



UNIVERSITATEA TEHNICĂ
DIN CLUJ-NAPOCA



Conferința Cercetării și Inovării – UTCN Proiecte Europene

O perspectivă asupra tranziției energetice prin proiecte Europene

Dr. Dan D. Micu

*Professor - Technical University of Cluj-Napoca, Romania
Fulbright Fellow - University of Florida, US
Professor - Beijing Jiaotong University, China*

Head of Energy Transition Research Center <https://entrec.utcluj.ro>



21 Martie 2025, Cluj-Napoca, Romania

Tranziția energetică...

Provocările cu care ne confruntăm...

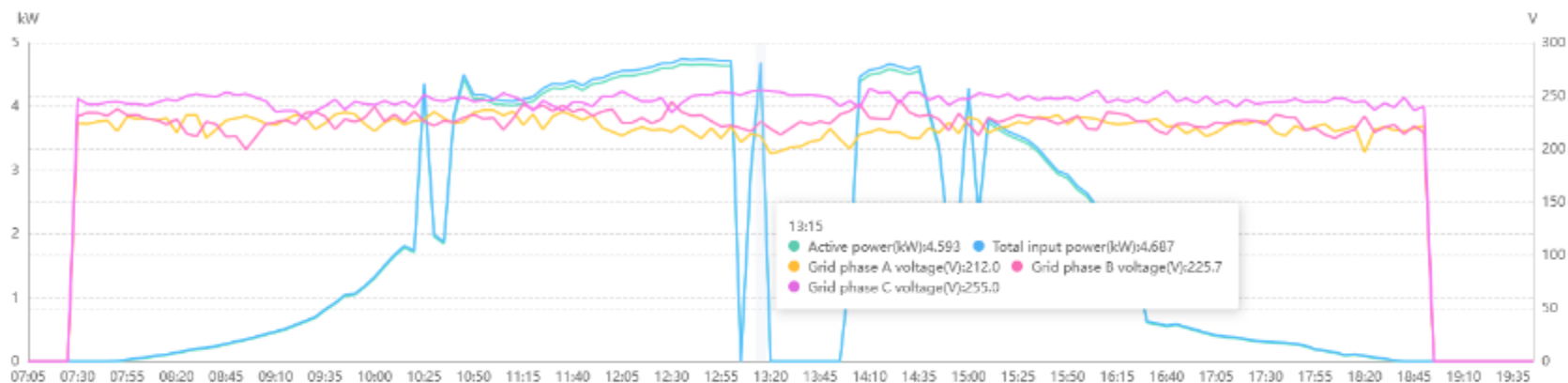
- **De la generare centralizată...la generare distribuită a energiei...Care este impactul în rețeaua locală de distribuție?**
- **Prosumatori rezidențiali, privați și publici...de la consumatorul vulnerabil la prosumatorul vulnerabil...Este o oportunitate pentru piața locală de energie? Este o oportunitate pentru comunitățile de energie?**
 - Energy retailers: “To all prosumers: we give you free hot water tanks (*black barrels*) to store the daylight PV electricity, otherwise injected into the power grid.”
- From **nZEB** goes passive to **ZEB** goes active... De la consumator pasiv...prosumator...utilizator activ de rețea... **Suntem pregătiți? Sunt autoritățile publice locale pregătite?**
- **Sărăcia energetică...Este generalizată în prezent? Poate tranziția energetică înspre surse regenerabile de energie să eradică sărăcia energetică?**
- **Stocarea energiei...Sunt suficiente proiecte?**

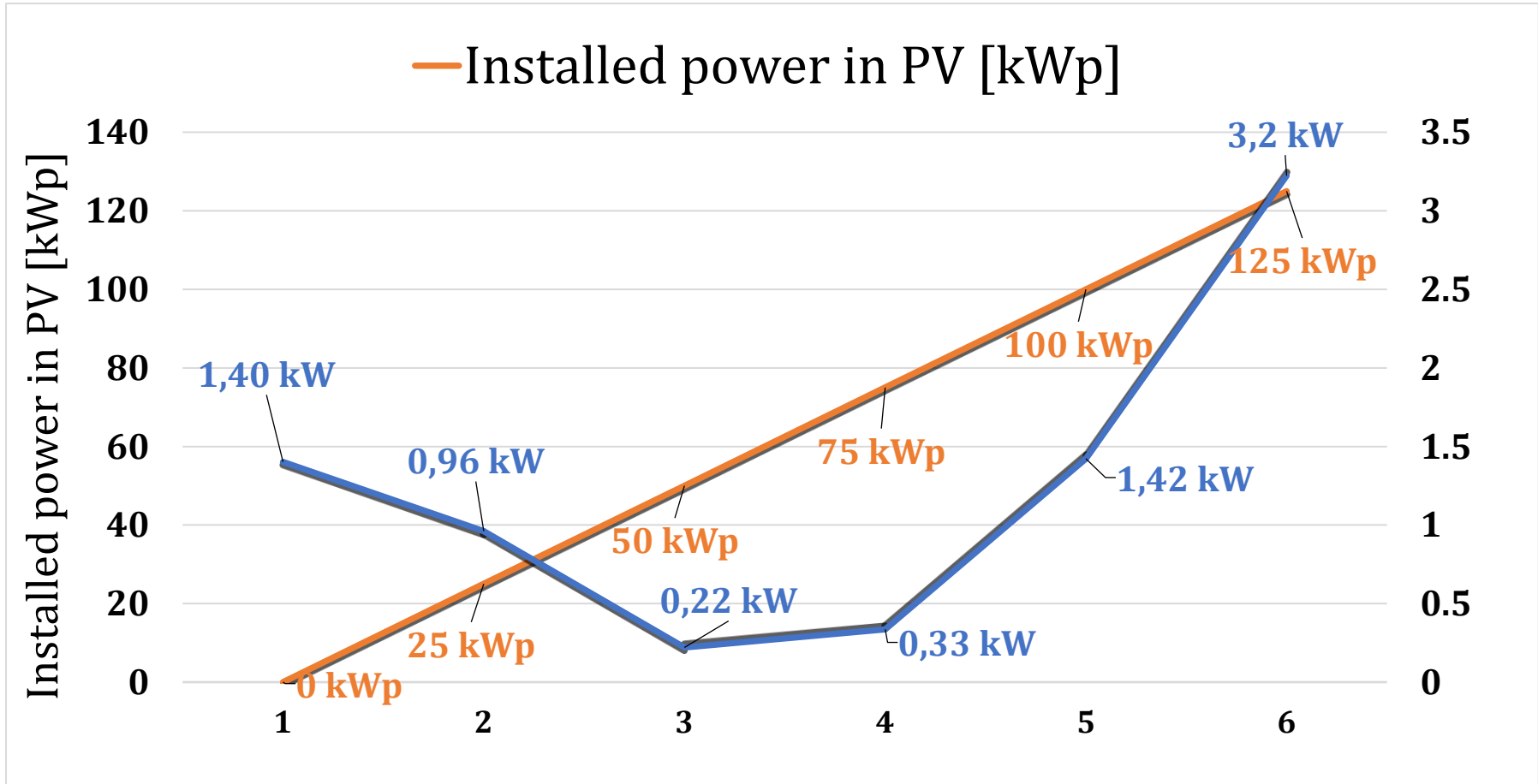
- **Mobilitate electrică... Care este impactul asupra rețelei locale de distribuție?**
- Contorizarea inteligentă...**oportunitate nevalorificată**
- Securitatea cibernetică și siguranța SEN
- Optimizarea fluxurilor de energie și integrarea cu piețele de flexibilitate
- **Cercetare și inovare...Este reprezentativa cercetarea în România în sectorul energetic?**
- **Profesioniști în domeniul energiei...Avem resursa umană pregătită pentru a finaliza tranziția energetică către neutralitate climatică?**

