JOINT FINAL CONFERENCE

Next Generation Energy Performance Assessment, Rating and Certification

Towards a Smart and Decarbonised Future for European Buildings

Part 2: Synthesis of insights
Summary of insights from EDYCE

24 May 2023
Brussels and online

D2EPC ePANACEA EDYCE

EDYCE technology insight

EDYCE logic

DEPC protocol

EDYCE inspection protocol

Static data
Standard condition/Adapted condition
Schedules
Secure monitoring data

PREDYCE platform

Building model - input file
Monitored indoor data file
Standard weather file
Monitored weather data file

FUSIX middleware

DEPC KPIs visualisation
Performance gap
Weekly update

Stage 1:
Data acquisition

Stage 2:
Dynamic models development

Stage 3:
Operational feedback

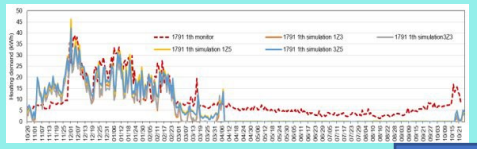
EDYCE technology insight

DEPC Protocol – PREDYCE - FusiX

DEPC protocol

KPI	Symbol
Global energy performance index	Q_gl
Primary energy need for heating	Q_h
Primary energy need for cooling	Q_c
Primary energy need for DHW	Q_dh
Primary electricity need for running technical installations	Q_tech
Primary electricity need for lighting (if relevant)	Q_l
Primary energy need for heating for an average space in the building	Q_h_av
Primary energy need for cooling for an average space in the building	Q_c_av
Primary energy need for heating for the critical zone	Q_h_cr
Primary energy need for cooling for the critical zone	Q_c_cr
Energy signature, global solar correlated	EN_SIG_2D
Energy signature, global solar correlated for the critical zone (heating)	EN_SIG_2D_h
Energy signature, global solar correlated for the critical zone (cooling)	EN_SIG_2D_c
Fictious Energy need for free-running mode (cooling)	FICT_COOL
Fictious Energy need for free-running mode (heating)	FICT_HEAT
Number of free-running hours (cooling season)	n_fr_c
Number of free-running hours (heating season)	n_fr_h
Number of free-running hours for critical room (cooling season)	n_fr_cr_c
Number of free-running hours for critical room (heating seson)	n_fr_cr_h
Number of hours when CO2 level is below category I, for heating season	n_co2_h_bI
Number of hours when CO2 level is below category I, for cooling season	n_co2_c_bI
Number of hours when CO2 level is above category III, for heating season	n_co2_h_aIII
Number of hours when CO2 level is above category III, for heating season	n_co2_h_aIII
Number of hours when CO2 level is below category I for the zone with maximum heating/cooling demand	n_co2_cr_bI
Number of hours when CO2 level is above category III for the zone with minimum heating/cooling demand	n_co2_cr_aIII
Operative temperature in the critical zone for heating season	T_op_cr_h_i
Operative temperature in the critical zone for cooling season	T_op_cr_c_i
Operative temperature in the critical zone in free-running for heating	
Operative temperature in the critical zone in free-running for cooling	

Monitoring



PREDYCE

zip

CSV

	KPI 1	KPI 2	KPI 3
SIM 1			
SIM 2			
MONI-TORED			
Δ 1			
Δ 2			

...

dataframe of timeseries results

CSV

For each KPI 5 columns are generated:

Date/ Time	SIM 1	SIM 2	MONI-TORED	Δ 1	Δ 2

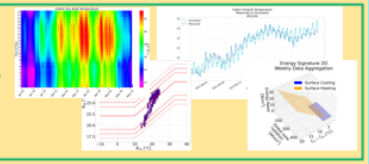
...

