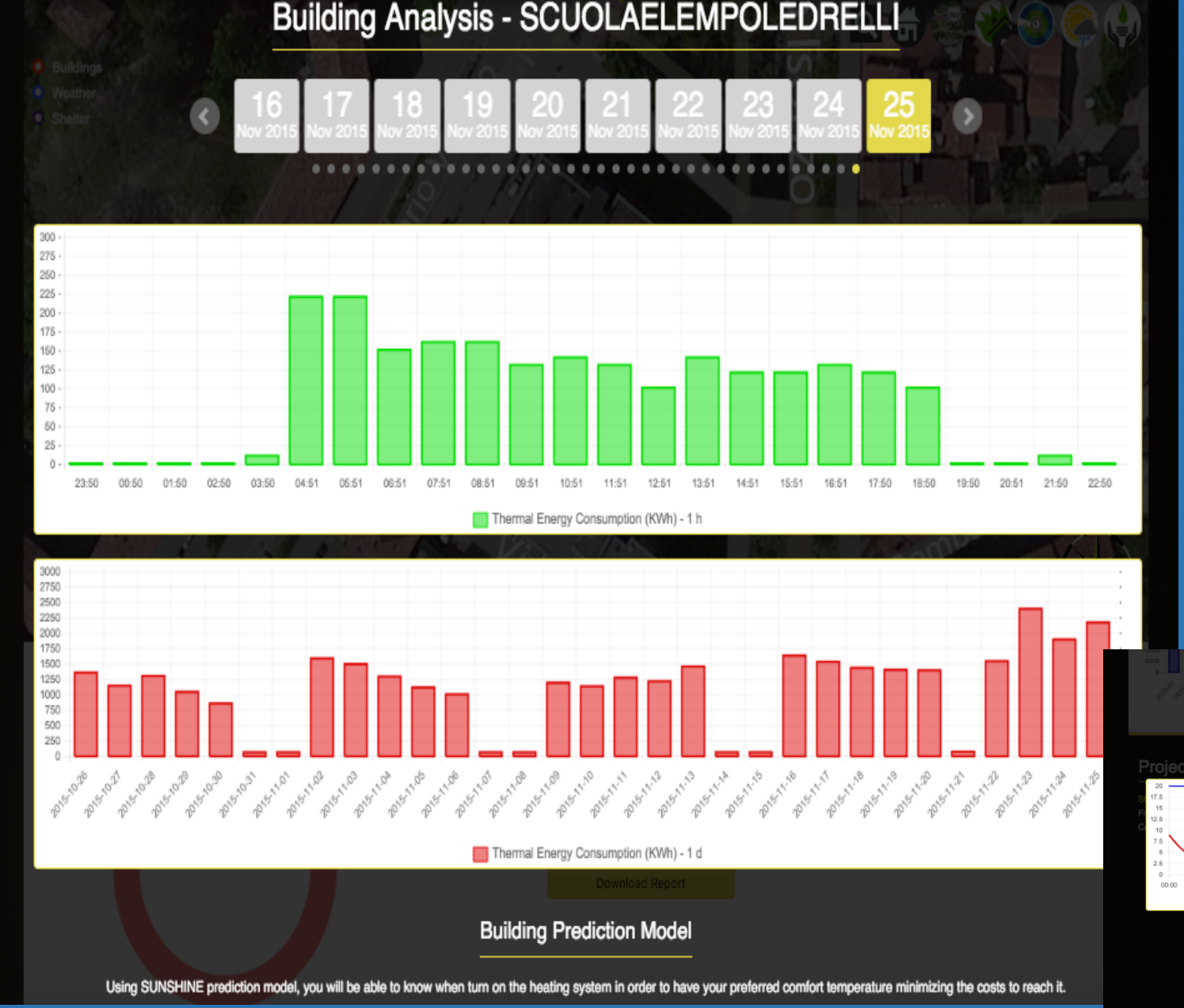


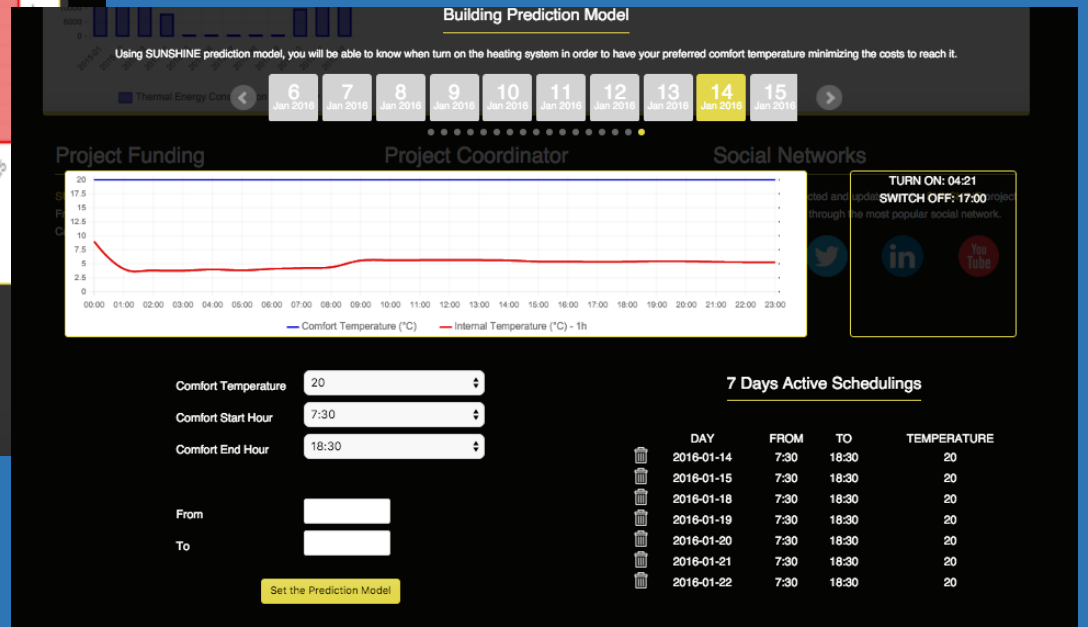
ILDING Grey-box electrical model

Green Button Connect My Data

OGC® Open Geospatial Consortium, Inc.