Dezvoltarea de soluții concrete, scalabile

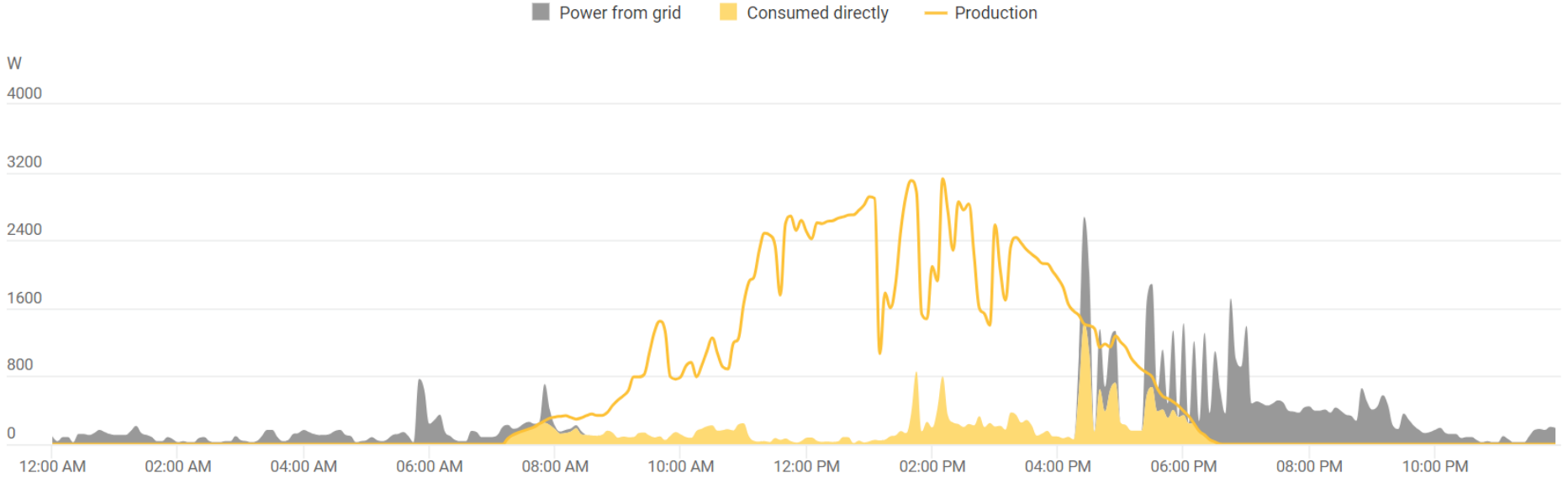
[2022-10-08] HV21A0321862

Active power(kW) Total input power(kW) Grid phase A voltage(V) Grid phase B voltage(V) Grid phase C voltage(V)





PV energy production VS energy use ... on an nZEB building



***Avem multe strategii...planuri de acțiune...programe...
unele doar pe hârtie...***

- Sustainable Energy and Climate Action Plan – **SECAP**;
- Integrated Urban Development Strategy – **IUDS**;
- Sustainable Urban Mobility Plan – **SUMP**;
- European Energy Award – **EEA**;
- District Heating Decarbonation Strategy – **DHDS**;
- Plan to increase the nearly zero buildings – **nZEB**;
- Attenuation action plan for the energy poverty – **EPAP**;
- Smart City / Digitalization Strategy / Action Plan – **SmartCity**
- Climate Change Adaption and Resilience Action Plan – **CCARAP** and others to come...

Electrification:
from “***we bring the light in to your
home***”
to
“***we give you EU money to sell the
Sunlight from your rooftop***”.



(2015 - ongoing)



**Laboratorul de Cercetare
în METODE NUMERICE
NUMERICAL METHODS
Research Laboratory**

Technical University of Cluj-Napoca

(2010 – 2015)



Energy Transition Research Center



Misiunea EnTReC este de a contribui în mod semnificativ, prin cercetare științifică avansată, la tranziția energetică spre neutralitate climatică în sectorul energetic, industrie, clădiri și comunități locale.



