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Long term monitoring strategies for increasing EPCs reliability

Rome, September 28th, 2021

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Actual EPCs barriers and limitations

The implementation of energy performance certificates (EPCs) varies significantly across EU in terms of scope and available information, resulting in **limited**:

- **reliability;**
- **compliance;**
- **market penetration;**
- **acceptance by users.**

EPCs improvement process

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Supporting EP assessors for a robust, modern and user-friendly data collection process, and comparable quality.

Layer 1
INPUT

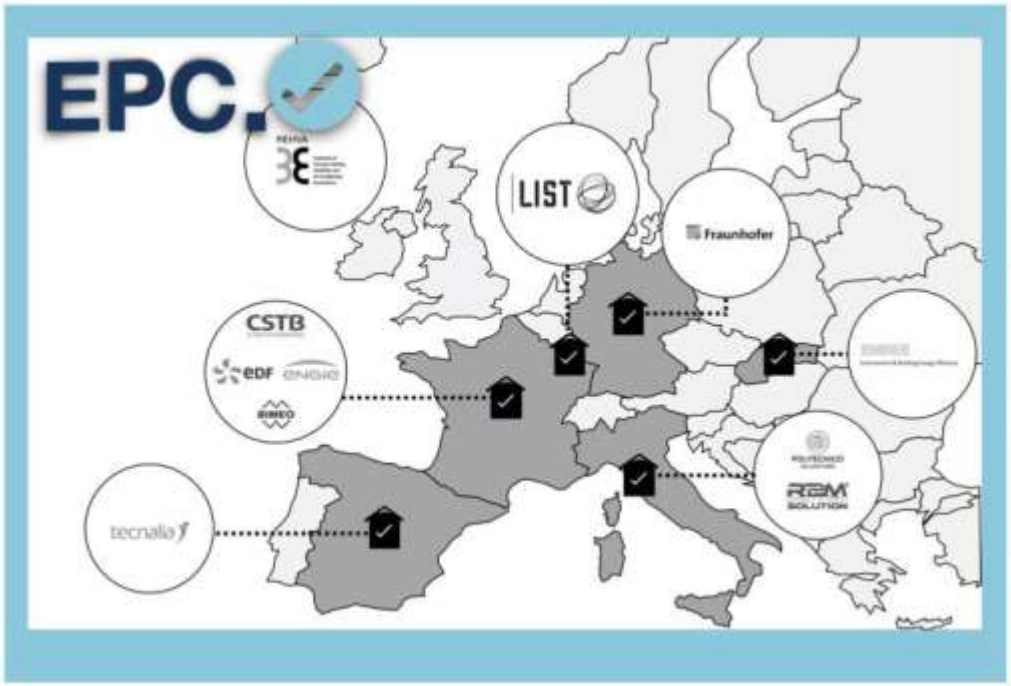
Cross exploiting calculated and actual EP to improve EPCs reliability.

Layer 2
EVALUATION/ CALCULATION

Developing user-friendly, tangible EPCs outcomes to raise awareness and engage end-users towards ambitious pathways to deep renovation and ZEBs.

Layer 3
OUTPUT/ RECOMMENDATION

EPC RECAST consortium



Project duration: Sept. 2020 – Dec. 2023
G.A. n. 893118
Programme: H2020-EU.3.3.1. - Reducing energy consumption and carbon footprint by smart and sustainable use
Topic: LC-SC3-EE-5-2018-2019-2020 - Next-generation of Energy Performance Assessment and Certification

EPC RECAST consortium

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R2M RESEARCH TO MARKET SOLUTION

Fraunhofer IBP

LUXEMBOURG INSTITUTE OF SCIENCE AND TECHNOLOGY
LIST

tecnalia Inspiring Business

REHVA
Federation of European Heating, Ventilation and Air Conditioning Associations