STANDARDS

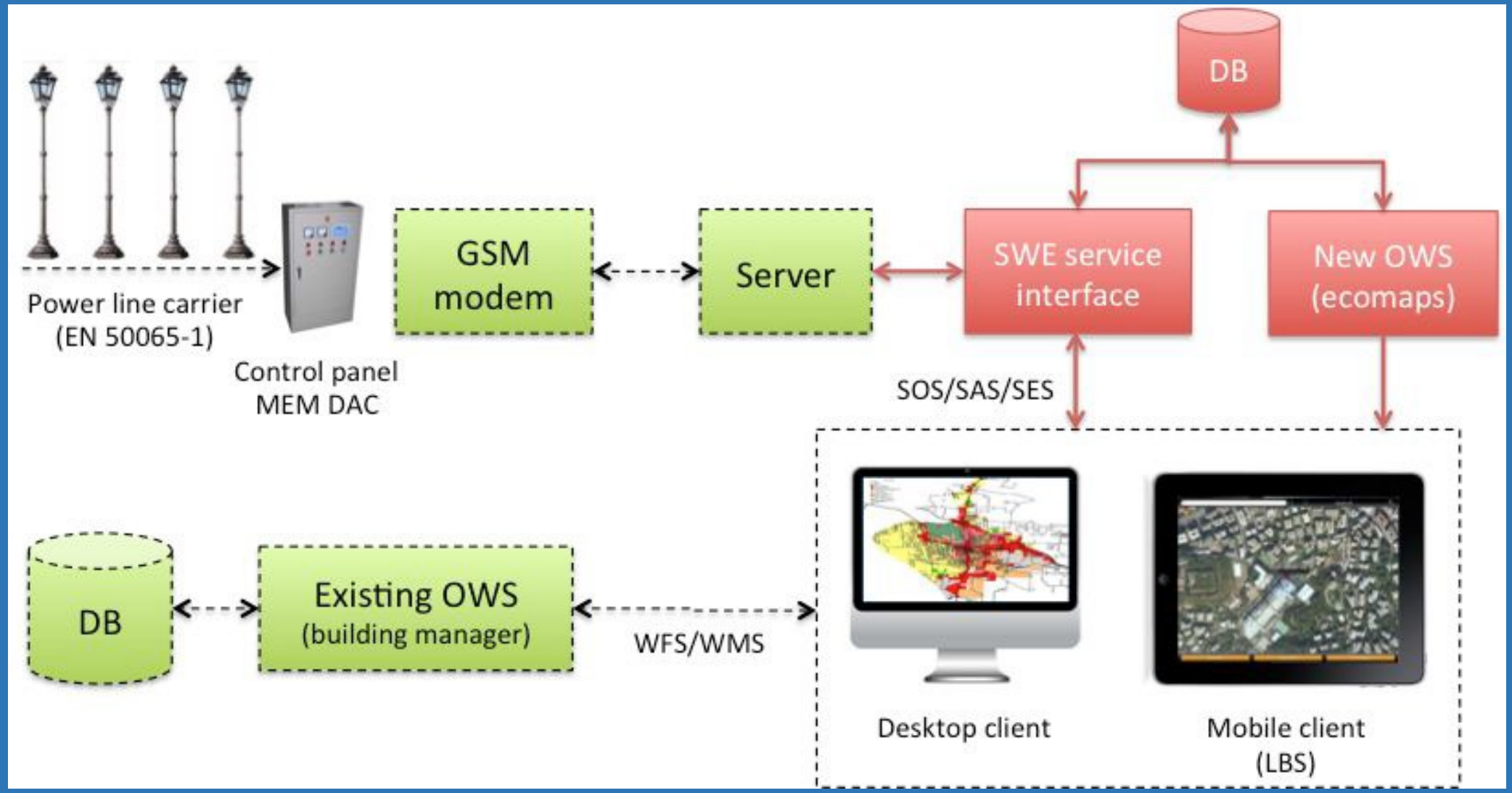

Building Analysis - SCUOLAELEMPOLEDRELLI
Buildings
Weather
Shelter
16 Nov 2015
17 Nov 2015
18 Nov 2015
19 Nov 2015
20 Nov 2015
21 Nov 2015
22 Nov 2015
23 Nov 2015
24 Nov 2015
25 Nov 2015
Thermal Energy Consumption (KWh) - 1 h
Thermal Energy Consumption (KWh) - 1 d
Download Report
Building Prediction Model
Using SUNSHINE prediction model, you will be able to know when turn on the heating system in order to have your preferred comfort temperature minimizing the costs to reach it.


Building Prediction Model
Using SUNSHINE prediction model, you will be able to know when turn on the heating system in order to have your preferred comfort temperature minimizing the costs to reach it.
6 Jan 2016
7 Jan 2016
8 Jan 2016
9 Jan 2016
10 Jan 2016
11 Jan 2016
12 Jan 2016
13 Jan 2016
14 Jan 2016
15 Jan 2016
Project Funding
Project Coordinator
Social Networks
TURN ON: 04:21
SWITCH OFF: 17:00
Comfort Temperature (°C)
Internal Temperature (°C) - 1h
Comfort Temperature
20
Comfort Start Hour
7:30
Comfort End Hour
18:30
From
To
Set the Prediction Model
7 Days Active Schedulings
DAY
FROM
TO
TEMPERATURE
2016-01-14 7:30 18:30 20
2016-01-15 7:30 18:30 20
2016-01-18 7:30 18:30 20
2016-01-19 7:30 18:30 20
2016-01-20 7:30 18:30 20
2016-01-21 7:30 18:30 20
2016-01-22 7:30 18:30 20

