R2CITIES
Residential district renovation
– Data management to the rescue –
- Webinar at EUSEW 2017 -

T 7.7 - Dissemination Workshops

EUSEW – 19 June 2017 – 4 pm

EeB.ENERGY.2012.8.8.3,
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Objective

- Discuss how to leverage

  ✓ smart data collection and mining
  ✓ real-time energy consumption control
  ✓ district monitoring platform

  helping you to manage all the data involved in district-scale retrofitting

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Outline of content

- ✓ R2CITIES project overview
- ✓ Energy data manager developed by R2CITIES
  - ✓ Functionalities
  - ✓ Risk reduction
  - ✓ Benefits for different stakeholders

SPEAKER

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R2CITIES Project Overview

Start date: July 2013

Duration: 60 months

Total budget: 14.8 million EUR

EU funding: 9.1 million EUR

17 partners from 5 different EU countries

31% of project partners are SMEs

R2CITIES will develop and demonstrate replicable strategies for designing, constructing and managing large scale district renovation projects for achieving nearly zero energy cities.

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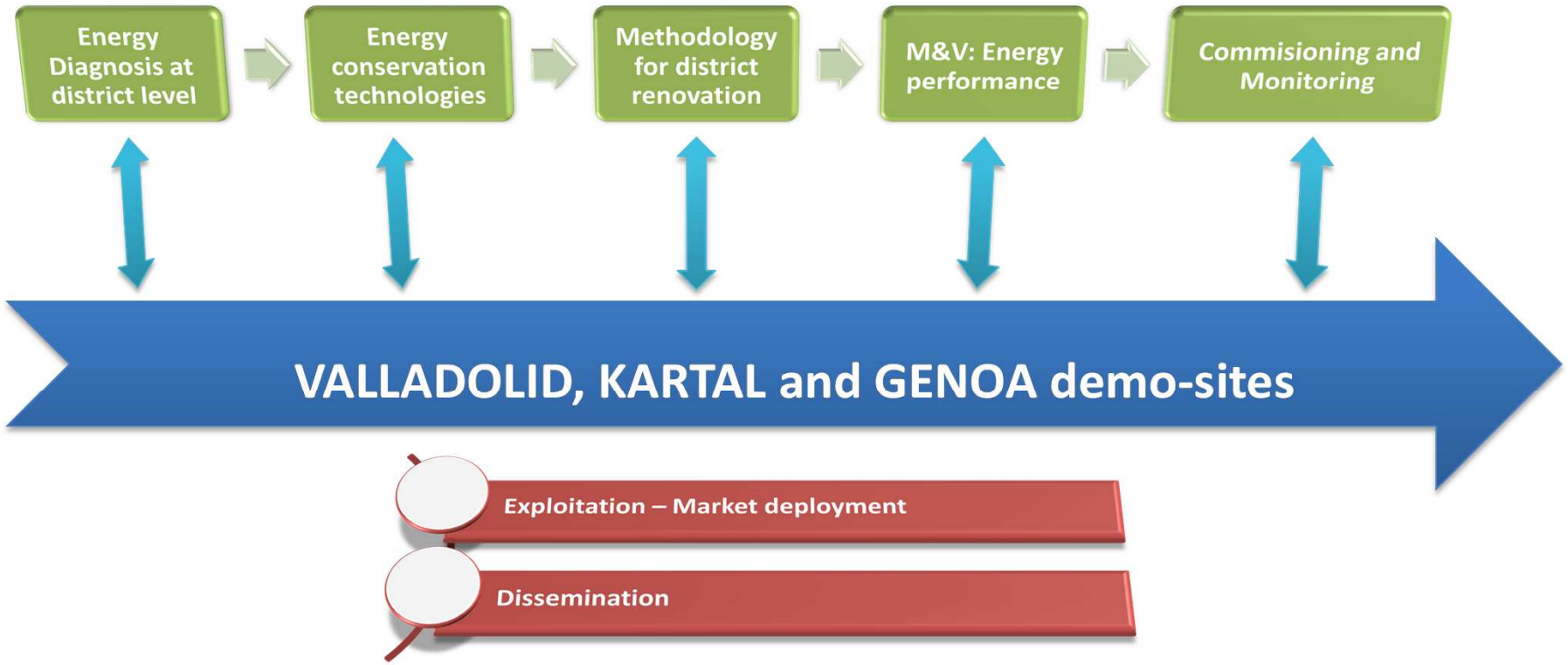
R2CITIES Project Overview



Data Management System - Rational

- ICT tools can provide information and data on how to **better configure the various elements of a system** to optimize its overall energy performance in a cost-effective manner.

- By monitoring and directly managing energy consumption, ICTs can **reduce energy consumption** of buildings in the EU by up to 10%.

- ICTs are not only important for the unneglectable contribution to the energy savings, but also to the **digitalization of the information**, making it available for the stakeholders.

- Innovative web-based energy data management system to monitor, control and benchmark the energy performance of buildings in different districts

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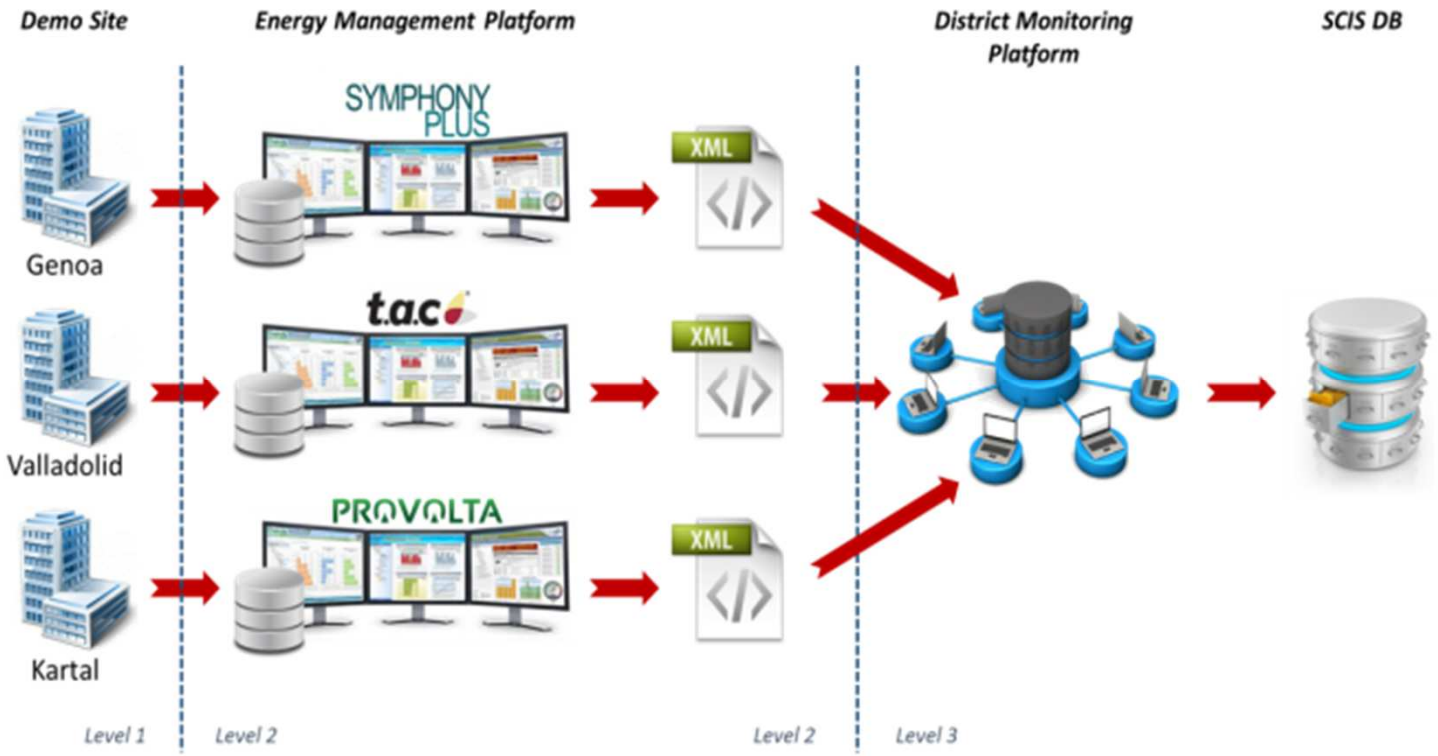
Energy Data Manager for Districts