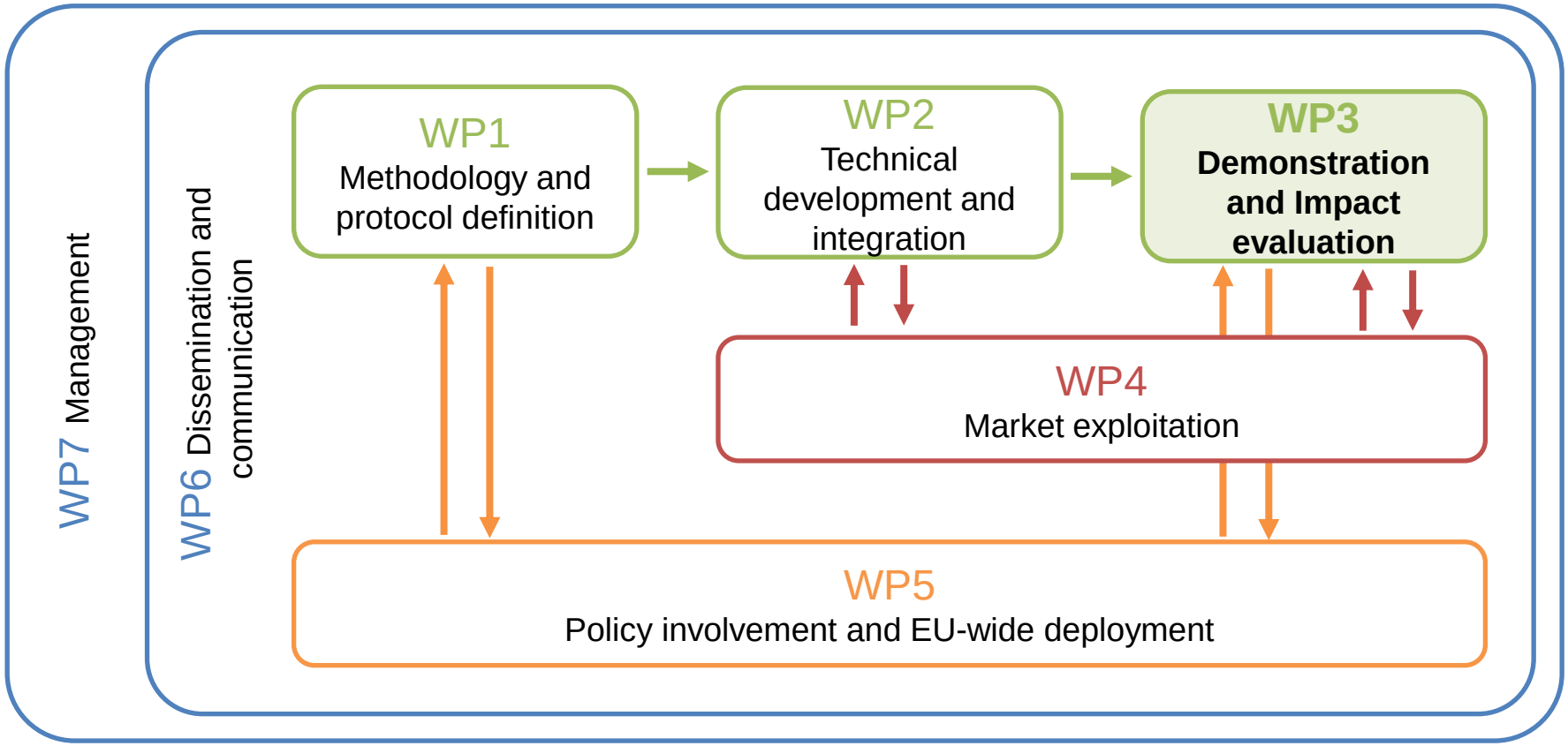
ENBEE
Environment & Building Energy Efficiency

bimeo

eDF

ENGIE

EPC RECAST project



EPC RECAST pert chart. Source: EPC Recast Grant Agreement

Objectives of WP3

- Define **testing and evaluation strategies** for the demonstrations;
- Define **KPIs** to evaluate the demonstrations;
- Develop required **training materials** for the EPC assessors;
- **Test the next-generation EPC on selected pilot** buildings / households in 6 EU countries: FR, SP, IT, DE, SL and LUX.