Not via REST

plots

PNG

*plots generated via Fusix

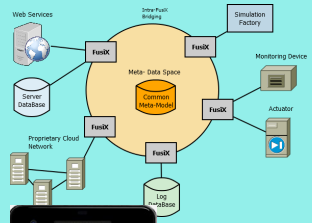


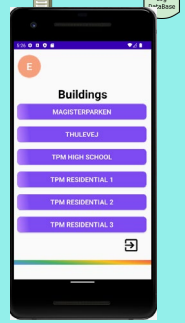
DEPC analysis protocol

- Determine adapted conditions of use
- Calculate energy consumption /savings according to real conditions
- Compare DEPC simulation and real performance

Recommendations

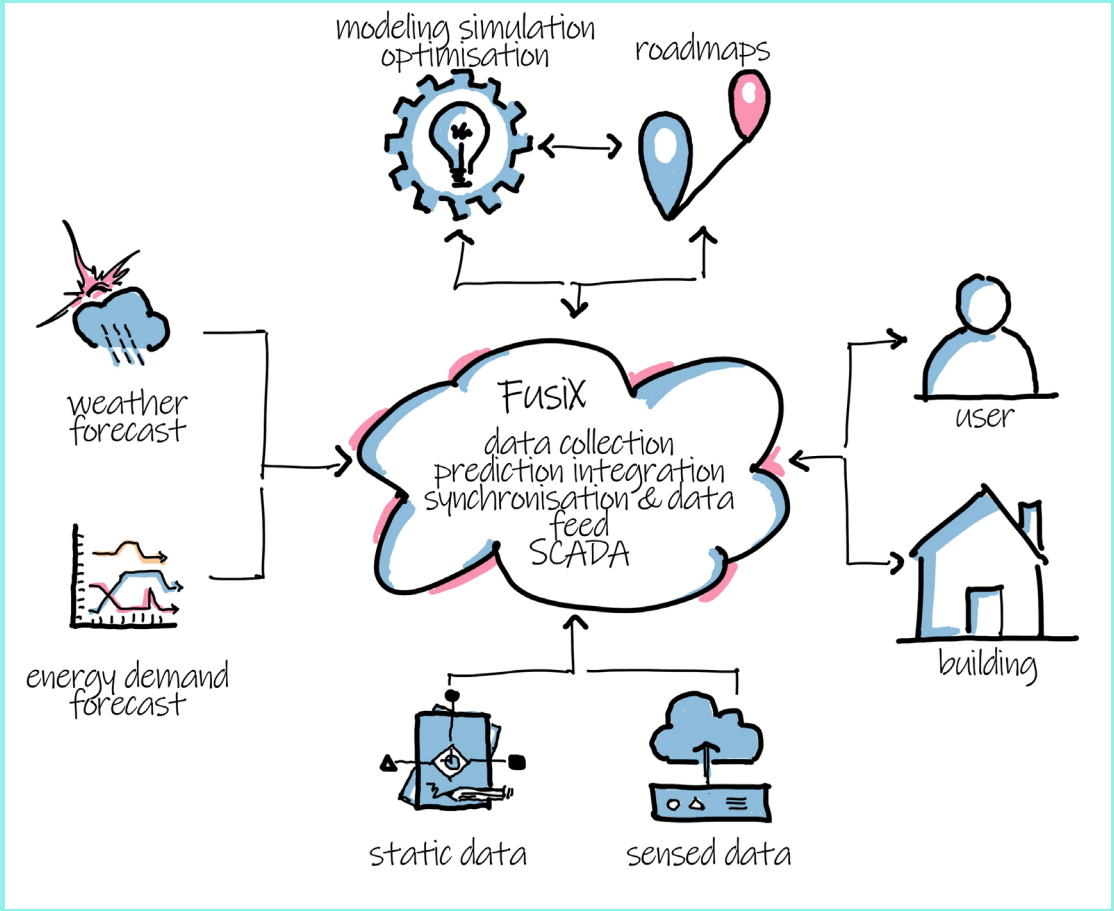
FusiX middleware





EDYCE technology insight

EDYCE concept and focus areas



Selected challenges that EDYCE paid attention to:

Performance gap: important aspect for the EDYCE project, returning the gap between calibrated simulation performed under standard and adapted conditions vs monitored data.