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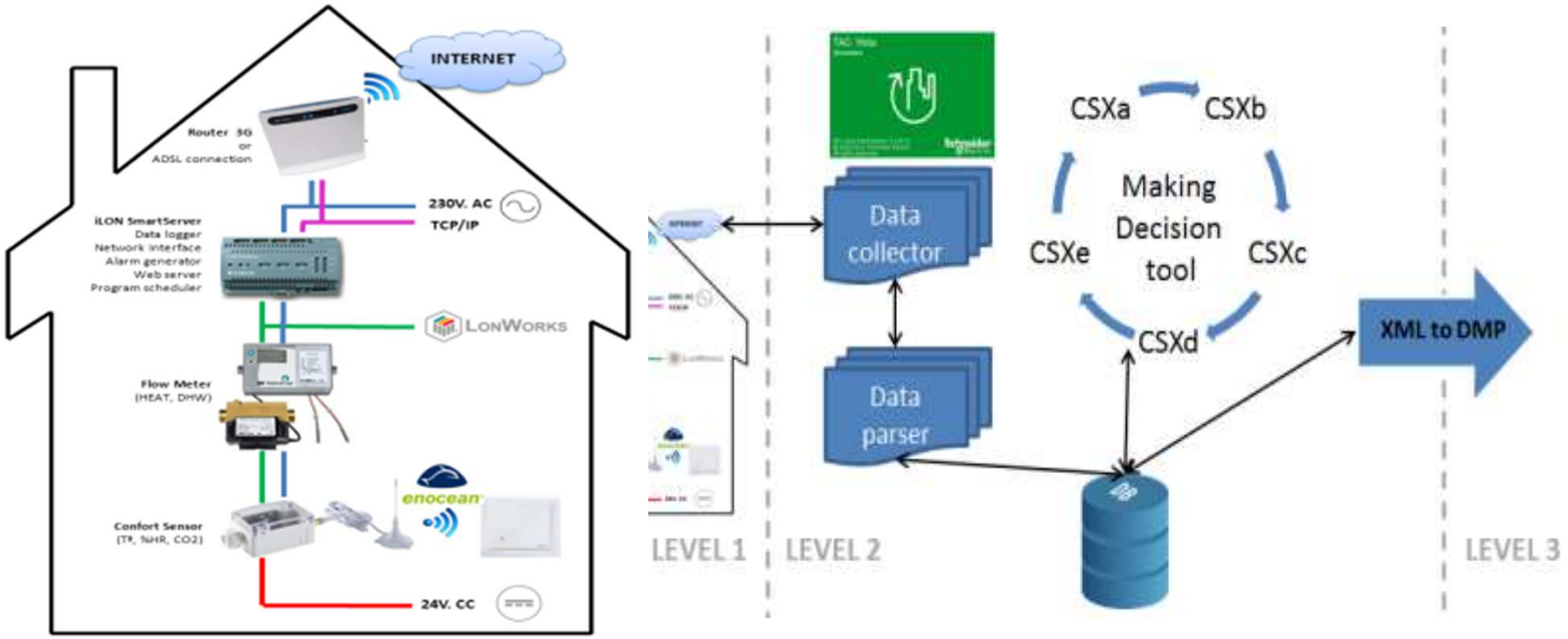
Valladolid Demo Site EMP – System Architecture



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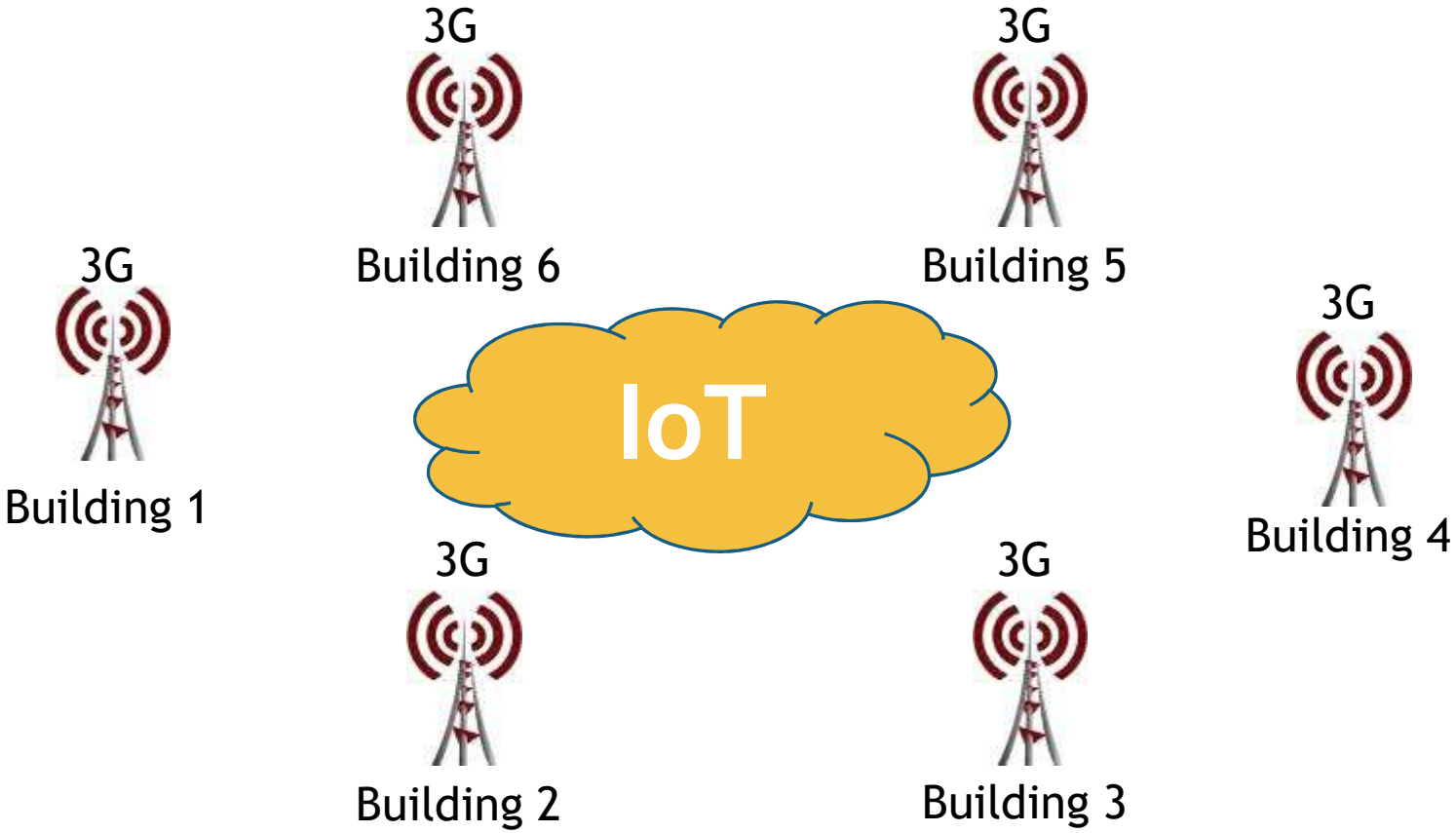
Valladolid Demo Site EMP – Data Collection