Testing and evaluation strategy

To validate results of the new EPCs, the authenticity of energy consumption reported in EPC must be verified through a **long-term monitoring**.

Data collection resolution

- **Spot measurement**: these only last for a short time, up to one day of operation. They are useful to instantaneously detect the value of a metric or to quickly check the functioning of a subsystem
- **Short-time measurement**: short-term monitoring is carried out to check the profile of metrics that vary with time. They are usually week or month-based and can be applied in a sub-metering or whole building metering approach
- **Long-time measurement:** this type refers to measurements spanning for more than one year. Long-term measurements are used to assess metrics that are influenced by variations in weather, occupants' behaviour or other operating conditions. Quite often the installation is permanent and usually applied in a whole building metering approach.

Main steps of the M&V process

	PLANNING
1	Set monitoring goals
2	Collect building data
3	Identify boundaries
4	Identify suitable sensors and data acquisition system
	INSTALLATION
5	Assess technical feasibility
6	Final plan and installation
	OPERATION
7	Data quality check
8	Data post-processing
9	Reporting

Data monitoring

Vector	System	Values to monitor
HEATING	Radiators	ΔT = °C Schedule = h
	Floor heating	ΔT = °C Mass flow rate = m^3/s Schedule = h
COOLING	Electrical air conditioner	Power=kW Schedule = h Efficiency = %
	Floor cooling	ΔT = °C Mass flow rate = m^3/s Schedule = h
DHW	Gas boiler	Independent heating and DHW: Power=kW Schedule = h Efficiency = % Centralized heating and independent DHW: kWh from gas meter Centralized heating and DHW: Water flow
	Electric boiler	Power=kW Schedule = h Efficiency = %
ELECTRICITY	Electricity meter	kWh

Monitoring approach

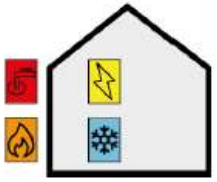
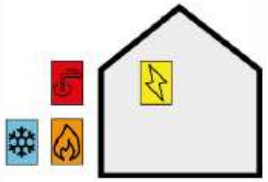
«level of monitoring» concept definition

Levels of monitoring	Building energy vectors	
	Thermal	Electrical
BASIC (BL)	Utility bills	Utility bills
MEDIUM (ML)	Metering / Utility bills	Metering / Utility bills
ADVANCED (AL)	Sub-metering	Sub-metering

