



# DECENTRAL VERSATILE BUILDING DATA SPACES

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Building Data Spaces – a digital twin profiting the operation, renovation and energy controlling of buildings.

# PROBLEMS ENERGY EFFICIENCY OF BUILDINGS



LACKING INFORMATION

For every step in the energy consulting and renovation planning the process starts from scratch acquiring information, since it is not stored in digital form.

UNKNOWN EFFECTS SUBSIDIES

When discarding XML after energy performance certification, the details of renovations are not known and this also conceals the effects of incentives.

PLANNING EFFORT

Lacking building-element data increases the planning effort. Pre-planning cannot be automated, is more expensive and must be funded.

INDIVIDUAL SOLUTIONS INCREASES PRICE

Without the ability to bundle renovation and production of materials the renovation becomes more expensive.

# DECENTRAL VERSATILE BUILDING DATA SPACES

## Ease Energy Consulting

The stored data contains most information to be able to simulate the building with a TRY data set evaluating renovation measures. This can be iterated if energy price or subsidy scheme change.

## Monitor subsidy effectiveness

Up to date building data may be correlated with incentives to see which ones were most successful. Subsidy schemes might also be aligned to the demand.



## Allow Regional Energy Planning

The RC-Models of the buildings can be used to model consumption in networks

## Trigger Projects

After storing the result of an energy consulting action, the building owner might be notified if the renovation has become more economic. PV and Heat Pump can be dimensioned with one mouse click.

## Allow Forecasting

The digital building twin allows forecasting of the energy demand, optimizing usage of renewable energy.

# PROJECT SETTING

- Project Focus

- Public Buildings
- Non-Residential Buildings
- Private Homes
- Involving Landlords

## Aims

- Enabling digital dividend by making use of building data
- Prototyping data applications
- Evaluating acceptance and effects
- Provide guidance for adapting policies



## Work plan

- Analyse
- Specify
- Implement
- Evaluate
- Disseminate/Exploit

## Project partners

- Energy Agencies + Official Bodies
- Software Companies
- Building Owners
- Policy experts
- Dissemination experts

# RESEARCH QUESTIONS

- What are the current and upcoming motivating topics to make use of Building data repositories?
- What are the core applications a data model should cover?
- What building data is available and what should be added to building data repositories?
- How persistent buildings data is and what should be the update cycle?
- How can behavioural data be merged for simulation, while providing privacy?
- What is the data storage methodology appreciated by building owners and how does it affect the system cost?
- What are the effects to be expected?



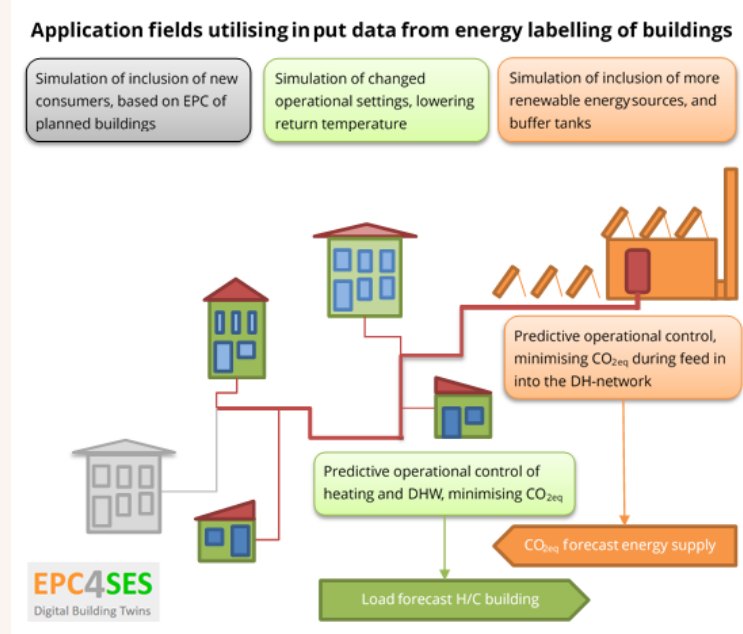
# FOUNDATION

The ERANet project EPC4SES was investigating the use of data stemming from energy performance certification for setting up digital twins and implementing model predictive control. The approach was tested with four pilots.

The EraNet project FinSESCO is targeting the use of data stemming from energy performance certification for energy consulting and setting up Energy (Saving) Contracting or Intracting, including measurement and verification.