TEAM MEMBERS

+ 10 YEARS OF EXPERIENCE

in



+ 30 INTERNATIONAL PROJECTS

with



+ 60 TEAM MEMBERS

from



10 RESEARCH GROUPS

within



8 FACULTIES

RESEARCH TEAMS



Energy Transition Group: Prof. Dan D. MICU, Dr. Denisa ȘTEȚ, Dr. Mihaela CREȚU, Dr. Andrei CECLAN, Dr. Levente CZUMBIL, Dr. Stefan CÎRSTEA, Prof. Laura DARABANT, Prof. Radu A. MUNTEANU, Dr. Dacian JURJ, Dr. Alexandru MURESAN, Dr. Bogdan TEBREAN, Dr. Dan IUDEAN, Dr. Calin MURESAN, Dr. Florin DRĂGAN, Dr. Romul COPÂNDEAN, Dr. Antoniu TURCU, Dr. Ștefan UNGUREANU, Dr. Anca IANCU, Drd. Timea FARKAS, Drd. Alexandru BERCIU, Drd. Mircea LANCRANJAN, Drd. Radu COVACI, Drd. Mihail VOROBIOV, Drd. Mahmuda RAHMAN

Distributed System Research Group: Prof. Tudor CIOARĂ, Prof. Ionut ANGHEL

Electromechanics Systems Research Group: Prof. Claudia MARTIS, Dr. Mircea RUBA, Dr. Augustin POP, Dr. Sorin COSMAN

Electric Mobility Applied Research Group: Prof. Bogdan VARGA, Dr. Dan MOLDOVANU, Dr. Vlad BURNETE, Prof. Florin MARIASIU

Termotechnics Group: Prof. Mugur BĂLAN, Dr. Paula UNGURESAN, Dr. Ancuta MAGUREAN

Lighting Electrical Laboratory Group: Prof. Dorin BEU, Dr. Tania RUS, Prof. Domnita FLORIN, Dr. Octavian POP

Process and Energy Systems Engineering Group: Prof. Eva DULF, Prof. Vlad MURESAN, Dr. Valentin SITA

Civil Engineering Group: Dr. Iulia PRODAN, Dr. Ligia MOGA, Dr. Nicoleta COBARZAN, Drd. Octavian BUJOR

Renewable Energies Research Group: Prof. Dorin PETREUȘ, Prof. Ovidiu POP, Dr. Toma PATARAU, Dr. Radu ETZ

Environmental Engineering Group: Prof. Horatiu VERMEȘAN, Dr. Timea GABOR

MEET OUR TEAM

We are described by **the passion and the enthusiasm** for what we do, supported by our skills and held results that with each new experience we develop and harness at a personal level for the **University's and the Community's Interest**.



We prove **courage in development** by undertaking performance **in energy related fields** through applied scientific research and a permanent open eye for new opportunities that could be transposed in scientific knowledge or feasible and efficient solutions for the industry.



AREA OF EXPERTISE

AREAS of EXPERTISE

Research center expertise and activities are concentrated on **multidisciplinary research** through the joint effort of several research groups

*Energy Efficiency
in Buildings &
Industry*

RES Integration

Smart Grid

*Energy Islands &
Communities*

Energy Storage

*Power flow
Optimisation*

nZEB adoption

Electric mobility

Waste to Energy

*Energy Culture
and Consumer
Behaviour*

*Energy Analytics
& Numerical
Tools*

*Energy Profiling
and Forecasting*

*IOT and
Blockchain
technology*

*Big Data
Analytics*

*Cognitive and
Artificial
Intelligence*

*Electromagnetic
Fields*

*Electromagnetic
Compatibility*



INTERNATIONAL PROJECTS

GREENER
supporting increased knowledge on renewable energy and energy efficiency in A&D hubs

NET ZERO CITIES



DOITSMARTER



REN+HOMES

interreg Danube Region

REHEATEAST

VELIXIA
BUILDINGS AS ACTIVE UTILITY MODELS

interreg Danube Region

Danube GeoHeCo

DR-BOB

persist
positive energy districts driven by citizens

cognition

EnTRAINER

SME mPower Efficiency

Gear@SME
smart energy ecosystem

LGA
holistic Green Airport

ENERGEIA





Project Title: hOListic Green Airport (OLGA)
Time: 60 months (1st of October 2021 – 1st October 2026)
Project value: 24.991.644 Euro
Project Link: <https://www.olga-project.eu/>



Project Title: Renewable Energy-based Positive Homes (RENplusHOMES)
Time: 2023-2026
Project value: 5 999 983 EUR
Project Link: <https://renplushomes.eu/>



Project Title: Smart Grid-Efficient Interactive Buildings (EVELIXIA)
Time: 2023-2027
Project value: 10 320 789 EUR
Project Link: <https://www.evelixia-project.eu/>



Project Title: EnTRAINER - Energy Transition Audits Towards Decarbonization
Time: 36 months (December 2022 – November 2025)
Project value: 1,842,112 EUR
Project Link: <https://entrainer-project.eu/>



Project Title: Sun coupled innovative Heat pumps
Time: 60 months (1st October 2018 – 30th September 2023)
Project value: 11.604.927 EURO
Project Link: <https://sunhorizon-project.eu/>





Project Title: Meeting the energy professionals' skills (MEnS)

Time: 36 months (1st of March 2015 – 31st of August 2017)

Project value: 1.478.160 euro

Project Link: <https://cordis.europa.eu/project/id/649773>



DR-BOB

Project Title: Demand Response in Block of Buildings (DR-BOB)

Time: 36 months (1st of March 2016 – 31st of August 2019)

Project value: 5.136.769 euro

Project Link: <https://cordis.europa.eu/project/id/696114>



Project title: REnewableCOGeneration and storage techNologiesIntegraTion for energy autONomous buildings (RE-COGNITION)

Time: 36 months (1st of April 2019 – 30 of March 2022)

Project value: 4.990.000 €

Project Link: <https://re-cognition-project.eu/>



Project title: A holistic framework for Empowering SME's capacity to increase their energy efficiency, (SMEmPower Efficiency)

Time: 36 months (1st of April 2019 – 30 of March 2022)

Project value: 1.990.000 €

Project Link: <https://smempower.com/>



Project Title: Generate Energy efficient Acting and Results at Small & medium enterprises (Gear@SME)

Time: 30 months (1st of September 2020 – 28th of February 2023)

Project value: 1 993 227 €

Project Link: <https://www.gearatsme.eu/>



Project Title: NetZeroCities Cluj-Napoca - 2023 – 2024 National Competence Centre and solutions for the development of Climate Neutral and Smart Cities

Time: 48 months (2023-2027)

Project value: 500.000 EURO

Cod SMIS: 156386



Project Title: Design and development of an Energy Efficiency Management and Control System with cost-effective solutions for residential and educational buildings

Time: 20 months (May 2022 – December 2023)