Operational assessment: bridging monitoring results (comfort, energy), use of smart heat meter data

Model simplification: shifting from static to dynamic modeling is not effort-free. Advice for modeling complexity: geometry and facilities.

Communication of results: KPIs, tenants, professionals, energy (distributed), signature, thermal and atmospheric comfort, free running operation.

Energy predictions – require long historical data but can help to secure that building does not drift away

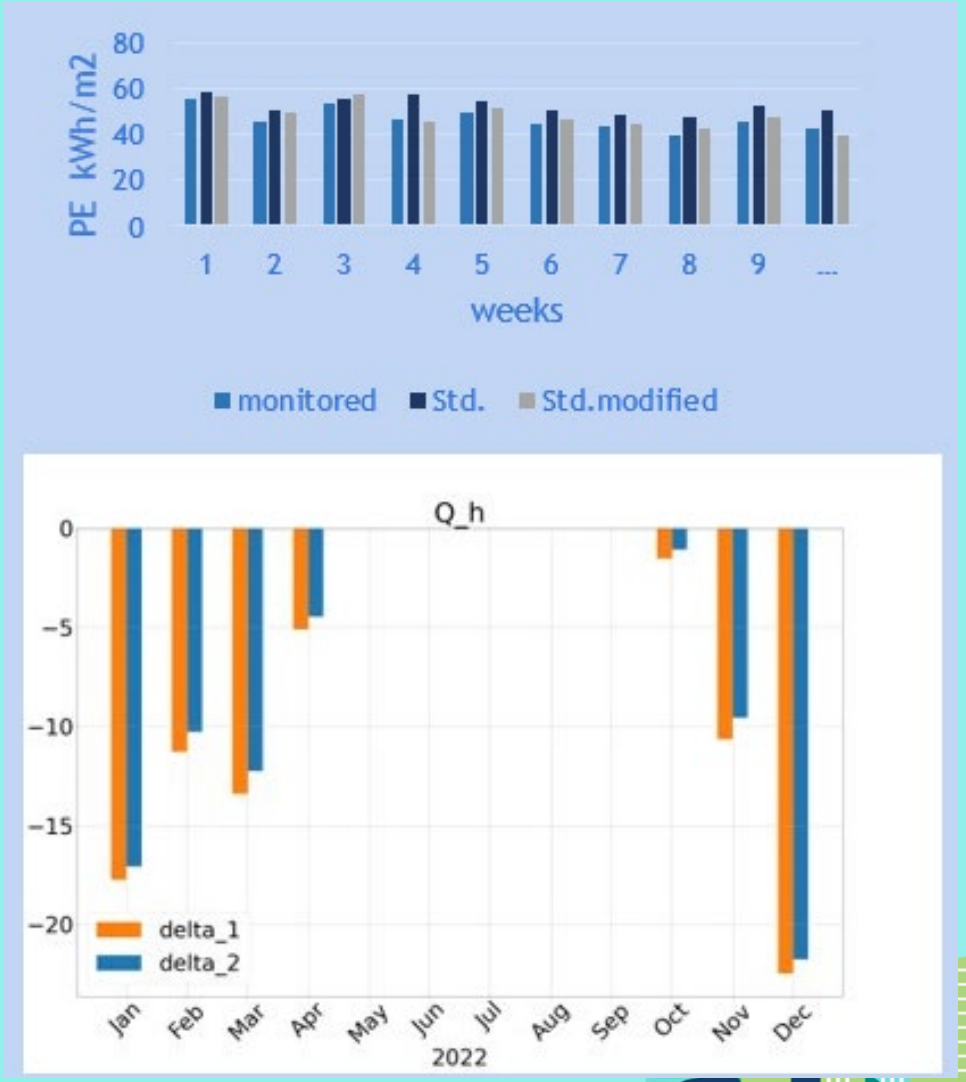
EDYCE technology insight

Performance gap

- Identification of standard and adapted condition
- Unification of visual communication
- Weekly results communication

Performance Gap on:
- Energy
- Energy signature
- Free running operation
- IEQ

Work in progress...