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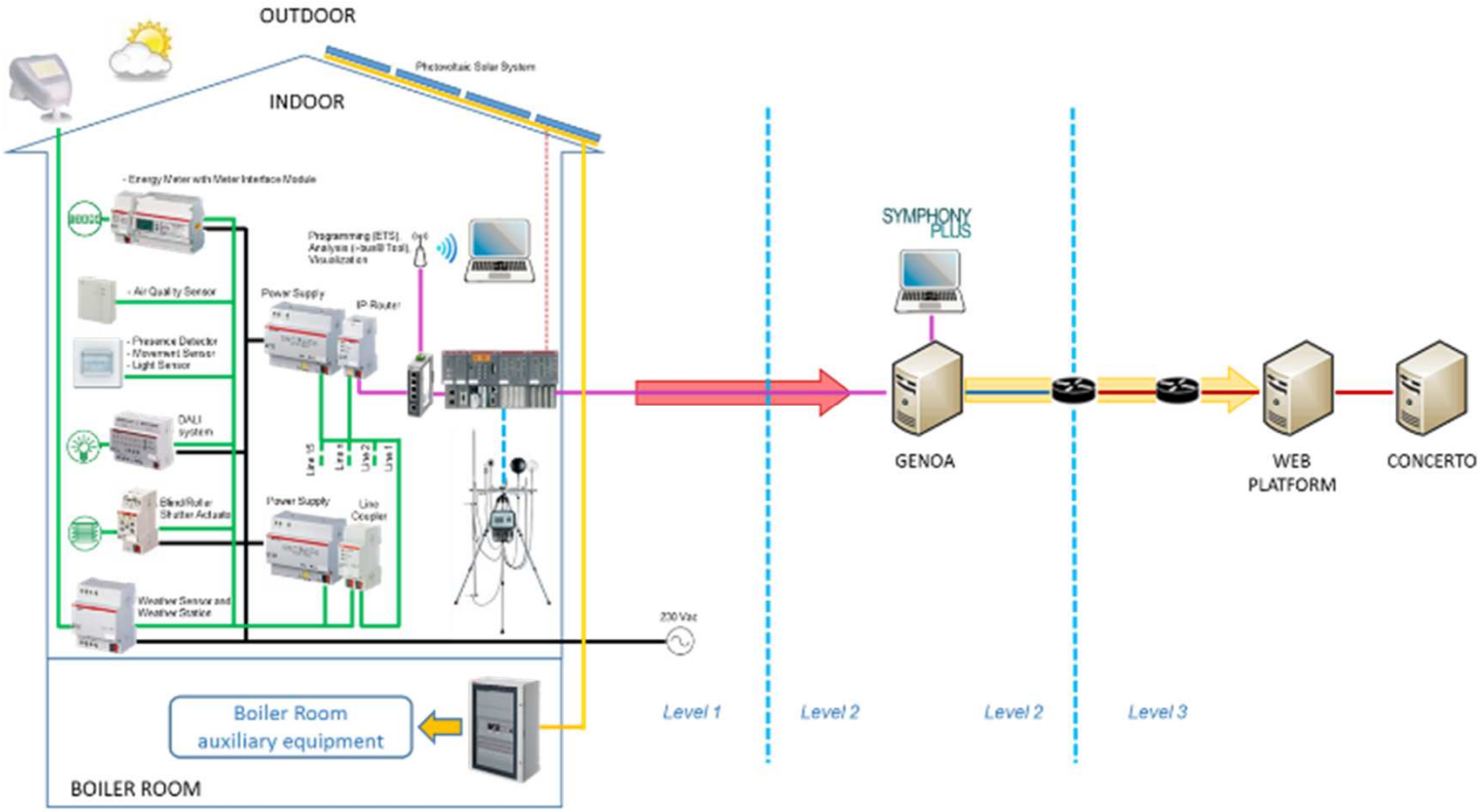
Genoa Demo Site EMP – System Architecture



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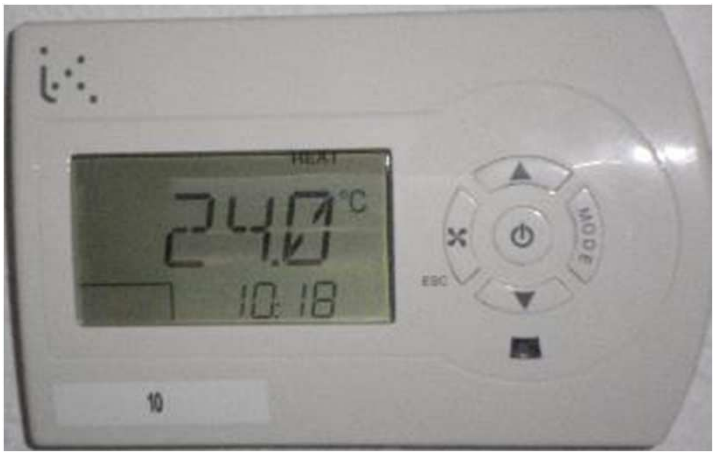
L1 – Monitored Parameters – Heating System