Project Link: <https://eeagrants.org/archive/2014-2021/projects/RO-ENERGY-0067>



Project Title: GREENER - 2023 – 2024

Supporting increased knowledge on renewable energy and energy efficiency in Alba Iulia

Time: 12 months (2023-2024)

Project value: 210.196 EUR



Project Title: ENERGEIA - 2023 – 2024

Empowering Energy Efficiency Awareness through a Holistic Educational Approach

Time: 12 months (2023-2024)

Project value: 199,987 EURO

Project Link: <https://www.linkedin.com/company/energeia-project-2023/about/>



Project Title: Positive EneRgy diStrIctS driven by ciTizens

Time: 29 months (March 2024 - December 2026)

Project value: 195.960 EUR

Project Link: <https://entrec.utcluj.ro/positive-energy-districts-driven-by-citizens/>



Project Title: Fostering the implementation of shallow geothermal hybrid heating and cooling systems in the Danube Region – GeoHeCo

Time: 29 months (January 2024 – June 2026)

Project value: 2.481.000 EUR

Project Link: <https://entrec.utcluj.ro/danube-geoheco/>



Project Title: Building local partnerships for reducing the fossil energy

demand of district heating systems in the Danube region – Reheateast

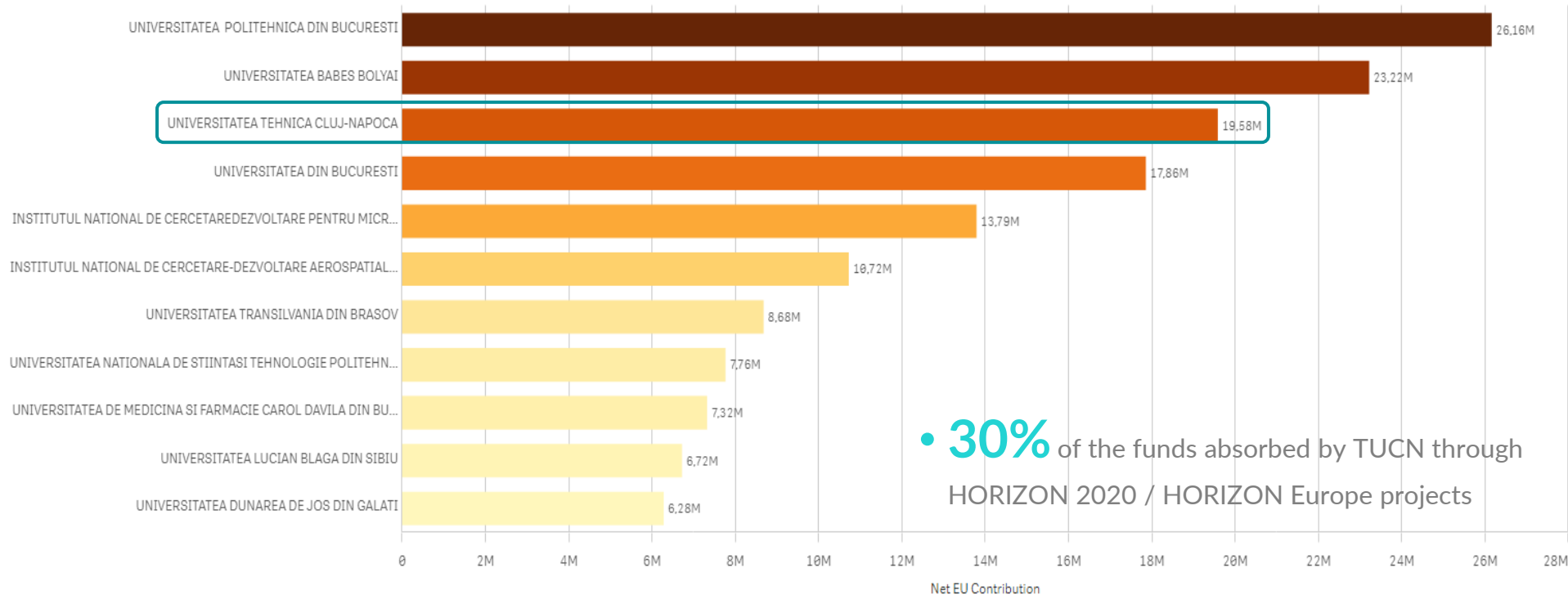
Time: 29 months (January 2024 – June 2026)

Project value: 2.214.691 EUR

Project Link: <https://interreg-danube.eu/projects/reheateast>



Top organisations



• **30%** of the funds absorbed by TUCN through
HORIZON 2020 / HORIZON Europe projects

EU - PARTNERS

EU - PARTNERS



EU - PARTNERS



ZIUA MONDIALĂ A EFICIENȚEI ENERGETICE 2025

AGENDA EVENIMENTULUI

“Sustenabilitate și eficiență energetică” – ediția II

5 martie 2025, Aula Centenar, Facultatea de Ingineria Materialelor și a Mediului
Bd. Muncii, 103-105, Cluj-Napoca