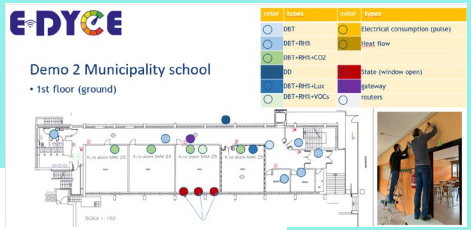


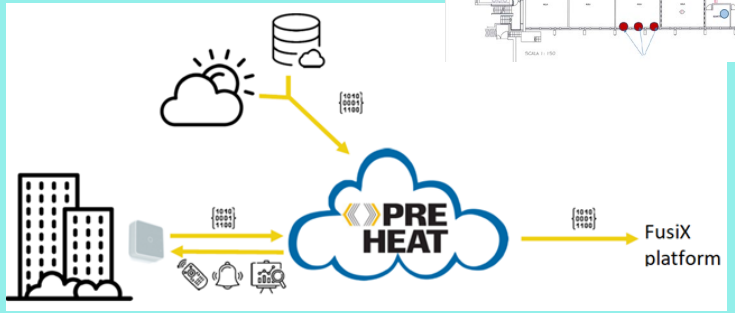
EDYCE technology insight

Operational assessment – bridging monitoring, use of smart heat meter data

Bridging monitored data:

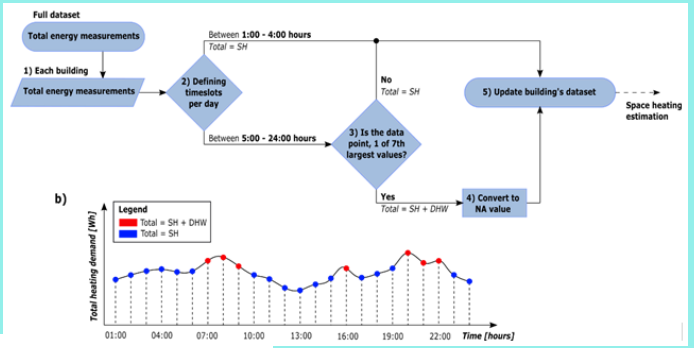
- Energy meters
- IEQ sensors
- Unification of sensor names
- Custom solution for each country demo
- Informed consent secured
- Standardized data processing

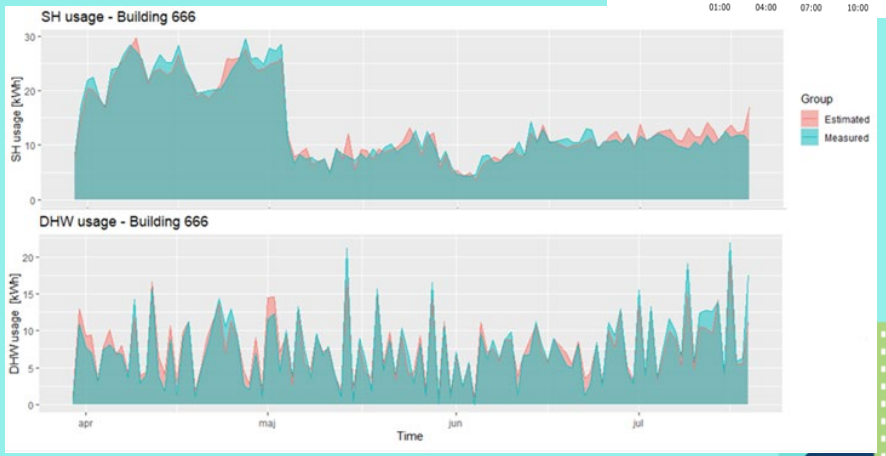




Disaggregation of smart heat meter data:

- Development of algorithms to disaggregate space heating (SH) and domestic hot water (DHW) from total heat.