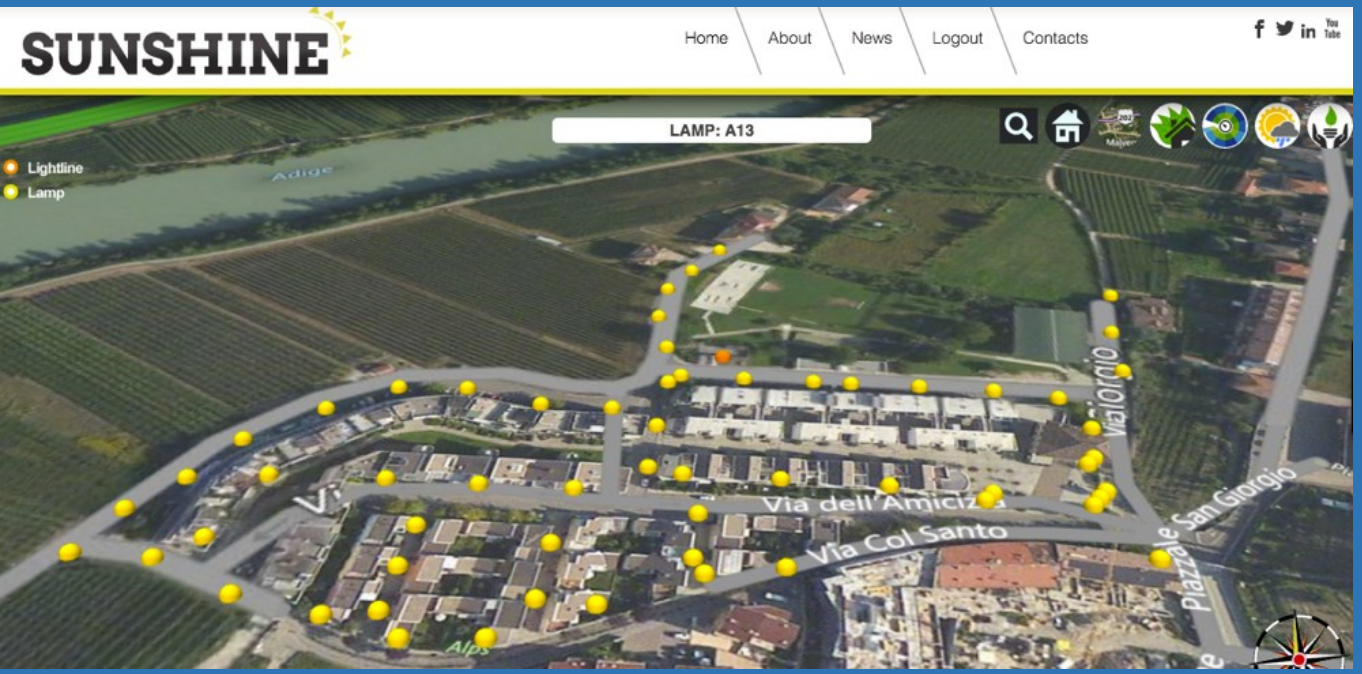
Public Lighting

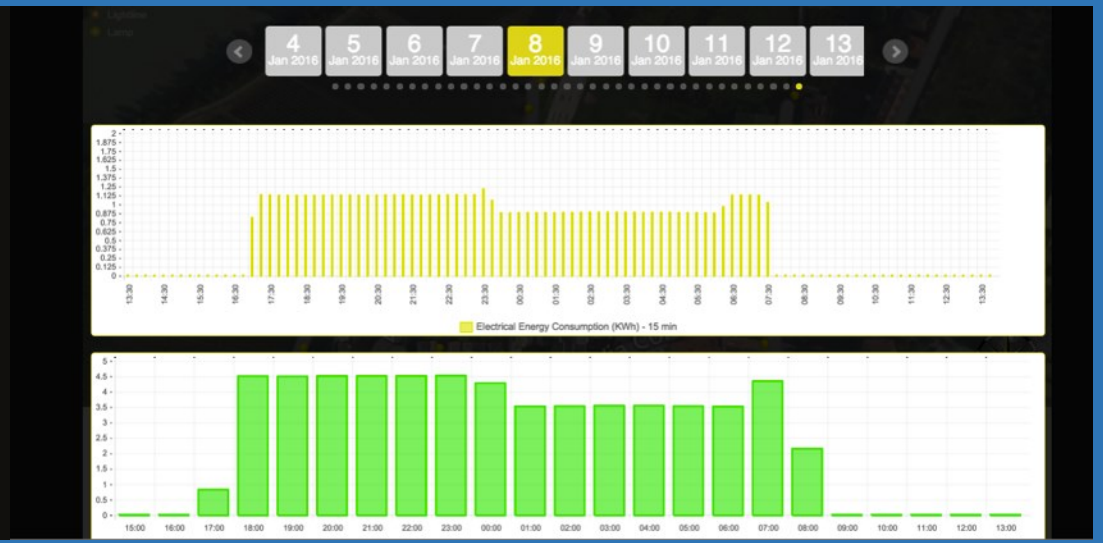
- Increasing number of public lighting system with point to point Led technologies;
- Hard to access different systems in one platform

How to support optimization of usage using IT technologies?