Monitored parameters

- External environment parameters
- Fuel consumption (gas, kWh)
- Monthly hour of functioning
- Alarm status



Controlled parameters

- Water temperature and flow rate
- Status of valves, pumps, manifolds and thermal power station
- Internal temperature from chrono-thermostats
- Thermal consumption

L1 – Monitored Parameters – Photovoltaic Plant

Monitored parameters

- External environment parameters
- Characteristics of the panels (type of cells, material, tilt angle, azimuth, etc)
- Energy production
- Electrical energy exchanged with the network
- Consumption of auxiliaries
- Alarm status

Controlled parameters

- Inverter functionality
- Current, tension, active and reactive power exchanged with the grid

Genoa Demo Site EMP – L2 – Symphony+

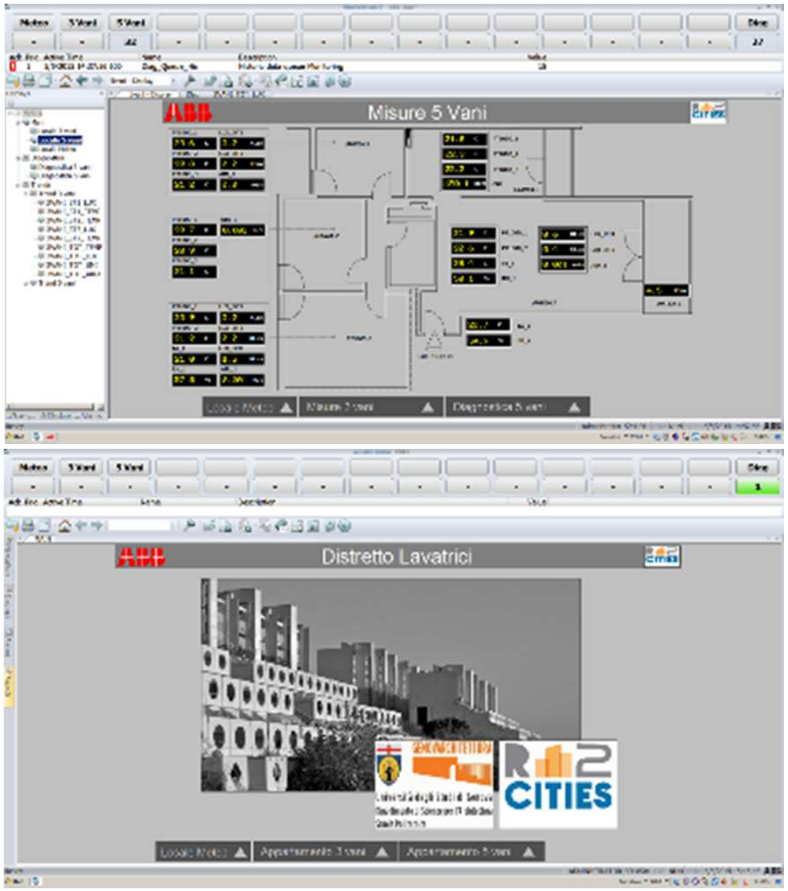
- ABB SCADA package software called Symphony Plus
- Symphony Plus's Human Machine Interface called **S+ Operations** provides users with a broad view of system operations by integrating the complete utility into one system the whole plants and at all levels
- S+ Operations is a window-based, web-enabled HMI
- S+ Operations provides users with detailed process overview displays to present better situation awareness and recognition of abnormal conditions. At the same Level a simulation software for the energy modelling is "virtually" installed

In the context of R2CITIES, S+ carries out the **functions** of:

- Acquisition of data from field sensors
- Historic archive of past data
- Visualization of data with support for trend analysis and comparison
- XML file generation in order transmit data to DMP

Genoa Demo Site EMP – Control Room

- In the Genoa demo site, the **control room** is located in the thermal power room on high bar ground floor.
- **PC hardware** is used as the hardware platform. The Symphony+ Office Clients are operable under Microsoft Windows.
- The **server functions** mainly consists of data acquisition, alarm processing, calculation engine, and historical data recording