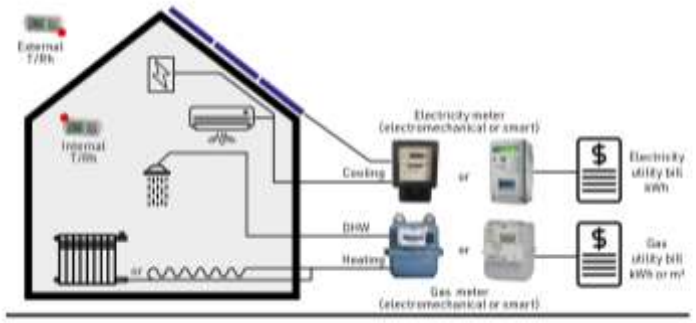
Standard configuration

Cluster of six different building configuration

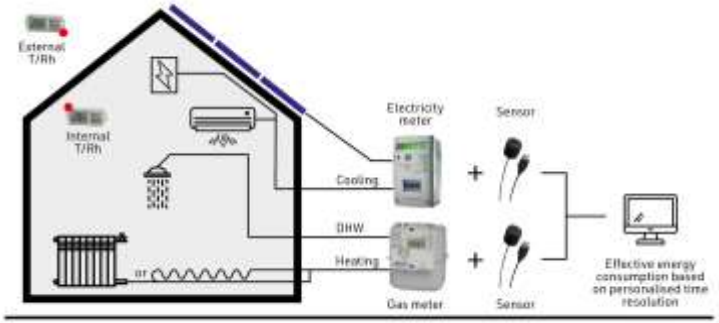
PILOT CONFIGURATION	MONITORING LEVEL	ENERGY MONITORING				ENVIRONMENTAL MONITORING	
		HEATING	COOLING	DOMESTIC HOT WATER	ELECTRICITY	INDOOR RH AND T	OUTOOR RH AND T
BASIC LEVEL							
CONFIGURATION 1 **INDEPENDENT SYSTEMS:** Heating, Cooling, DHW, Electricity **CENTRALIZED SYSTEMS:** - **ELECTRICITY METER:** Electromechanical/ Smart **GAS METER:** Electromechanical/ Smart		1.a Utility bills (gas)	1.a Utility bills (electricity)	Utility bills (gas)	Utility bills (electricity)	Metering	
		1.b Utility bills (electricity)					
MEDIUM LEVEL							
CONFIGURATION 2 **INDEPENDENT SYSTEMS:** Heating, Cooling, DHW, Electricity **CENTRALIZED SYSTEMS:** - **ELECTRICITY METER:** Smart **GAS METER:** Smart		2.a Metering (gas)	2.a Metering (electricity)	Metering (gas)	Metering (electricity)	Metering	
		2.b Metering (electricity)					

PILOT CONFIGURATION	MONITORING LEVEL	ENERGY MONITORING				ENVIRONMENTAL MONITORING	
		HEATING	COOLING	DOMESTIC HOT WATER	ELECTRICITY	INDOOR RH AND T	OUTOOR RH AND T
	ADVANCED LEVEL						
CONFIGURATION 3 **INDEPENDENT SYSTEMS:** Cooling, DHW, Electricity **CENTRALIZED SYSTEMS:** Heating **ELECTRICITY METER:** Smart **GAS METER:** Smart		3.a Sub-metering (energy) 3.b Sub-metering (temperature + mass flow)	Metering (electricity)	Metering (gas)	Metering (electricity)	Metering	
CONFIGURATION 4 **INDEPENDENT SYSTEMS:** Cooling, Electricity **CENTRALIZED SYSTEMS:** Heating, DHW **ELECTRICITY METER:** Smart **GAS METER:** -		4.a Sub-metering (energy) 4.b Sub-metering (temperature + mass flow)	Metering (electricity)	Sub-metering (temperature + mass flow)	Metering (electricity)	Metering	
CONFIGURATION 5 **INDEPENDENT SYSTEMS:** DHW, Electricity **CENTRALIZED SYSTEMS:** Heating, Cooling **ELECTRICITY METER:** Smart **GAS METER:** Smart		Sub-metering (temperature + mass flow)	Sub-metering (temperature + mass flow)	Metering (gas)	Metering (electricity)	Metering	
CONFIGURATION 6 **INDEPENDENT SYSTEMS:** Electricity **CENTRALIZED SYSTEMS:** Heating, Cooling, DHW **ELECTRICITY METER:** Smart **GAS METER:** -		Sub-metering (temperature + mass flow)	Sub-metering (temperature + mass flow)	Sub-metering (temperature + mass flow)	Metering (electricity)	Metering	