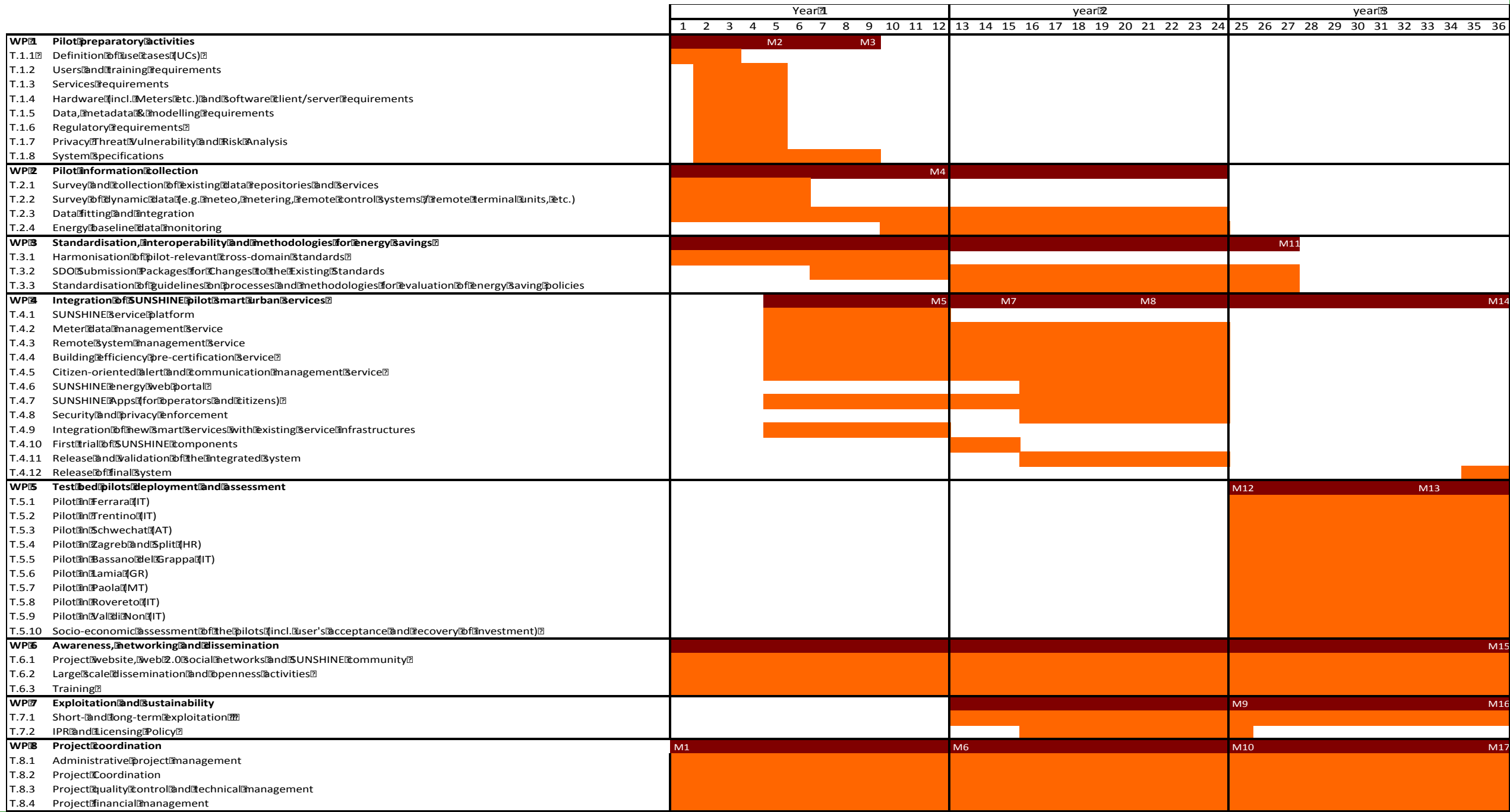

DB
Power line carrier
(EN 50065-1)
Control panel
MEM DAC
GSM
modem
Server
SWE service
interface
New OWS
(ecomaps)
SOS/SAS/SES
DB
Existing OWS
(building manager)
WFS/WMS
Desktop client
Mobile client
(LBS)