SPEAKER

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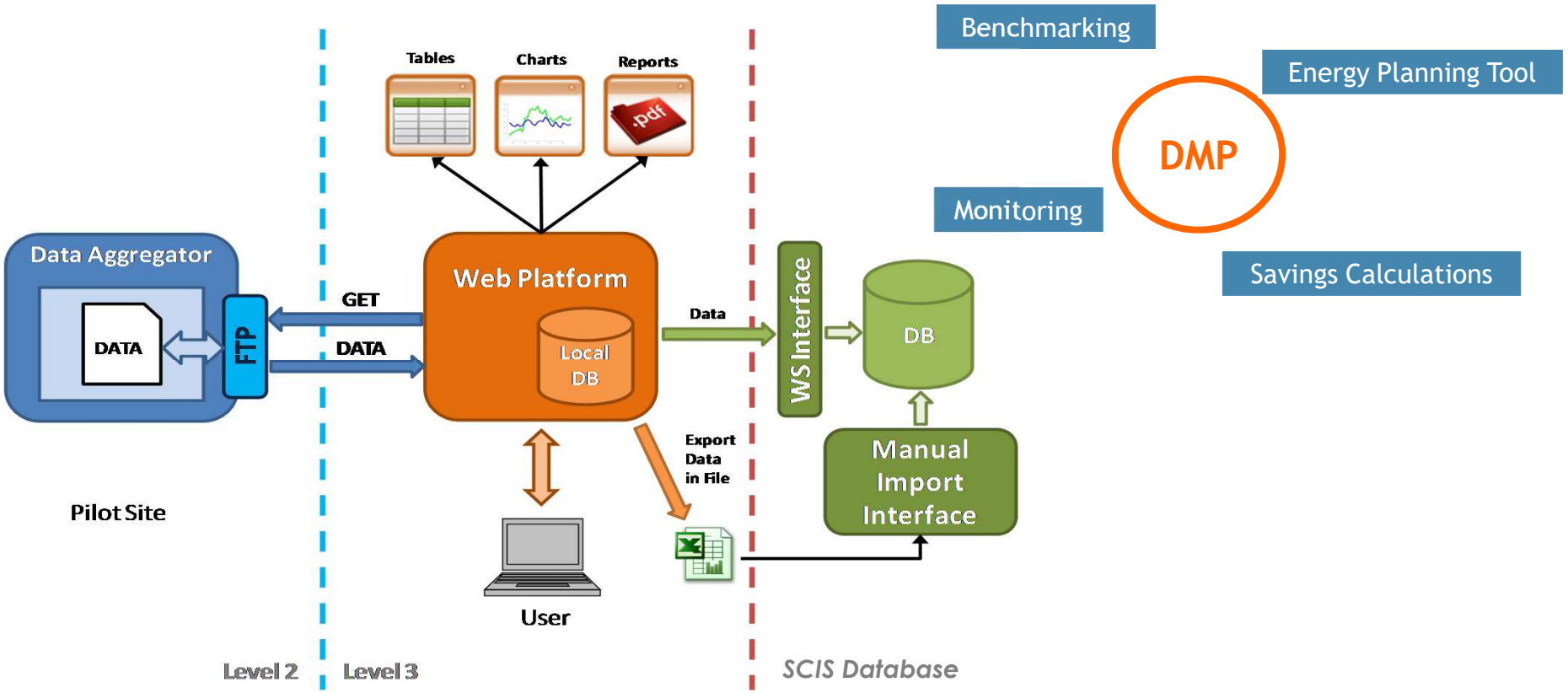
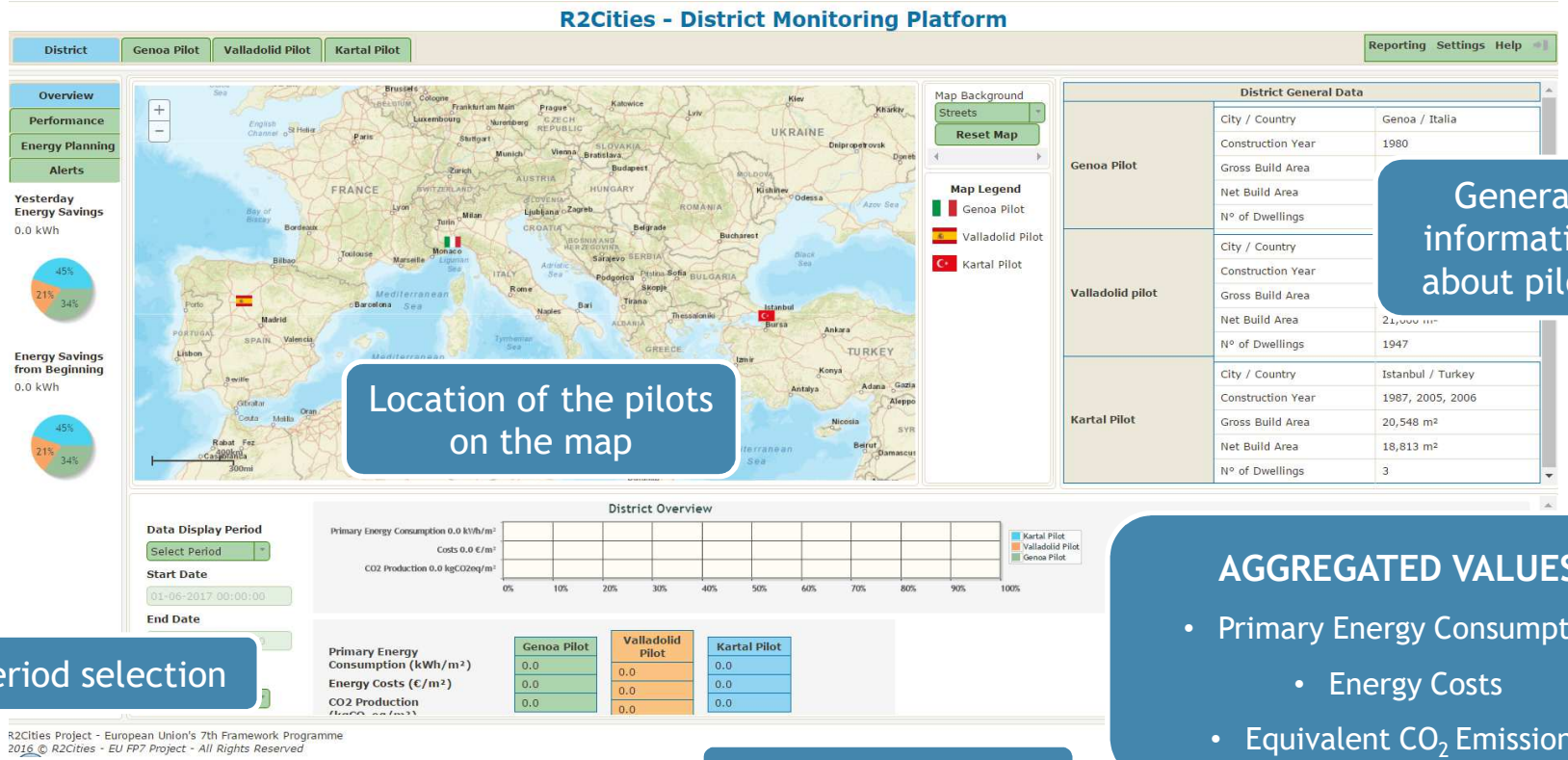
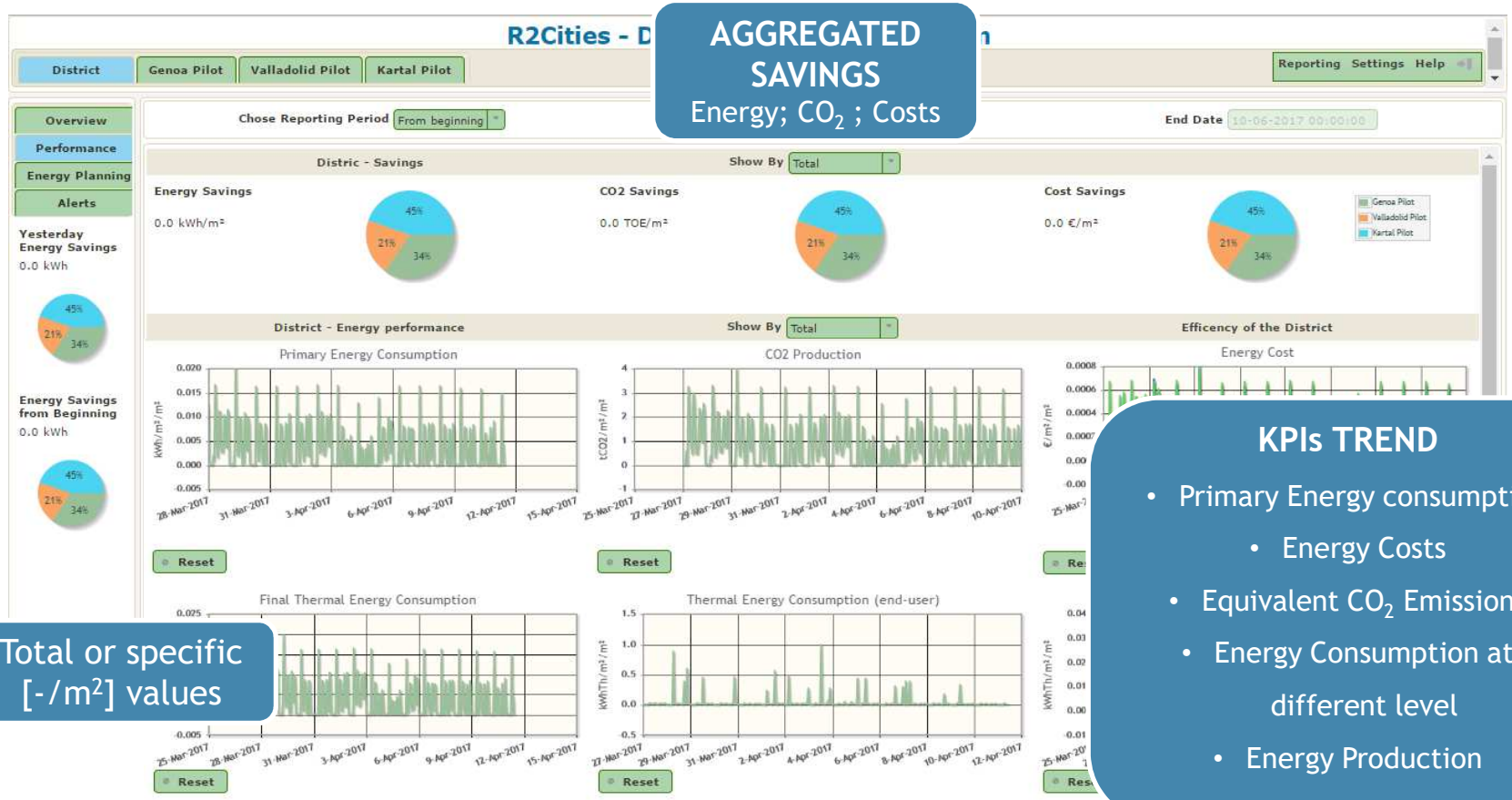
District Monitoring Platform