09:00 –09:30	Primirea și înregistrarea participanților – Aula Centenar
09:30 –09:45	Deschidere eveniment: Conf.dr.ing. Bogdan NEAMTU <i>Decan</i> Facultatea de Ingineria Materialelor și a Mediului Conf. Dr. Ing. Titus CRIȘAN <i>Prodecan</i> Facultatea de Inginerie Electrică Prof. dr. ing. Dan MICU <i>Coordonator EnTReC</i> Facultatea de Inginerie Electrică Energy Transition Research Center (EnTReC) ȘI. dr. ing. Cristina Daniela HORJU-DEAC <i>Organizator eveniment</i> Facultatea de Ingineria Materialelor și a Mediului Departamentul de Ingineria Mediului și Antreprenoriatul Dezvoltării Durabile Prof. Dr. Ing. Horațiu VERMEȘAN <i>Moderator eveniment</i> Facultatea de Ingineria Materialelor și a Mediului Departamentul de Ingineria Mediului și Antreprenoriatul Dezvoltării Durabile
Sesiune 1: Inovație și cercetare pentru tranziția energetică	
09:45 10:00	Transformarea clădirilor prin surse geotermale de energie integrate în structurile de rezistență Sl. dr. ing. Iulia PRODAN <i>Facultatea de Construcții</i> Energy Transition Research Center (EnTReC) Conf. Dr. Ing. Mihaela CRETU <i>Facultatea de Inginerie Electrică</i> Energy Transition Research Center (EnTReC)
10:00-10:15	Energie inteligentă - Rolul IoT, AI și Blockchain în eficiența energetică Prof. dr. ing. Tudor CIOARĂ <i>Facultatea de Automatică și Calculatoare</i> Distributed System Research Laboratory (DSRL)
10:15-10:30	Reflecții asupra valului fotovoltaicelor pentru prosumatori Conf. Dr. Ing. Andrei CECLAN <i>Facultatea de Inginerie Electrică</i> Energy Transition Research Center (EnTReC)
10:30-10:45	Perspective de cercetare și provocări tehnice în domeniul transportului sustenabil cu hidrogen Prof. dr. ing. Bogdan VARGĂ <i>Facultatea de Autovehicule Rutiere, Mecatronică și Mecanică</i> Electric Mobility Applied Research Center (EMARC)
10:45-11:00	O noua generație de motoare pentru vehicule electrice Prof. Dr. Ing. Claudia MĂRȚIS <i>Facultatea de Inginerie Electrică</i> Energy Transition Research Center (EnTReC)
11:00-11:15	Metodologie și foaie de parcurs pentru decarbonizarea companiilor Prof. Dr. Ing. Denisa ȘTET <i>Facultatea de Inginerie Electrică</i> Energy Transition Research Center (EnTReC)
11:15-11:30	Campusurile educaționale ca promotori pentru Districte cu Energie Pozitivă Conf. dr. ing. Tania RUS <i>Facultatea de Inginerie a Instalațiilor</i> Energy Transition Research Center (EnTReC)
11:30-12:00	Pauză de cafea

Sesiune 2: Perspectiva mediului socio-economic

12:00 - 12:15	Studiu de caz: Cladire certificata GREEN HOMES Marius OLAR Manager Departament Tehnic SISTEMA Comfort and Energy Saving Arad
12:15 - 12:30	Sustenabilitatea și eficiență energetică în contextul comunităților energetice Radu TĂRĂU Director executiv EnergoBit Control Systems
12:30 - 12:45	Sisteme de stocare a energiei cu baterii pentru un viitor sustenabil Septimiu COSTEA Director Nova Power & Gas E-Infra Group
12:45 - 13:00	Proiecte de eficienta energetica implementate Cristian BILEGAN Marketing Manager DataCor Bistrita -Nasaud
13:00 - 13:15	Dezvoltare durabilă, economie circulară și reducerea amprentei de carbon în sectorul apei din județele Cluj și Sălaj Cristel MUREȘAN Compania de Apă Someș SA
13:15 - 13:30	Viitorul CEMACON: drumul nostru spre producție cu amprenta de carbon redusă Dan MARINA Manager de Mediu CEMACOM
13:30 - 13:45	Soluții Knauf Insulation pentru o clădire eficientă energetic Sebastian Erhardt MORAR Technical Advisor Knauf Insulation România
13:45 - 14:00	Eficiență energetică în construcții - soluțiile inovatoare XELLA Sebastian IVAN BIM Manager Xella Romania
14:00 - 14:15	Fabrica la 4 bari - reducerea amprentei de CO₂ și a costurilor operationale Vlad BALC Area sales manager SMC Romania
14:15 - 14:30	Rolul investițiilor sustenabile în tranziție la o economie curată Adrian Florin POTRA Director Departament Analiza Riscurilor ESG și Finanțare Durabilă- Banca Transilvania
09:30 - 13:30	EXPOZIȚIE: EnTReC, EMARC, SISTEMA, DataCor, Cemacom, Knauf Insulation Romania, SMC ,Valfluid Romania, Xella Romania
15:00 - 17:00	Masă rotundă: "Tranziția energetică a companiilor: De la conformare legislativă la avantaj competitiv sustenabil" Eveniment dedicat mediului socio-economic organizat în cadrul proiectului " <i>Fostering the implementation of shallow geothermal hybrid heating and cooling systems in the Danube Region (Danube GeoHeCo)</i> ". Participare pe bază de invitație.
Evenimentul se adresează reprezentanților mediului socio-economic și autorităților publice locale care își doresc să identifice posibilități de colaborare sau oportunități comune și să implementeze acțiuni în domeniul eficienței energetice și a decarbonizării.	

PARTENERI:



Finished Projects



EnTReC - EU Projects

Topics

Demonstration Pilots

Eficiența energetică în clădiri și industrie; Integrare RES; Smart grids; Comunități de energie; Adoptarea nZEB; Analiză energetică și instrumente numerice; Profilarea și prognoza de energie; Big Data; Inteligență artificială



Ongoing Projects



Pilot demonstrativ

j.r.o



Facultățile de IE, ETTI, AC



Facultatea de Instalații



Cămine Studențești
Complex Mărăști



Complexul de Natație

Aeroportul Avram Iancu



PILOT SITES

entrec.utcluj.ro



Dr. BOB

*Demand Response
in Blocks of Buildings*



*REnewable COGeneration and
storage techNOlogies IntegraTion
for energy autONomous buildings*