Optimisation of energy consumption of public lights

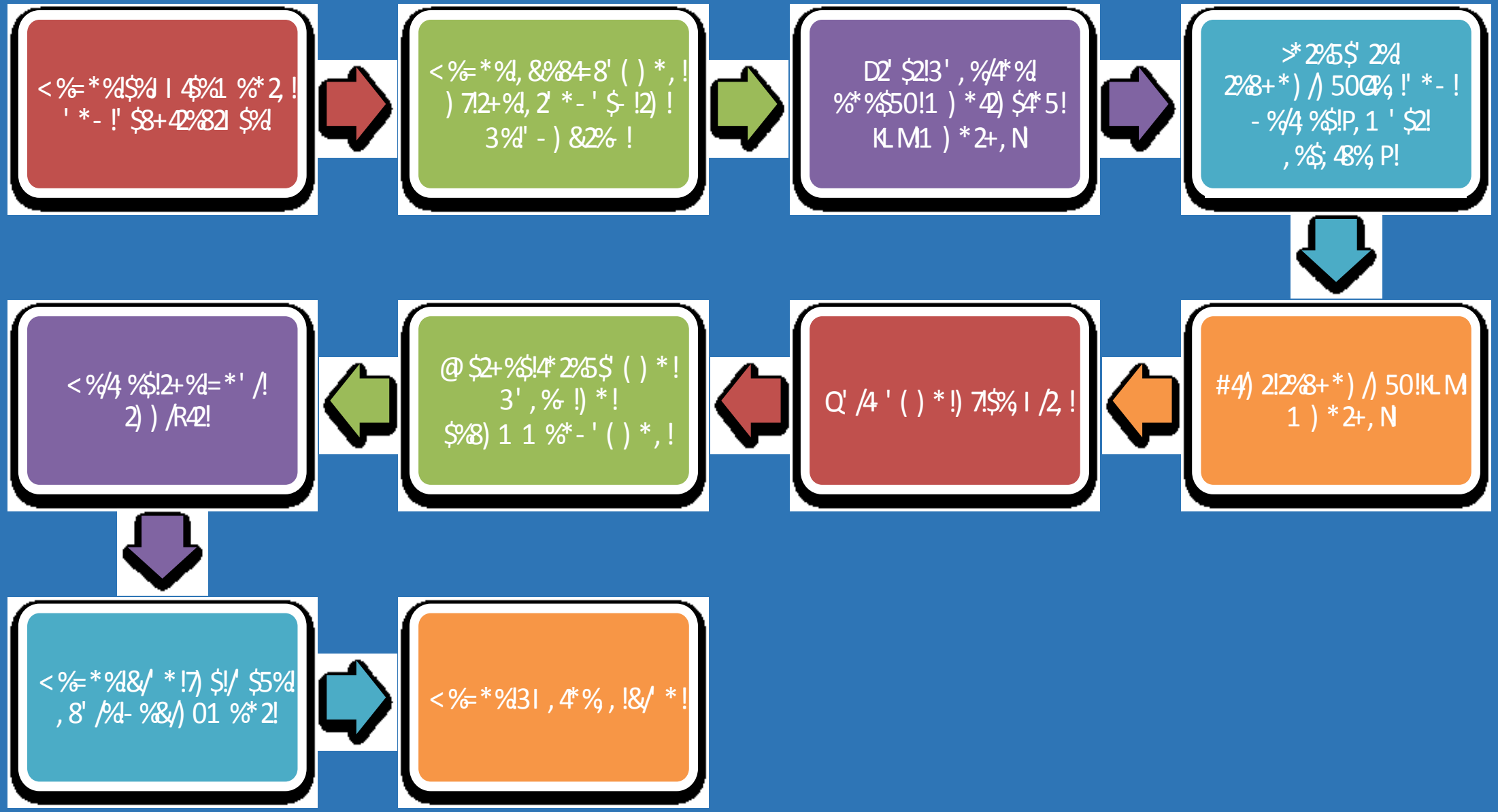


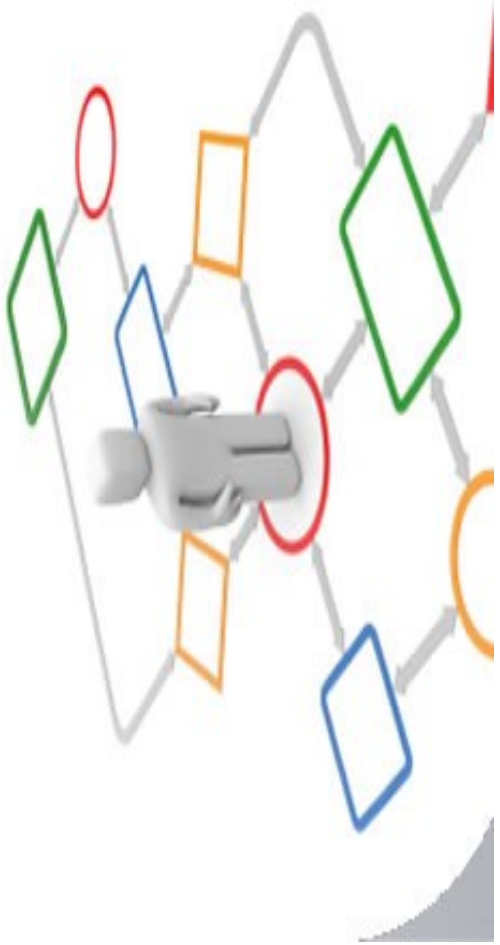


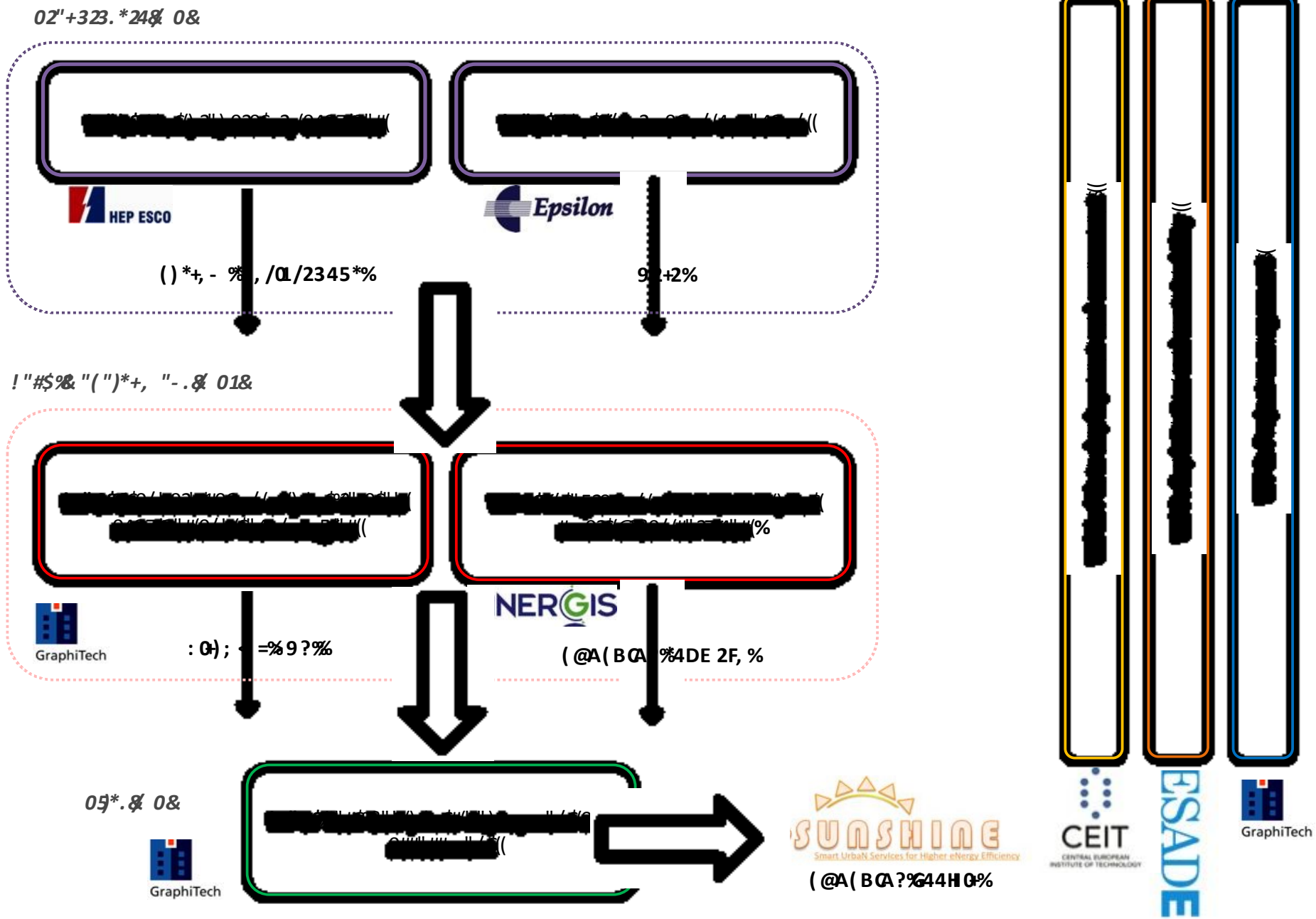
The Sunshine organizational approach


Year 1
year 2
year 3
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
WP 1 Pilot preparatory activities
M2
M3
T.1.1 Definition of use cases (UCs)
T.1.2 Users and training requirements
T.1.3 Services requirements
T.1.4 Hardware (incl. Meters etc.) and software client/server requirements
T.1.5 Data, metadata & modelling requirements
T.1.6 Regulatory requirements
T.1.7 Privacy Threat Vulnerability and Risk Analysis
T.1.8 System specifications
WP 2 Pilot information collection
M4
T.2.1 Survey and collection of existing data repositories and services
T.2.2 Survey of dynamic data (e.g. meteo, metering, remote control systems / remote terminal units, etc.)
T.2.3 Data fitting and integration
T.2.4 Energy baseline data monitoring
WP 3 Standardisation, interoperability and methodologies for energy savings
M11
T.3.1 Harmonisation of pilot-relevant cross-domain standards
T.3.2 SDO Submission Packages for Changes to the Existing Standards
T.3.3 Standardisation of guidelines on processes and methodologies for evaluation of energy saving policies
WP 4 Integration of SUNSHINE pilot smart urban services
M5
M7
M8
M14
T.4.1 SUNSHINE service platform
T.4.2 Meter data management service
T.4.3 Remote system management service
T.4.4 Building efficiency pre-certification service
T.4.5 Citizen-oriented alert and communication management service
T.4.6 SUNSHINE energy web portal
T.4.7 SUNSHINE Apps (for operators and citizens)