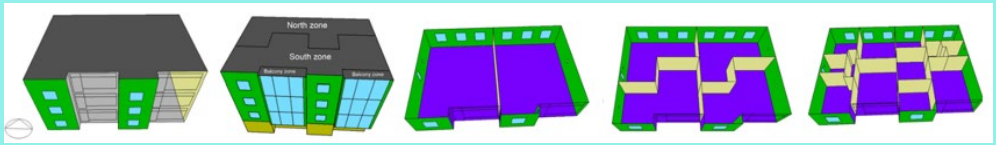


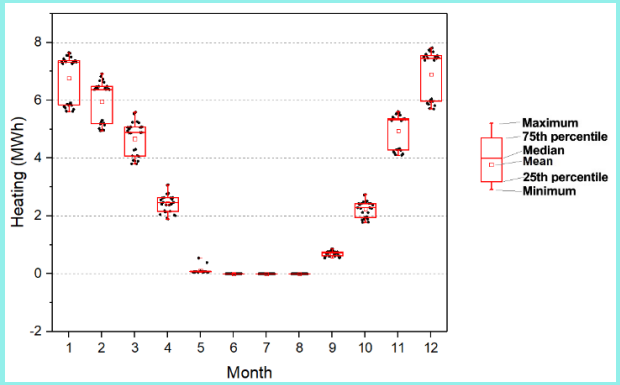
EDYCE technology insight

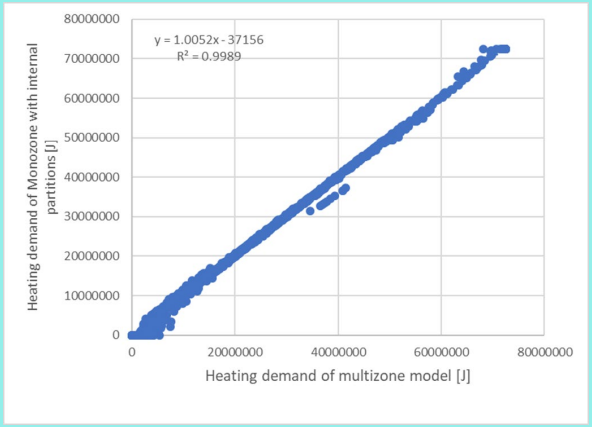
Dynamic model simplification

Geometry simplification

- From multizone to monozone



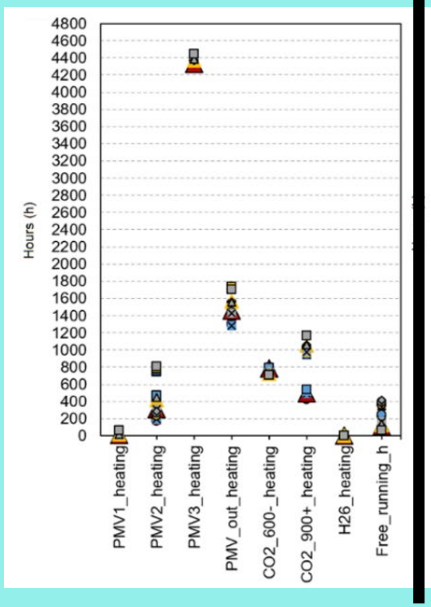




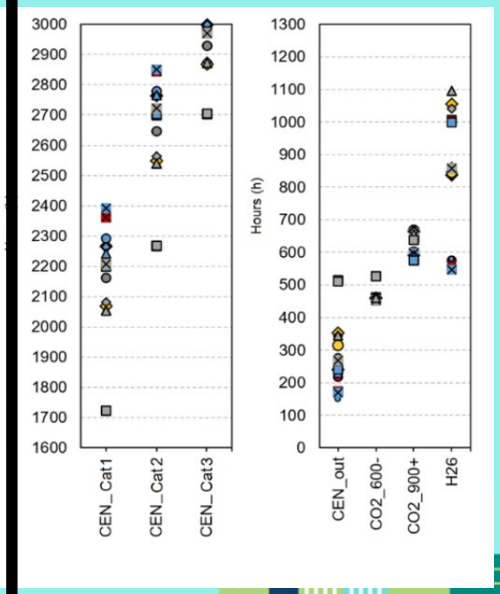
Facilities modelling

- Heating
- Ventilation

Heating season



No heating season



EDYCE technology insight

Results selection and communication

DEPC protocols

- 7 KPIs for private end users
- 28 KPIs for professional end users

- Weekly → Yearly aggregated data
- Asset / Adapted / Operational
- Each KPI has a unique name