Virtual District Level- OVERVIEW



Virtual District level- PERFORMANCE



AGGREGATED SAVINGS
Energy; CO_2 ; Costs

Total or specific [-/m²] values

KPIs TREND

- Primary Energy consumption
- Energy Costs
- Equivalent CO_2 Emissions
- Energy Consumption at different level
- Energy Production

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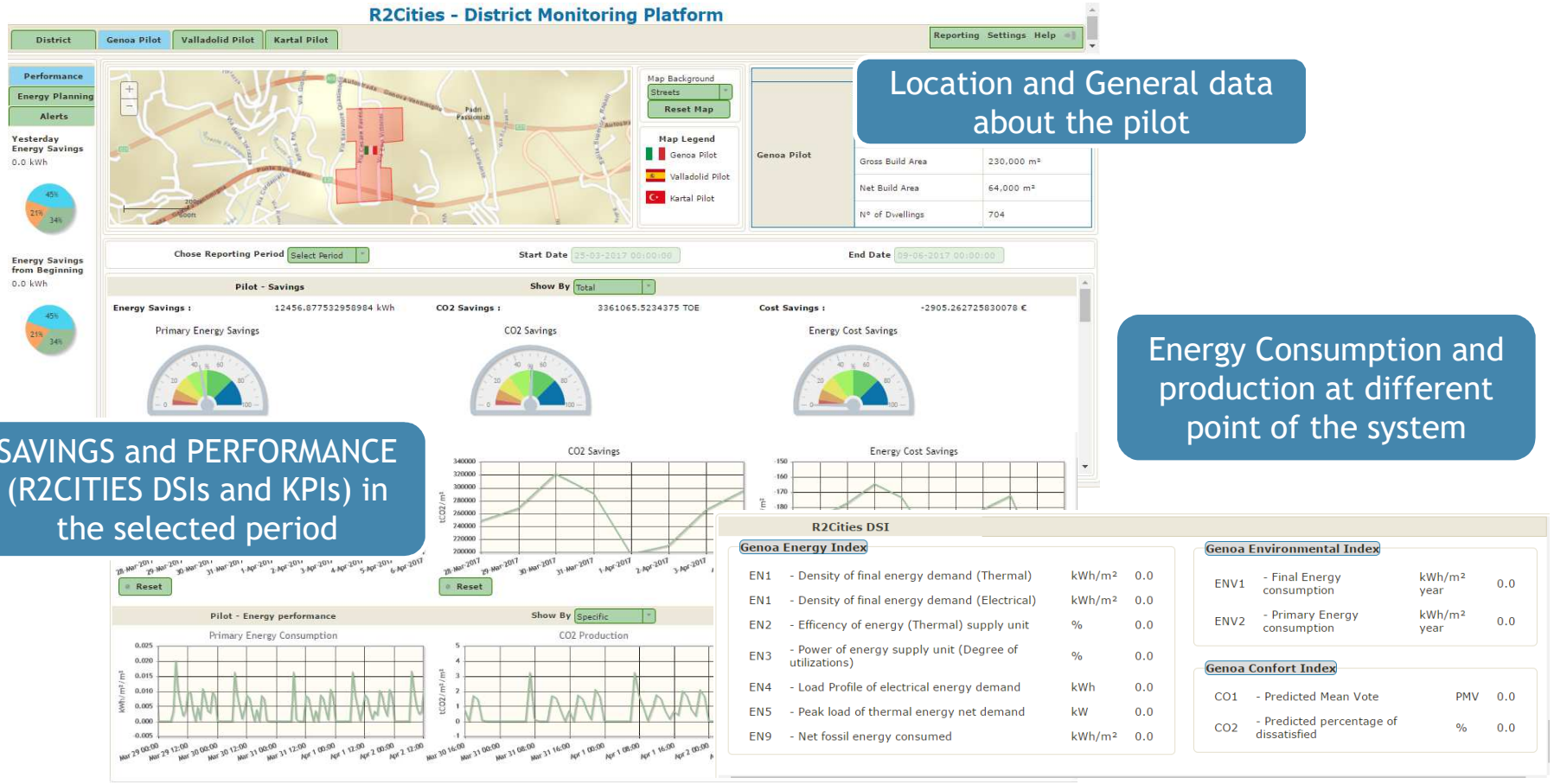
Demo Site Level - PERFORMANCE