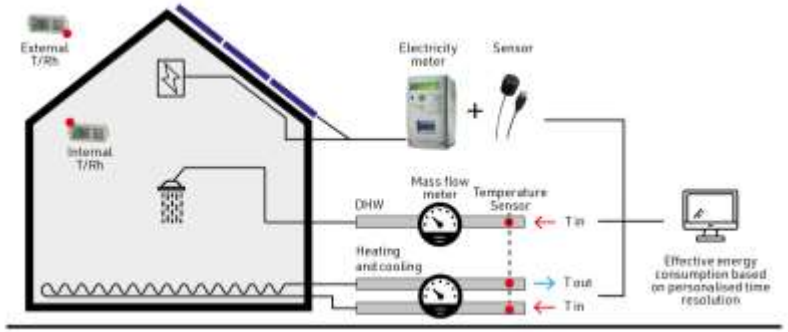
Example of standard configuration



Basic



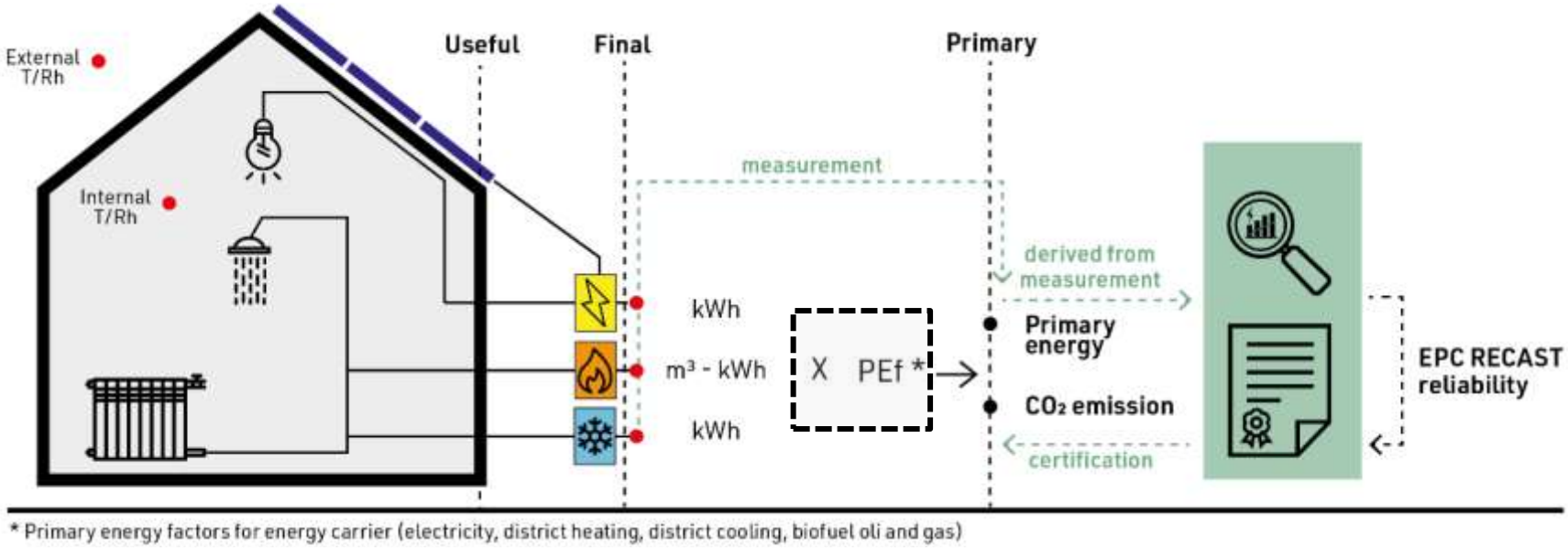
Medium



Advanced

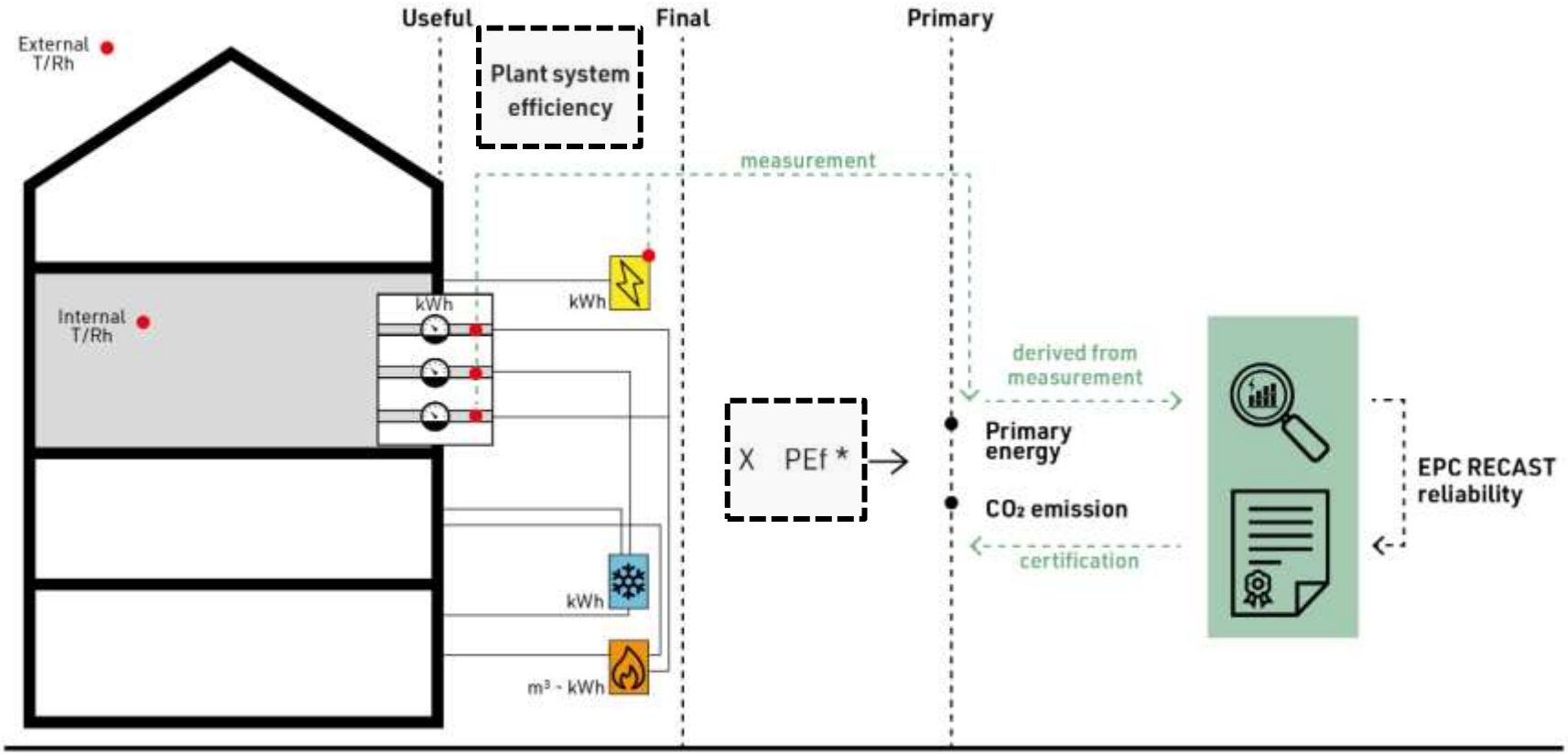
Evaluation of energy consumption

From final energy monitoring to primary energy calculation



Evaluation of energy consumption

From final energy monitoring to primary energy calculation



Pilot recruitment across EU

1. France
2. Germany
3. Italy
4. Luxembourg
5. Slovakia
6. Spain






Demo site example in Italy (IT01)

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ITALY

Pilot n.: 73

ID: IT01

Location: 23900 Lecco

Type: Apartment in a multifamily building

Year of construction: 2012

Level of monitoring: Advanced

Configuration type: n.6

Demo site example in Italy (IT01)