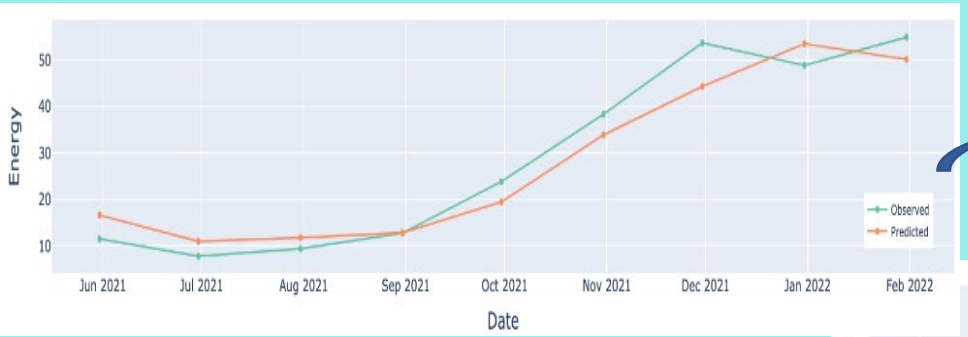
<u>4 KPIs domains</u>
- Primary energy
- Energy signature
- Free running operation
- IEQ (atmospheric/thermal)

EDYCE technology insight

Energy predictions

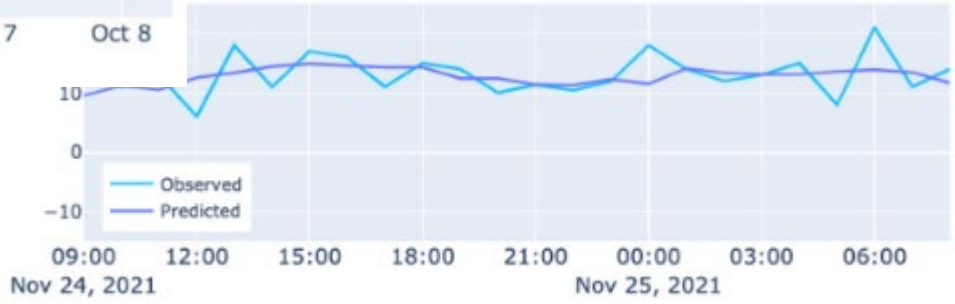
- Possible but sufficient historical data is required.
- Can be used in different time frames (short -24h, middle -week, long -months)