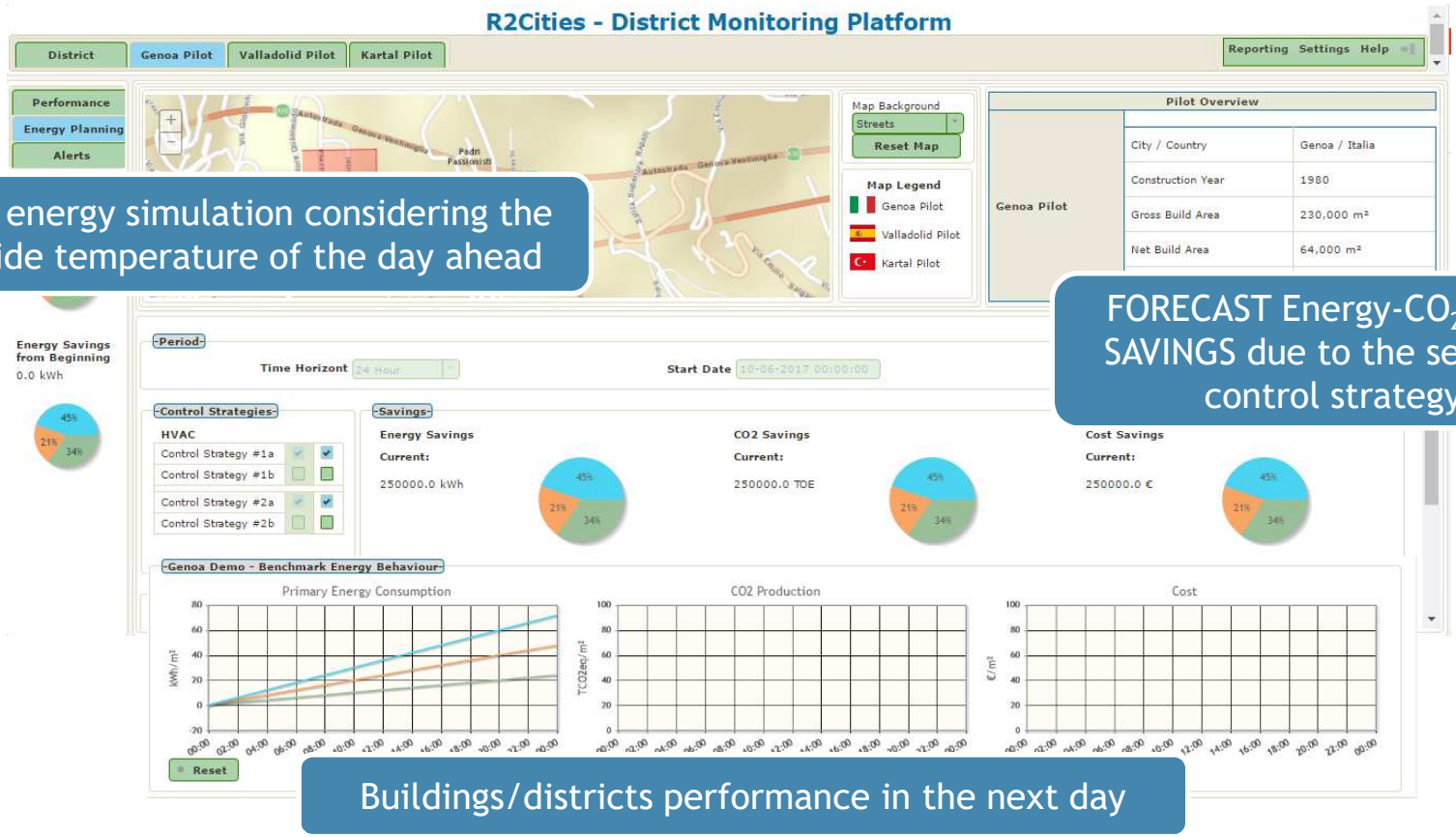


Location and General data about the pilot

Energy Consumption and production at different point of the system

SAVINGS and PERFORMANCE (R2CITIES DSIs and KPIs) in the selected period

Demo Site Level – ENERGY PLANNING



Daily energy simulation considering the outside temperature of the day ahead

FORECAST Energy-CO_2-Costs SAVINGS due to the selected control strategy

Buildings/districts performance in the next day

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Results and Benefits

Functionalities	Benefits	
Web-based access	Availability of data every time from any smart device	Ease energy management
Data retrieving from any EM system	No need to adapt to systems installed in different building/district	Ease energy management
Monitoring and visualization	Awareness of the consumption due to tenants behavior or energy management strategy	Efficient energy management
	Real time fault detection	Timely actions
Benchmarking	Best practice identification	Replication actions
	Worst practice identification	Corrective actions
Energy Planning Tool	Identification of the best solution for the next day	Optimized control strategies implementation

Cost Savings

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Risk Reduction

PITFALL	DMP HELPING HAND - mitigate/manage the risk
Energy Service **Outages** **Equipment disruption**	Real time fault detection
Decreasing of equipment performance	Real time monitoring at different points of the system
Difference between actual **consumptions and bills**	**Cash flow management** by means of real time monitoring of energy consumption and costs
User/Tenants bad behavior - Temperature set point not aligned to regulation/guidelines; - Systems operating out of the right time-schedule	Direct control on the system Real time monitoring
User/Tenants complaints (justified and unjustified)	Web access
Control strategies not optimized for the specific weather conditions	Energy planning tool

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Lessons Learnt and Challenges

Lesson learnt

The DMP established a universal protocol to receive the data gathered by each EMP. This **standard protocol** for the DMP is important in order to be able to minimize the modifications to the system when it is installed in a new site.

Definition of a basic set of standard displays and KPIs that can be applied to all possible sites and can be used as a base to build the personalized interface.

Challenges

Technical challenges /future trend

Stakeholder Awareness of benefits

- Model Predictive Control / Learning methods
- Internet of things
- Smart districts energy management
- Platform as a tool useful to be law compliant
- Development of an integrated service oriented platform

SPEAKER

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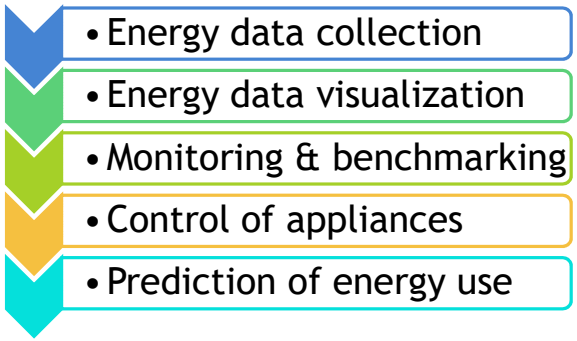
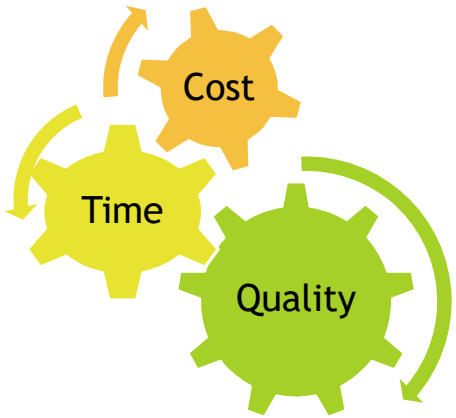
In a Nutshell - ICT Solution to

- collect energy consumption data from different buildings and districts
- process, report and visualize energy data through a graphical user interface
- facilitate decision-making through prediction of energy consumption
- benchmark the energy efficiency measures
- provide recommendations for energy-efficient control





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Unique Selling Point

A simplified and optimised energy management

thanks to near real-time energy monitoring, data visualization and decision-support tool

- ✓ a smarter way for gathering and analysing data collected from different sites
- ✓ an energy planning tool at district level
- ✓ currently tested during a project funded by the European Union