**Pilot location from
UK
Teesside University**



**Pilot Location from
France
Park Business**



**Pilot location from
Italia
Fondazione
Poliambulanza
Hospital**



**Pilot location
from Romania
Tehnical University
of Cluj-Napoca**



**Corby
Innovation
Hub
UK**



**Technical
University
of Cluj-
Napoca
România**



**Hellenic
Petroleum
Grecia**



**Politecnico
di Torino
Italia**



**The City of
Lizzanello
Italia**



**Pre-Pilot
Use Case:
CERTH
Smart
House
Grecia**

IMPLEMENTED SOLUTION

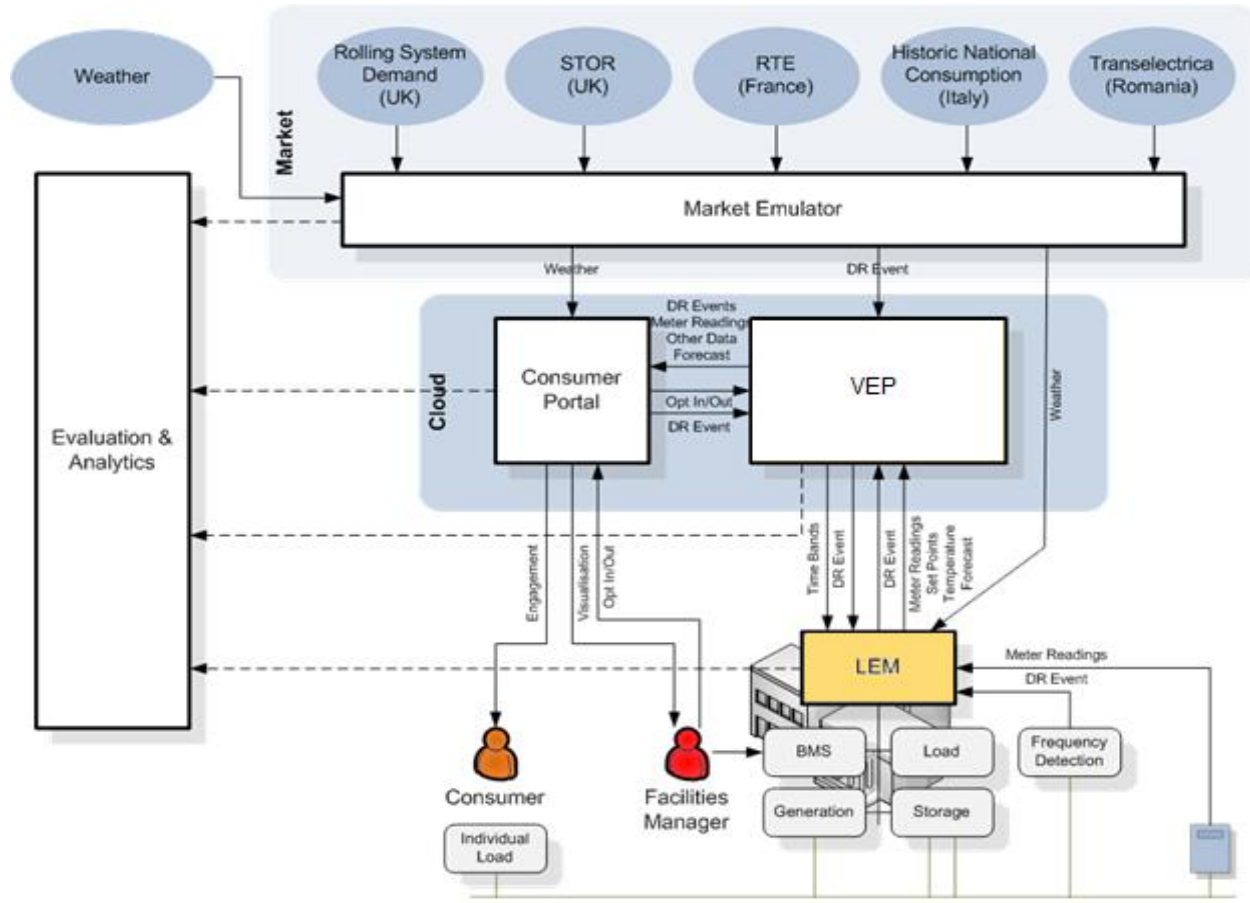


- Demonstration *pilot site – TUCN*
- Implementation of a *Building Energy Management System* for energy monitoring
- Integration of the system in four different TUCN locations to enable the demonstration of the *Demand Response*
- Deployment of the DR-BoB architecture at TUCN pilot
- Collection and analysis of *energy monitoring data*
- Calculation of the *Key Performance Indicators* to prove the DR