T.4.8 Security and privacy enforcement
T.4.9 Integration of new smart services with existing service infrastructures
T.4.10 First trial of SUNSHINE components
T.4.11 Release and validation of the integrated system
T.4.12 Release of final system
WP 5 Test bed pilots deployment and assessment
M12
M13
T.5.1 Pilot in Ferrara (IT)
T.5.2 Pilot in Trentino (IT)
T.5.3 Pilot in Schwechat (AT)
T.5.4 Pilot in Zagreb and Split (HR)
T.5.5 Pilot in Bassano del Grappa (IT)
T.5.6 Pilot in Lamia (GR)
T.5.7 Pilot in Paola (MT)
T.5.8 Pilot in Rovereto (IT)
T.5.9 Pilot in Valdi Non (IT)
T.5.10 Socio-economic assessment of the pilots (incl. user's acceptance and recovery of investment)
WP 6 Awareness, networking and dissemination
M15
T.6.1 Project website, web 2.0 social networks and SUNSHINE community
T.6.2 Large scale dissemination and openness activities
T.6.3 Training
WP 7 Exploitation and sustainability
M9
M16
T.7.1 Short- and long-term exploitation
T.7.2 IPR and Licensing Policy
WP 8 Project coordination
M1
M6
M10
M17
T.8.1 Administrative project management
T.8.2 Project Coordination
T.8.3 Project quality control and technical management
T.8.4 Project financial management

Main phases of SUNSHINE



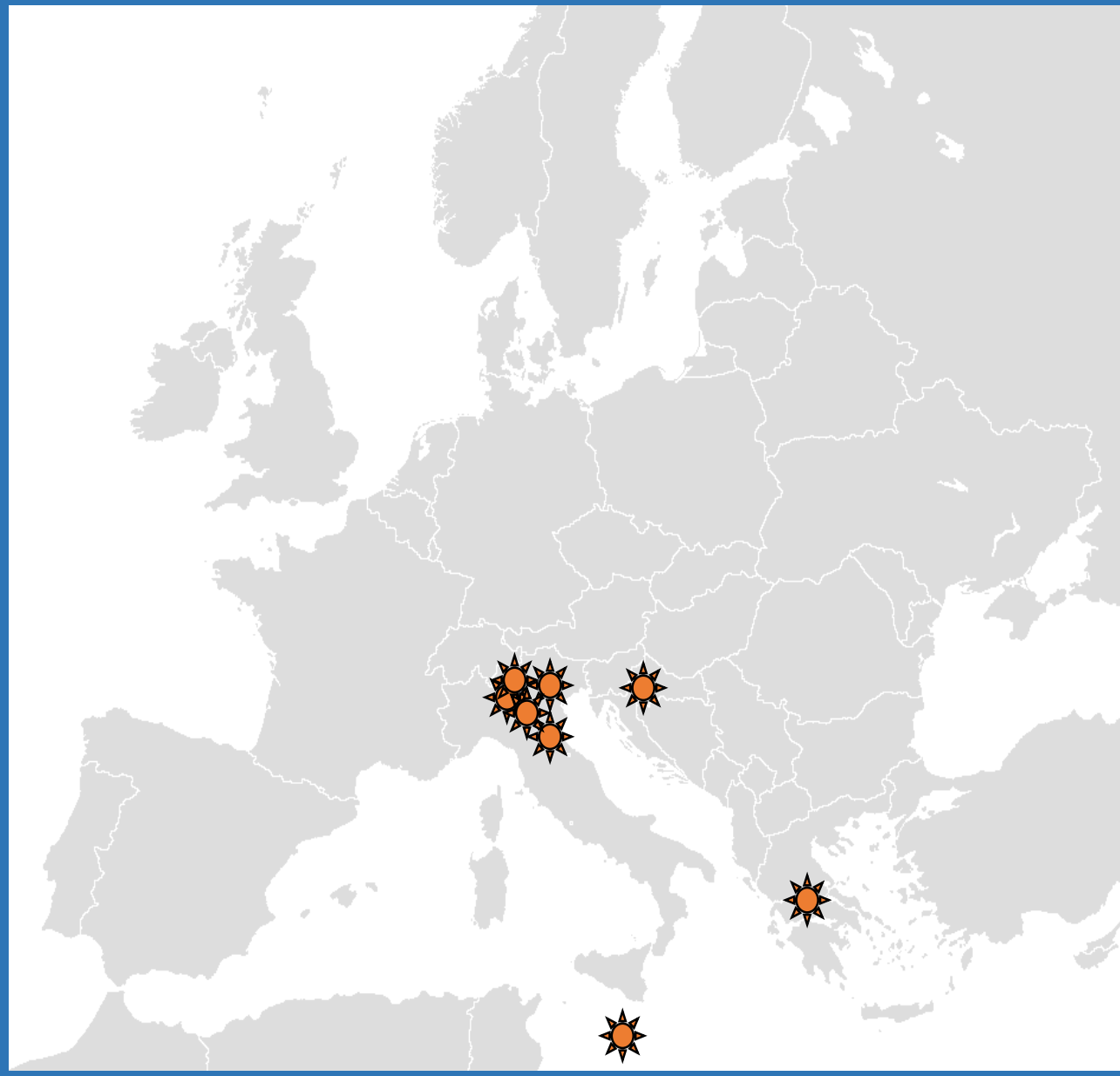



HEP ESCO
Epsilon
GraphiTech
NERGIS
GraphiTech
SUNSHINE
Smart UrbaN Services for Higher eNergy Efficiency
CEIT
CENTRAL EUROPEAN INSTITUTE OF TECHNOLOGY
ESADE
GraphiTech

The Sunshine Pilots

Test bed pilots deployment and assessment

- Ferrara, IT
- Lamia, GR
- Paola, MT
- Rovereto, IT
- Trentino, IT
- Val di non, IT
- Zagreb, HR
- Bassano del grappa, IT