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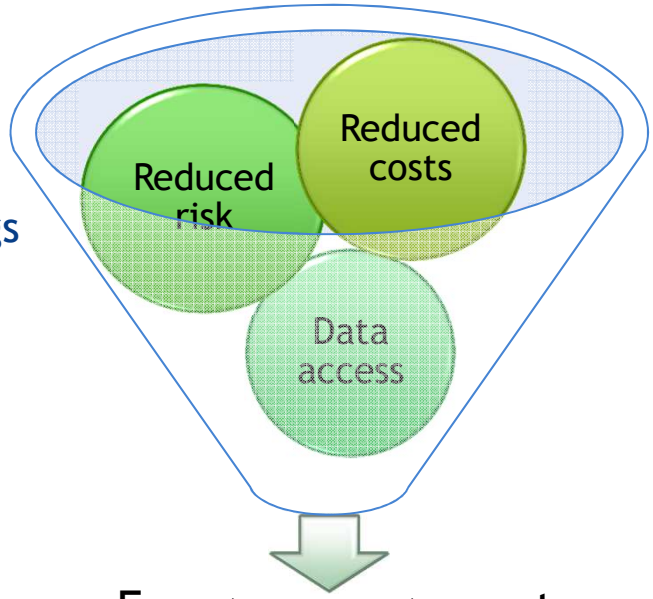
Values

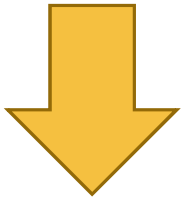
- ✓ **Reduces costs and risks**
  - detecting system failures by constantly gathering information
  - reduction in energy consumption of buildings
    - without investment: ≤ 10%
    - with investment: > 10%
- ✓ **Gets the job done**
  - managing energy efficiently
- ✓ **Provides access to data**
  - handling of different types of measures data from different sites



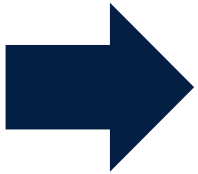
Product Benefits

ICT solution serving as a **tool to support energy-efficient operations**

across multiple sites (e.g. several residential building districts)

enabling  **energy** consumption

energy **efficiency**
renewable energies use



Zero-Energy Districts & Cities

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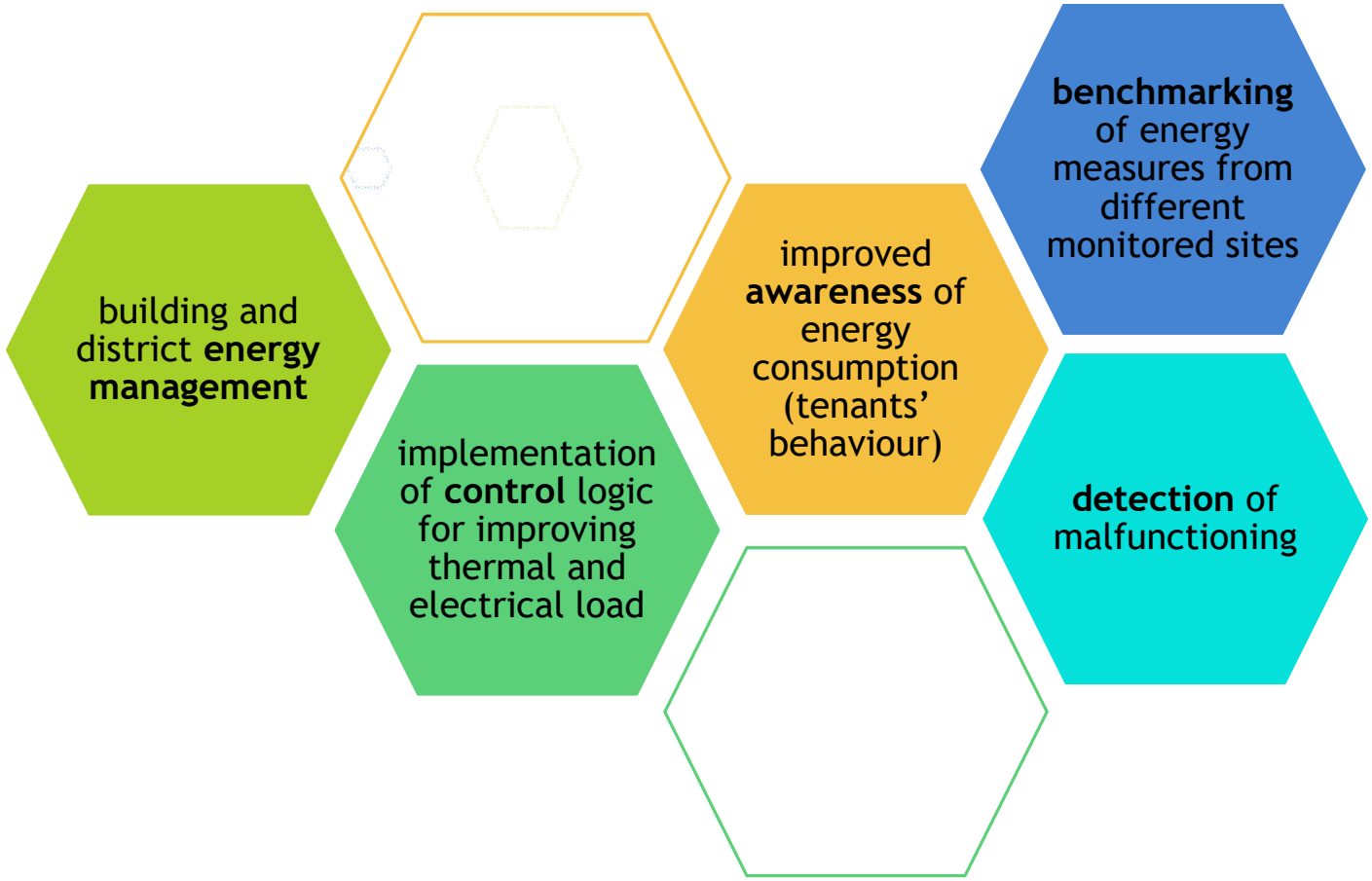
Application Fields



How Large-Scale Building Owners Benefit

- ✓ obtaining an **easy-to-use tool** to aggregate, monitor and predict energy consumption data from building and/or district scale
- ✓ obtaining **recommendations** for energy-efficient control of HVAC systems
- ✓ optimizing **energy usage** of buildings and/or entire districts through control of smart appliances
- ✓ **benchmarking** of energy efficiency measures across multiple sites to obtain global vision
- ✓ improving **awareness** of the energy impact of the behaviour of the tenants

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How Energy-Intensive Industries Benefit

- ✓ **monitoring** of the performance of the equipment during production processes
- ✓ **detecting** malfunctioning sensors, control units along an production

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Product Offers

EMP+DMP
- monitor energy performance
- manage energy consumption across multiple sites

DMP
- monitor energy performance on across multiple sites

EMP
- manage the energy data at building/district level

If you are interested please contact:

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