Month



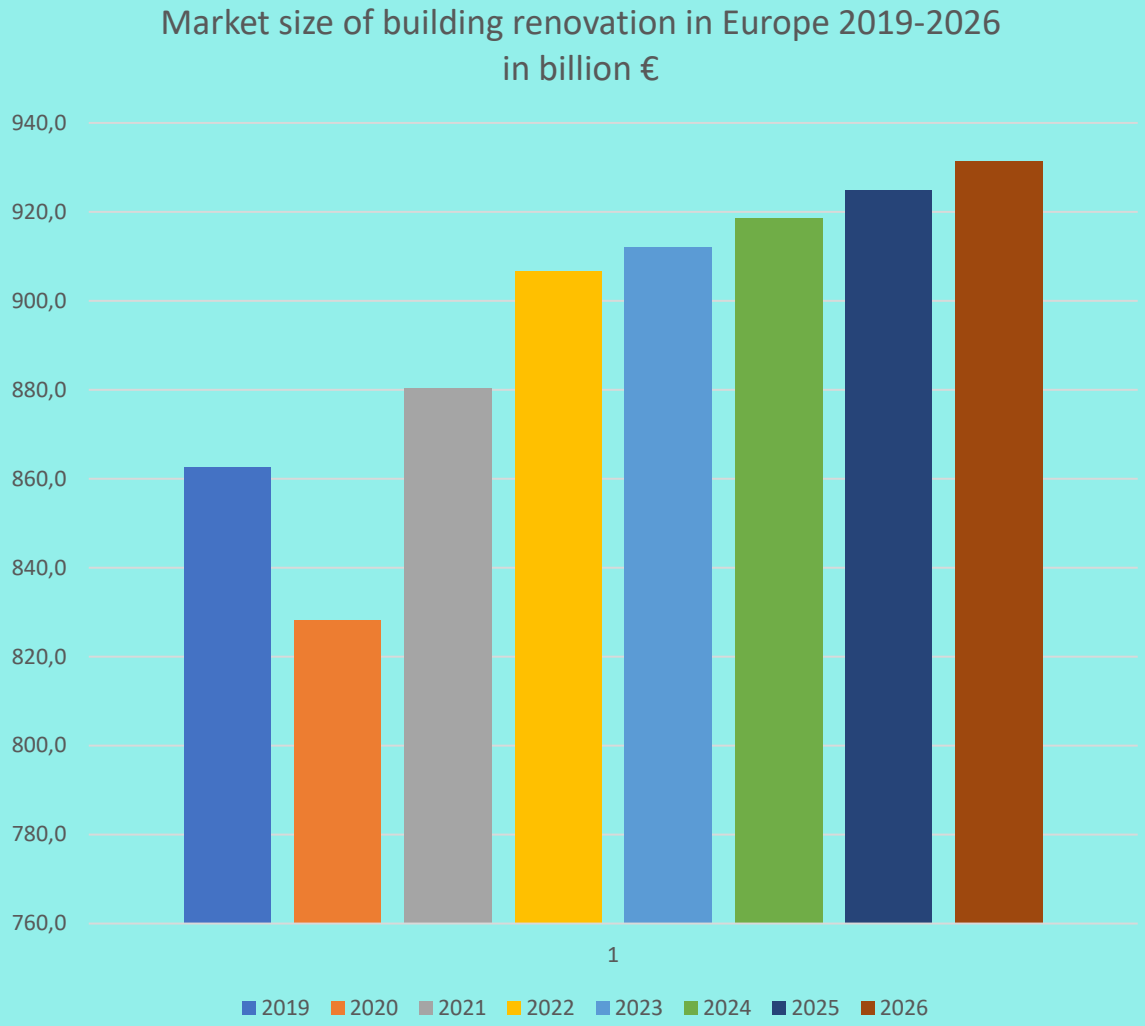
Week

Day



Market Insights

EPC as part of Construction/Renovation Market



Renovation Market in Europe	Almost 27% of the total energy consumption in Europe is spent by residential buildings
	Europe is responsible for almost 40% of the total energy consumption and approximately for 36% of CO2 emissions production
	Investment in renovation represents almost 30% of total investment in construction
	Energy renovations contributing with a total of 12% of constructing sector
	This applies for €115 billion, 65% of which in residential market accounting for €74.8 billion.
	Renovation market is expected to grow from to 862.7 billion € (2019) to 935 billion € (2026)

Market Insights

Potential for E-DYCE

Renovation Wave

- plan that aims to at least double the annual renovation rate by 2030
- fosters deep energy renovation
- target of a decarbonized building stock by 2050

Next Generation EU

- €806.9 billion recovery plan for Europe
- 2030 Climate Target Plan aims reducing greenhouse gas emissions by 2030, at least to 55% below the 1990 levels
- Financial incentives to the building owners aiming at refurbishment actions

Market Trends

- global warming + rise of petrol prices= increased awareness on sustainability
- Smart buildings integrated apps

Market Insights

E-DYCE ESG Reporting

Environmental

- Reducing greenhouse emissions
- Reducing energy consumption
- Reduced use of natural resources