The use cases were depicted in uc.smartenergy.nu

A building smart card was proposed as off-line data storage



**Dynamische Wirtschaftlichkeitsberechnung**

**Thermische Sanierung**  
 Die zu finanziellen Gesamtkosten betragen 1.205.762 €  
 Die jährliche Energiekosten betragen 37.333 € bei CO<sub>2</sub> von 3.142 t und einem Energiepreis von 0,206 €/kWh  
 Bei einer Tragung der jährlichen Energiekosten von 0,10 % ist die Investition bei Energieeffizienz und einer Eigenkapitalbindung nach 46,8 Monaten (3,9 Jahre) zurückgezahlt.  
 Bei einer Finanzierung über 20% Förderung, 50% Eigenkapital und 30% Crowdfinanzierung mit einem Zinssatz von 2,5 % bis die Investition nach 46 Monaten (3,8 Jahre) keine Kostenverpflichtungen darstellt.

**Berechnung WP**  
 Die Umstellung auf Wärmepumpe wird mit einer Aufkühlung des Heizmediums von 80/60 °C auf 40/40 °C geschätzt.  
 Es ist keine direkte Umstellung auf WP möglich mit 80/60 °C. Es entsteht Zustandsenergie von 3.800 € für neue Wärmepumpensysteme mit 19 kW.  
 Nach dem Einsetzen werden 2000 € für die Installation.  
 Ergebnisse wurden: L<sub>1</sub> 8791, L<sub>2</sub> 8791, E<sub>1</sub> 8791, E<sub>2</sub> 8791, H<sub>1</sub> 8791, H<sub>2</sub> 8791  
 Energie-Gesamtwert: 10,4 kWh/1000 kWh, neu=0,001/779 C=49924 ghaAnney ( ) Heißwasser 100/90 Heißwasser 1900 Investition Heizkörper 123242 mit WP1 Investition Heizkörper 3800 Ein-PV-Credit-Aktiva/Invest  
 An der Heizung 100/90  
 Orientierung PV Fläche m<sup>2</sup>

**Wirtschaftlichkeit Wärmepumpe mit PV**  
**Kostenannahmen** Heizkörper Paas 3.800 € Wärmepumpe 37.962 € für Heißwasser von 19 kW  
**Ergebnis der Simulation**  
 Die Energiekosten betragen 37.333 € bei CO<sub>2</sub> von 3.142 t, nach der Sanierung 20.419 kWh, das ist eine Veränderung von -44,3%  
 Die in der Aktiv eingetragene Strom betragen 5100 kWh, die Netz eingekauft 5100 kWh, mit PV erzeugt wurden 5100 kWh  
 Temperaturen max. Raumtemp. 21,3 °C

**Energy**

**Ergebnis aus der Simulation nach Analyse des XML**

**Calculated indicators and EPCs**

Parameter	Value
Energiebedarf (kWh/m <sup>2</sup> )	20,14
Effizienzkategorie	G, A

**EPC Rating against Reference Building**

Rating	Energy Delivered
A1+	0%
A1	0%
A	0%
B	0%
C	0%
D	0%
E	0%
F	0%

**Wirtschaftlichkeit Wärmepumpe mit PV**  
**Kostenannahmen** Heizkörper Paas 3.800 € Wärmepumpe 37.962 € für Heißwasser von 19 kW  
**Kosten** aus der thermischen Sanierung 1.205.762 €  
**Ergebnisse**  
**Kategorie** **Energieerzeugung** **Energiepreis** **Summe**  
 Energiekosten neu WP 0,10 €/kWh 0,20 €/kWh 0,40  
 alte Energiekosten 0,20 €/kWh 0,20 €/kWh 0,40  
 Bei Kapitalkosten von 38,375 € pro Jahr beträgt die Energiekosten 0,4, bisher 71,702 € Veränderung Gesamtkosten -33,633 €  
**Ergebnis dynamische Wirtschaftlichkeitsberechnung** Amortisationszeit 10,33 Jahre, Amortierung Schmelzende PV Energie und sonstige Energieverbrauch können das Ergebnis verändern.  
 Amortisationsrechnung kumulierte Kosten-Einsparung  
 10% Förderung, 50% Eigenkapital, 30% Crowdfinanzierung, Fremdzins 2,5% bei Energiekostensteigerung 5,0%  
 — Einweisung — Kosten

**FinSESCO**  
 Fintech for Smart Energy System Contracting

# ABOUT EFFIZIENTE.ST

G. Cebrat first dedicated himself to energy research in 1997 and has done so again since 2008 with his company effiziente.st. In particular, the use of renewable energy and increasing efficiency in the living environment have been trialled in several projects. A balcony power station has been in operation since around 2010. A background in mechanical engineering and many years of scientific work, also with the support of students, enable valid and usable research results. Many ideas for decarbonisation are ventilated as stromium.at for PV in window shutters, vollladen.at for ubiquitous charging, and myheatpump.eu for heat pumps in apartments of century old buildings.

DIY PV Balcony PV 2010



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