The technology developped has been piloted in the context of 8 sites, specifically:

- 20 public buildings in Ferrara (Italy);
- 60 technical buildings owned by Trentino Network located across Trentino province (Italy);
- 5 public illumination lines in the city of Rovereto (Italy) (total of 80 illumination units) (Italy);
- 3 building complexes in the area of Val di Non (Italy) and their outdoor public illumination systems (Italy);
- 4 public illumination lines in the centre of Bassano del Grappa (Italy)
- 10 buildings owned by HEP ESCO in Zagreb and Split (Croatia) and the illumination systems in the surroundings of one of HEP ESCO's power plant (50 illumination units); (total of 200 illumination units);
- 5 buildings in Lamia (Grece) owned by Technological Educational Institute di Lamia;
- 2 buildings owned by Malta College of Arts, Science and Technology (MCAST) in Paola (Malta);

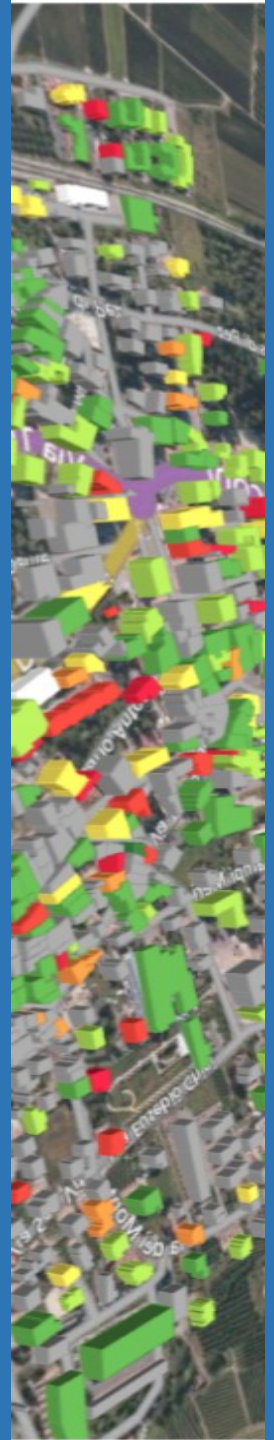
Pilots and Scenarios

- Different Scenarios need different strategies

	Scenario 1	Scenario 2	Scenario 3

At the end of the second year of the project:

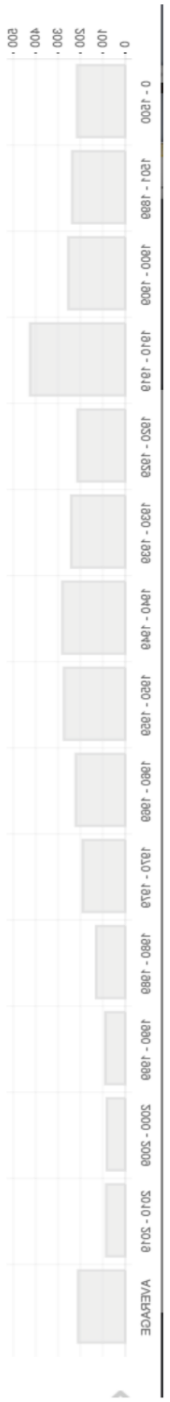
- For all the pilots the “energy maps” have been generated;
- All pilots were able to monitor the energy consumptions of their pilot buildings or public light through smart meters;
- Almost all the pilots were able to provide these information to the central SUNSHINE server;
- The models at the basis of the energy map production and suggestion services have been defined.
- All the pilots have provided the energy consumption baseline;
- The web application has been released;
- The mobile application prototype has implemented and deployed.



Last 12 months of the project have focus on the pilot deployment of the technologies and methodologies designed and developed during the first two years of the project. Pilot phase is a crucial aspect of the whole project. Pilots are not only useful to raise users' awareness through a "learn by doing" process, but they test the technologies in real operational conditions. This has in turn allowed gathering data on the usability of the technologies as well as further energy consumption data that will increase the size of the database of the SUNSHINE IT services.

The piloting activities are focused mainly in:

- To Set up the pilot IT infrastructure as designed during WP4;
- To involve the pilot users on testing the platform;
- To assess the achievements in terms of energy saving using SUNSHINE;
- To organize training session addressed to pilot users.

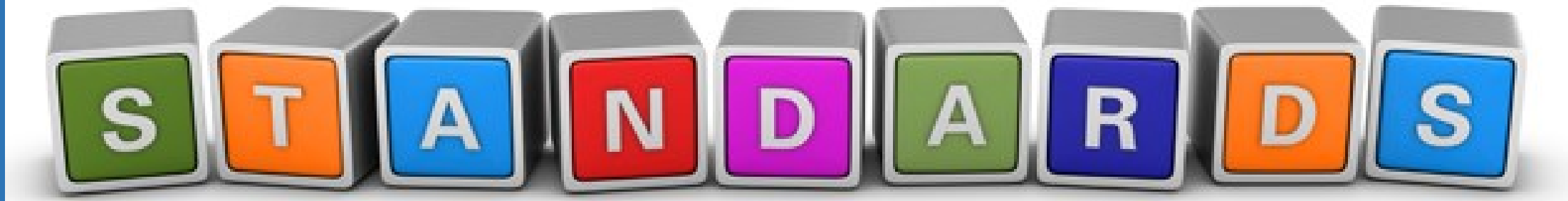


The pilot deployment has brought to a number of undertaken activities and findings. The technological solutions implemented in the projects are both completed and tested in a validated environment and, after a series of integration and testing loops, the final SUNSHINE solution has been released and made available at the end of the project. IT services that allow to deploy the SUSNHINE infrastructure have been implemented and are available for the pilot access through the dedicate web and mobile SUSNHINE applications. This guarantees that pilot actions have started on M25 according to the amended DoW.