SYSTEM ARCHITECTURE



Dr. BOB
Demand Response
in Blocks of Buildings



ENERGY MANAGEMENT SOLUTION

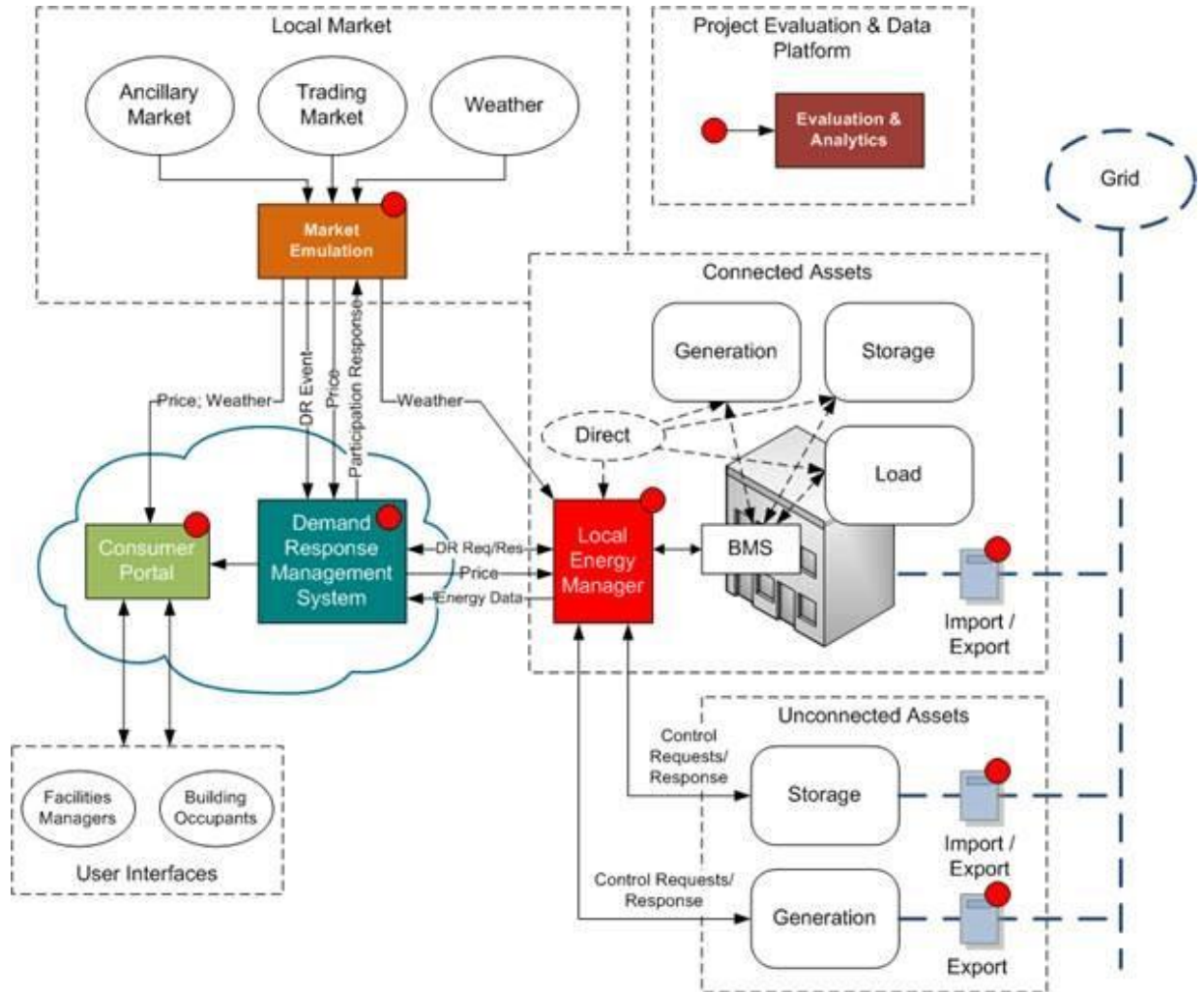


Dr. BOB

Demand Response in Blocks of Buildings



HORIZON 2020



INTEGRATED RES



REnewable COGeneration and storage techNOlogies IntegraTIon for energy autONomous buildings



RENEWABLE ENERGY SOURCES DEVELOPED AND STORAGE SOLUTIONS



Sistem de micro-cogenerare utilizând o turbină pe biogaz



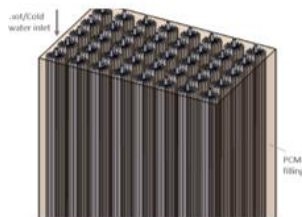
Sistem Fotovoltaic integrat în anvelopa clădirii



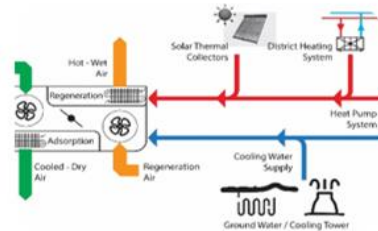
Turbine eoliene cu ax vertical și geometrie variabilă



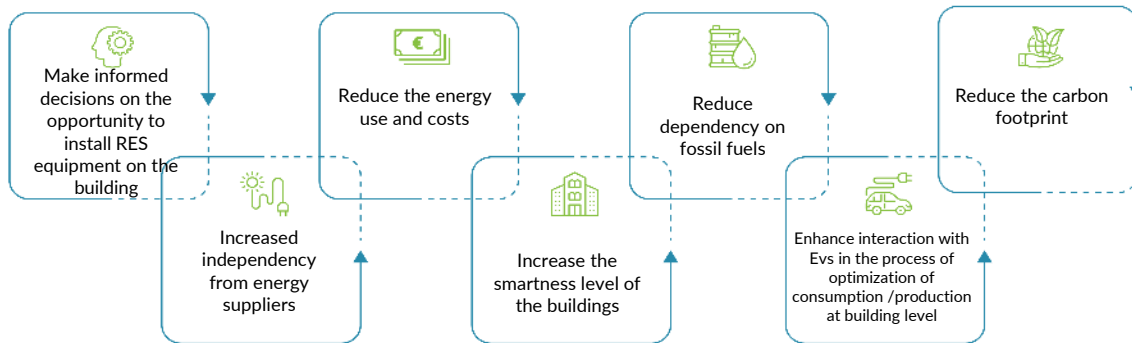
Stații de încărcat mașini electrice ca soluție de stocare virtuală



Soluții hibride de stocare a energiei: Sistem de stocare termică latent și hibrid



Tehnologii hibride termo-solare pentru răcire



SYSTEM ARCHITECTURE

entrec.utcluj.ro



REnewable COGeneration and storage technologies IntegraTIon for energy autONomous buildings



• • • • **①** First level: Interactive interface

• • • • **②** Second level: ITC platform incorporating the Automated Cognitive Energy Management Engine with an Intelligent Portal (iGateway) and the BE-PLATO tool - decisions about the opportunity to install renewable energy sources in the building

• • • • **③** Third level: New renewable energy building integrated technologies, implemented within the project and tested at different pilots

Interfața BEMS implementată

entrec.utcluj.ro

Total consumption:

Power: 169,0kW

Energy: 109895kWh

1. "Gh. Baritiu" location Online
No Errors

General	62,8%
Power:	106,18kW
Energy:	1585kWh
Server room 1	
Power:	17,32kW
Energy:	242kWh
Server room 2	
Power:	12,09kW
Energy:	208kWh
Main chiller	
Power:	0,00kW
Energy:	0kWh

2. "Marasti" dormitories Online
No Errors

General	0,0%
Power:	0,00kW
Energy:	1kWh
Heating unit	
Power:	2,92kW
Energy:	46kWh
Dormitory 1F	
Power:	0,00kW
Energy:	0kWh
Dormitory 2B	
Power:	0,00kW
Energy:	0kWh

Trends PAC Chiller

3. Faculty of building services Online
No Errors

General	14,5%
Power:	24,53kW
Energy:	341kWh
Main chiller	
Power:	4,58kW
Energy:	28kWh

4. Swimming pool Online
No Errors

General	22,5%
Power:	36,31kW
Energy:	552kWh
Auxilliary chiller	
Power:	0,00kW
Energy:	0kWh

Interfața BEMS implementată

entrec.utcluj.ro

General Online

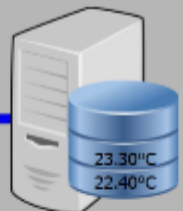
Power 100.0%
Max. today: 193.70kW
Max y-day: 198.29kW