Social

- Sustaining and/or developing employment positions
- Advancing skills among workforce
- Engaging local communities

Governance

- Transparency in data analysis
- Sustaining Ethics and Integrity
- Ability to comply on legal framework

Market Insights

E-DYCE Added Value

Research Institution

- Renovation Methodology,
- Smart Meter Methodology,
- Building Performance KPI's list

Building Association

- Integrated E-DYCE framework
- Smart Meter Data Methodology
- Renovation Methodology

Consultant -EPC Expert

- Integrated E-DYCE framework
- Renovation Methodology
- Energy Performance Tool on Cloud

Expert Recommendations

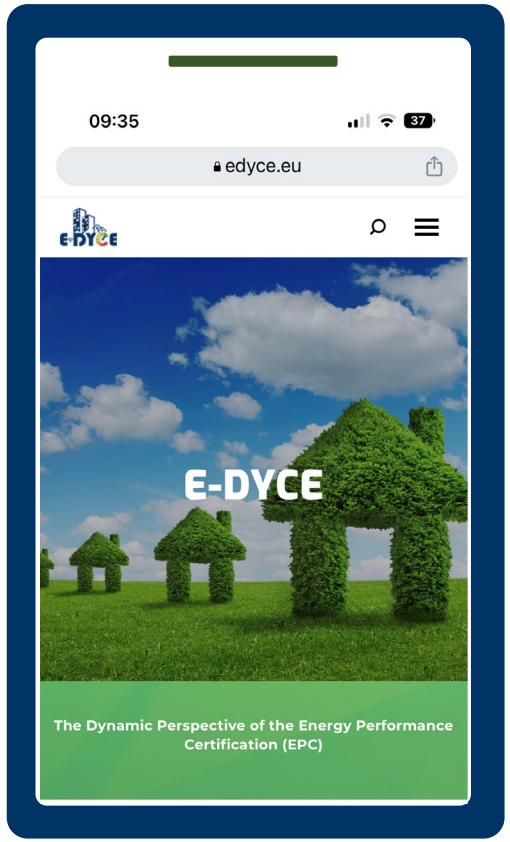
- **Use** the expected energy consumption according to **standard EPC conditions of use as a starting point** and **recalculate** expected energy consumption **objectives** or energy savings **according to real or realistic conditions of use** (**DEPC**)
- Use steady-state for constant heat losses and gains, **use dynamic for strongly dynamic phenomena** (ventilation, solar gains, cooling or comfort).
- Simplify dynamic simulation models (geometry/facilities) - more reliable results for energy but less reliable for IEQ calculations.
- **Simplify monitoring according to the objectives**/use existing: yearly for general energy performance, monthly for building operation optimisation, weekly time frame and hourly data for particular dynamic problems or comfort.
- Disaggregate monitored KPIs to be able to explain performance gap (e.g. space heating and domestic hot water)
- Show IEQ comfort conditions in addition to energy ones to avoid comfort downscaling problems (e.g. air exchanges and or too low set points)

Policy Recommendations

- Obligation to **communicate energy use data to "energy office"** by the law (data belongs to public body).
- **Complementary policy tools to control real performance** – when energy use exceeds threshold then obliged to optimize (there must exists follow up procedures).
- **Monitor public policy actions** - obligation to communicate energy use for 2 years **after** a **subsidised** optimisation **program**, e.g. solar collectors for hot water/ heat pumps. Check if policy works as planned.
- **Energy data hub for storage of historical energy use** from smart meters with high resolution (electricity and heat). Can promote innovation!
- Adapt the EPC to **provide expected final energy** e.g. kWh/year (to be able to compare actual use with expected)
- I**ntroduce in the EPC's the energy metering scheme** – disaggregation.

- **Informed consent from tenants is required – bottleneck that is not solved yet and need to be regulated.**
- White paper will follow...sign for newsletter.

Energy flexible DYnamic building CErtification



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Thank you

for your attention

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