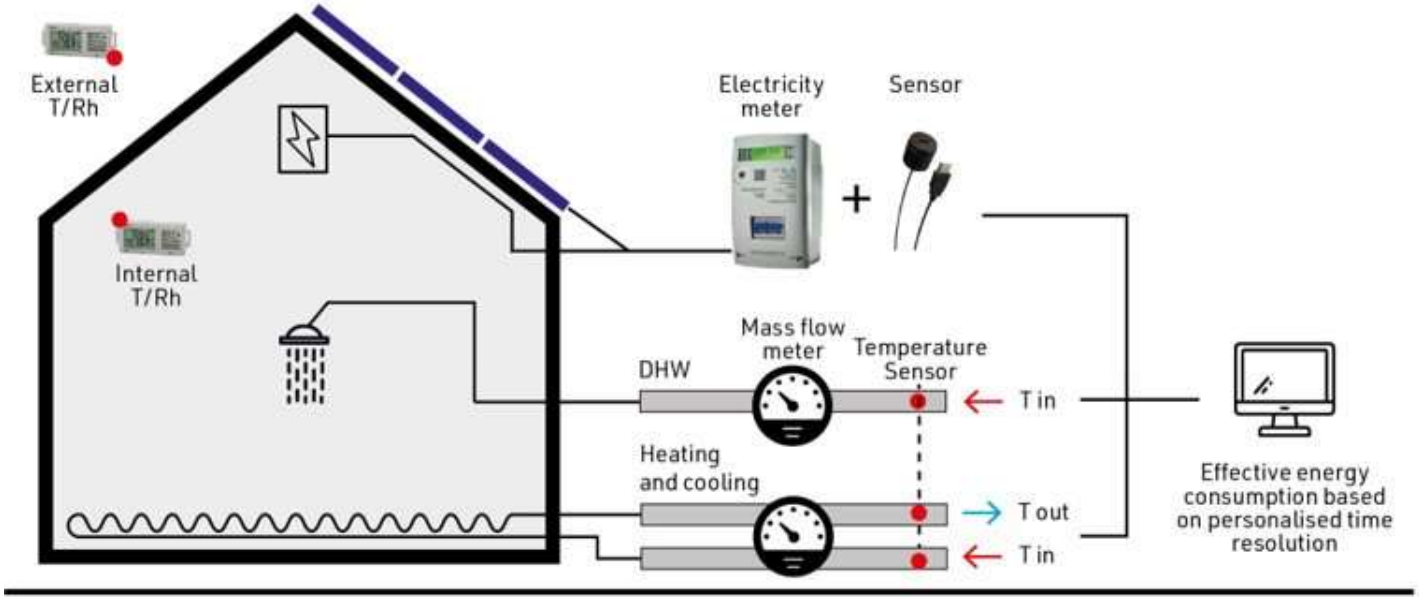
IT01 – Electrical and thermal energy

Smart meter for electricity

Heating /cooling

DHW

LTM - configuration example for IT01



Type of monitoring: Advanced Level - Configuration 6

Sensor’s kit for energy monitoring

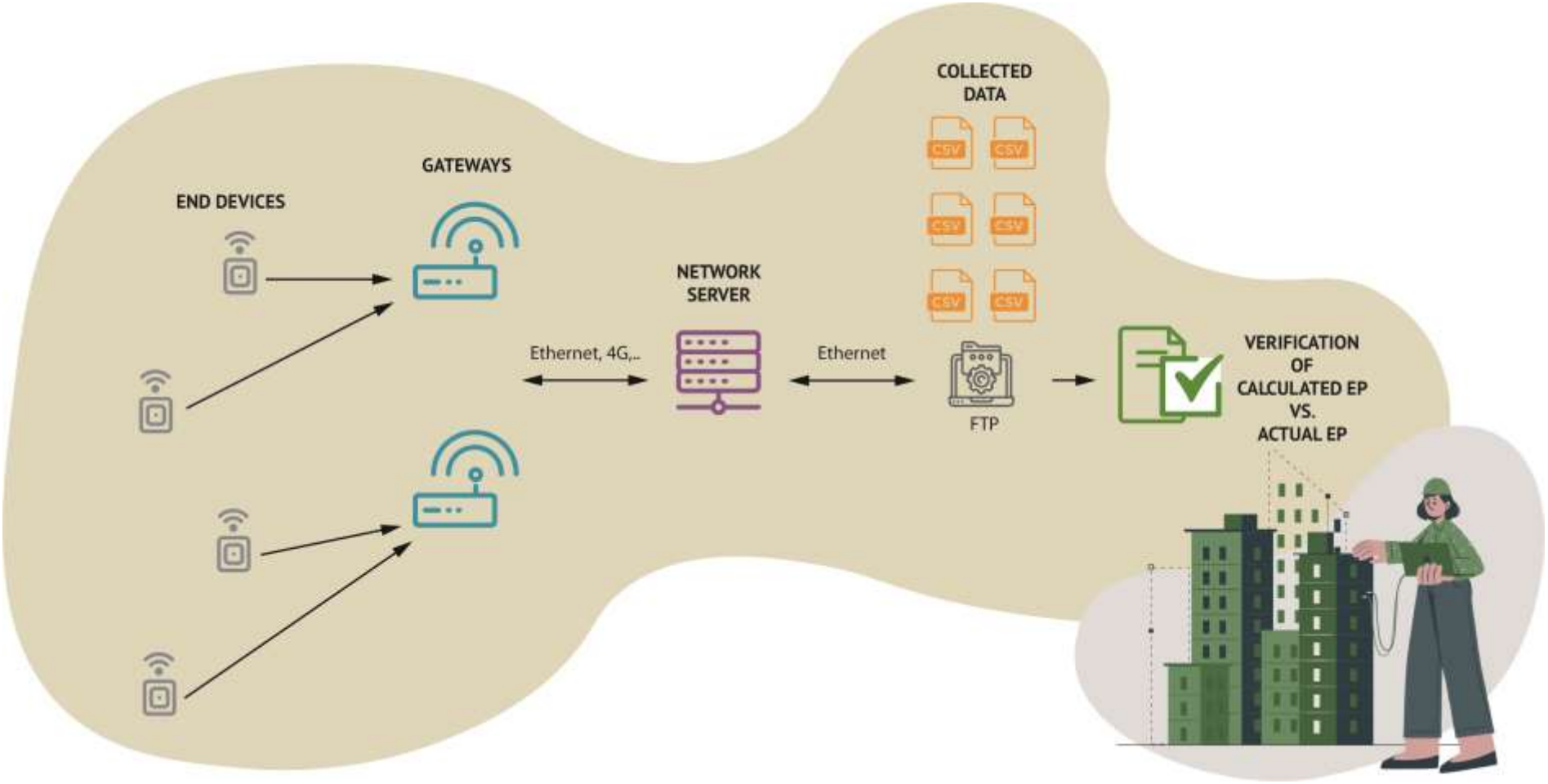
Energy vector	System	Sensors	
HEATING	Floor heating	Ultrasonic flow meter	
		Contact temperature sensor	
COOLING	Floor cooling	Same sensors as heating	--
DHW	Shared gas boiler	Ultrasonic flow meter	
		Contact temperature sensor	
ELECTRICITY	Electricity smart meter	Pulse sensor for electrical meter	

Sensor’s kit for energy monitoring

	Sensors	
OUTDOOR	Outdoor temperature and relative humidity sensor	
INDOOR	Indoor temperature and relative humidity sensor	

A gateway is needed to collect and transfer all data.

Monitoring method



Thank you for your attention

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