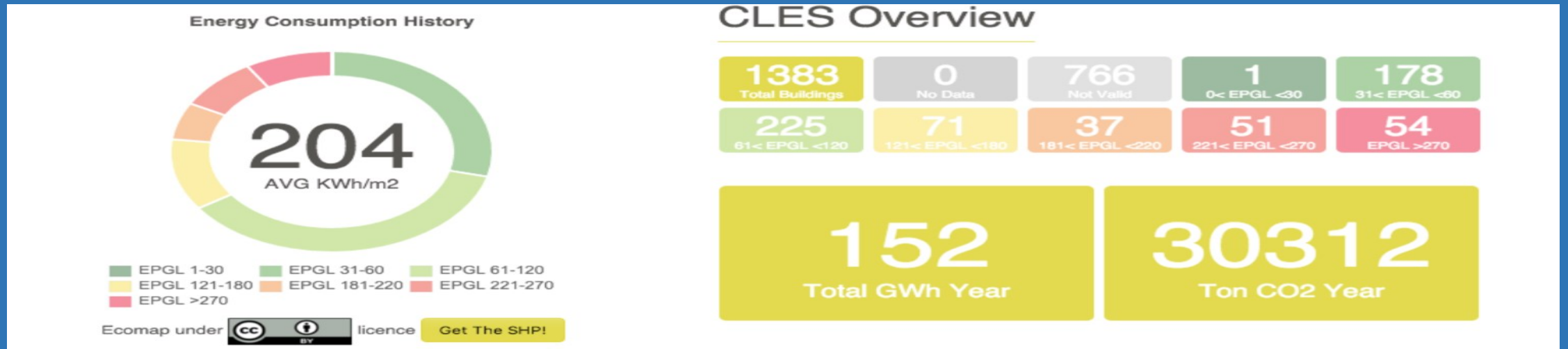
The main technical objectives achieved during the last 12 months are related to: :

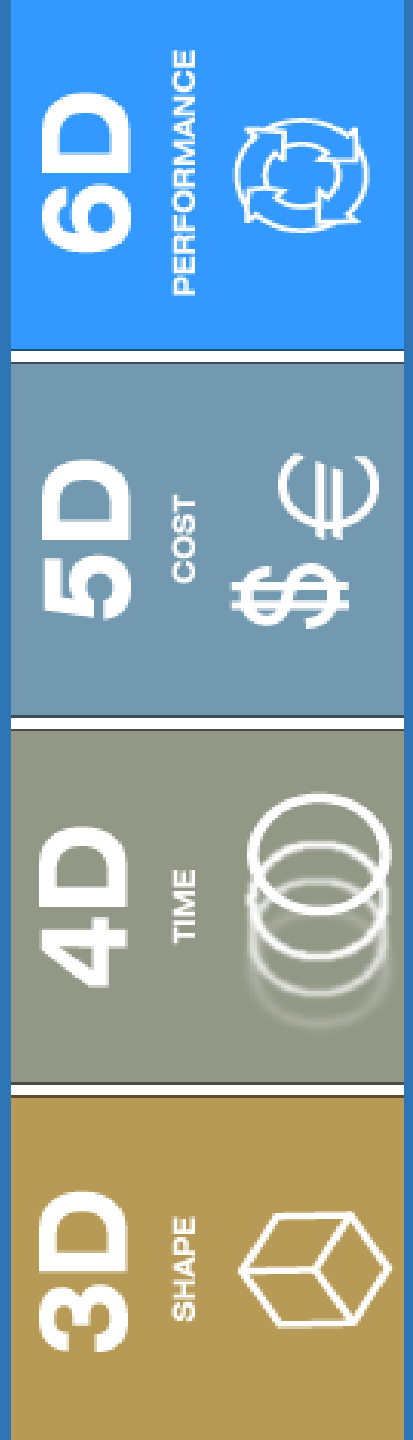
- The deployment and set-up of the pilot IT infrastructures in order to communicate in a robust way with the SUNSHINE central infrastructure ;
- The improvements and updating of the web and mobile client interface following the users feedbacks and bugs findings ;
- The improvements and extension of some SUNSHINE services (i.e. refinement of the energy model including internal gains, energy maps generation for cooling needs).

SUNSHINE



The Sunshine Consortium was involved in the completion of the Standardisation, interoperability and methodologies for energy . This activity has been fundamental to ensure the adherence of SUNSHINE technical implementation to the standardization activities in order to guarantee the scalability and reliability of the proposed solutions outside the controlled pilot environment. A direct involvement of SUNSHINE consortium within the CityGML energy ADE standardization working group has brought to the definition of a SUNSHINE data model fully compliant with this on-going standard, furthermore the analysis, development and testing of the pilot IT infrastructures based on Green Button initiative has posed SUNSHIEN project as reference benchmark for the implementation of this protocol which is increasingly used by energy companies.





From not a technical point of view the last year of the project has been dedicated, among others, to the design and development of the business plan of the project; in particular following the suggestion of the EU to the definition of each partner business plan in order to define the exploitation of the project in the short and long-terms.

The outputs of this activity were:

- Market assessment of SUNSHINE tools environment.
- Partners' individual business plans.
- Consortium exploitation plan.


2016
•Definition, if necessary, of a protocol and agreement for service provision: Organization, pricing policy, collaboration opportunities among consortium members
•Fundraising and human resources activities
•Work on the robustness of technical tools: From prototype to product
•Dissemination and marketing activities: Results of the project presentations and demonstrations to potential users and stakeholders
•Maintenance activities of technical products and customization
•Training activities of current pilots and new users
•Awareness of future research calls
2017
•Dissemination and marketing activities: Products and services presentations and demonstrations to potential users and stakeholders
•Maintenance activities of technical products and customization
•Assessment of first year of exploitation activities
•Awareness of future research calls
•Preparation for future proposals
•Training activities for users
2018
•Dissemination and marketing activities: Products and services presentations and demonstrations to potential users and stakeholders
•Maintenance activities of technical products and customization
•Assessment of second year of exploitation activities
•Awareness of future research calls
•Preparation for future proposals

Sunshine contribution and results

- Delivered three web-services compliant with Open Geospatial Consortium (OGC)
- integrated existing technologies for SOS/SES services within a middleware based on OGC standards
- Delivered three client applications through customisation of existing software solutions
- Formalised an extension to the OGC standard CityGML on building energy efficiency and to propose it to the OGC standardisation committee
- Assessed the impact and sustainability (both in the short- and long-term) of the project through comparison of baseline energy data collected over 12 months

Further links and reading

SUNSHINE Public Website

- http://www.sunshineproject.eu/

SUNSHINE Energy Web Portal

- http://sunshine.graphitech-projects.com

SUNSHINE Youtube channel

- https://www.youtube.com/user/SunshineProjectEu/

Thanks for your attentions

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