Energy consumption
Today: 2553.2kWh
Y-day: 3065.0kWh

Server room 1 Online

Power 26.3%
Max. today: 49.27kW
Max y-day: 57.04kW

Energy consumption
Today: 738.1kWh
Y-day: 971.2kWh



Physics Lab Online

Power 16.1%
Max. today: 37.26kW
Max y-day: 37.48kW

Energy consumption
Today: 420.4kWh
Y-day: 450.5kWh



Other: Lighting and Auxiliaries

Power 57.4% 75.37kW

Trends **PAC** **Chiller**

Main chiller Online

Power 0.0%
Max. today: 0.00kW
Max y-day: 0.00kW

Energy consumption
Today: 0.0kWh
Y-day: 0.0kWh



BicolD

1. "Gh. Baritiu" location

2. "Marasti" dormitories

3. Faculty of building services

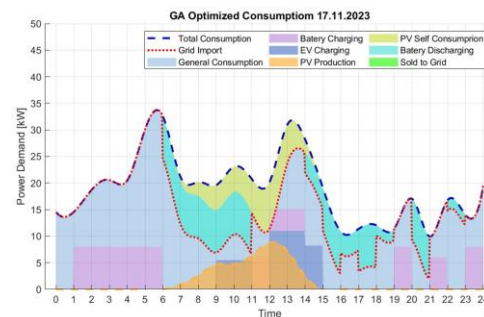
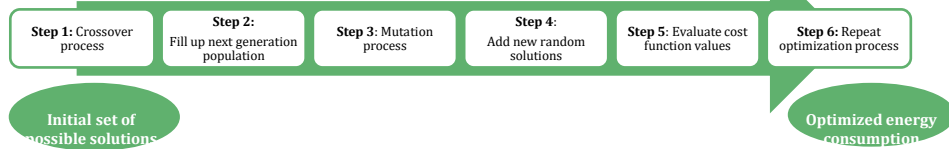
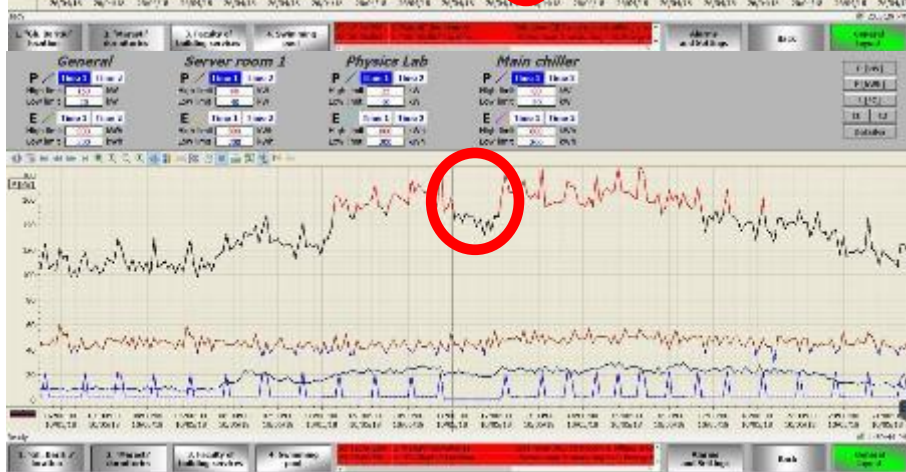
4. Swimming pool

00:26:14.037 2."Marasti" dormitories: Cold room DC1 cold room is offline, err
23:50:19.925 2."Marasti" dormitories: General measuring unit, Energy High

Alarms and Settings

Back

General layout



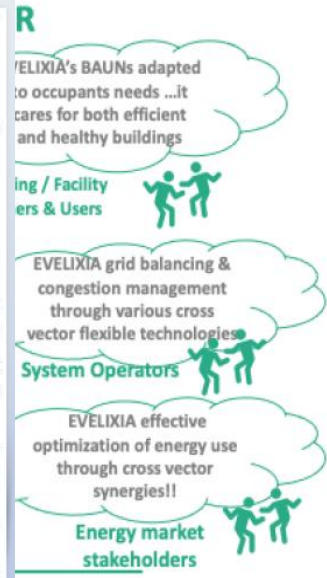
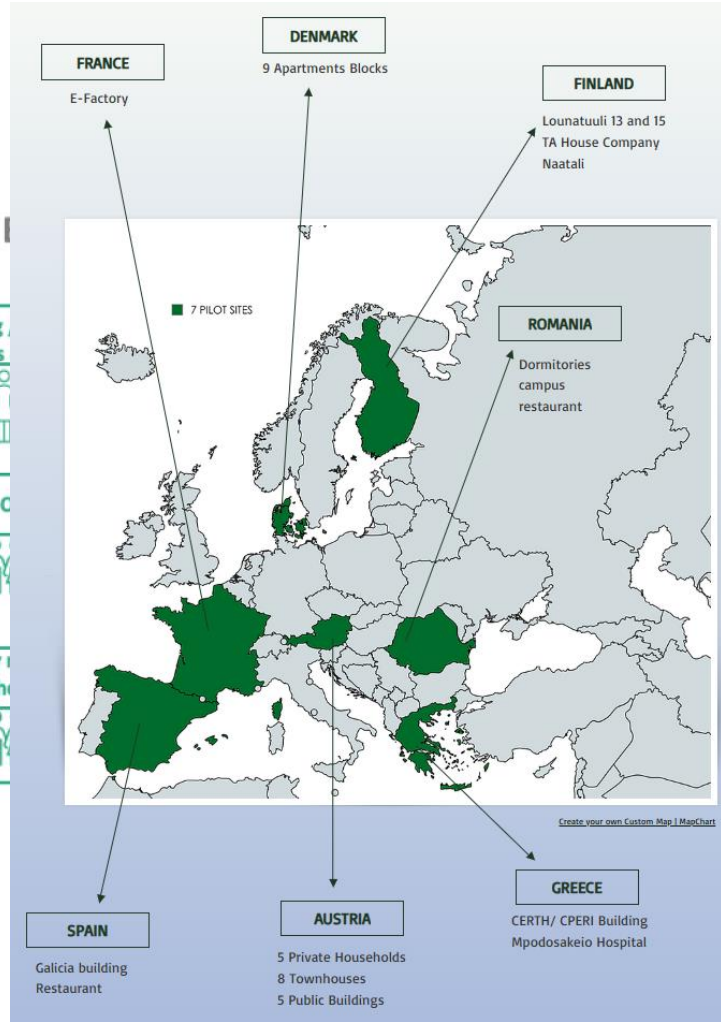
Proposed METHODOLOGY



Smart Grid-Efficient Interactive Buildings



Stakeholder Requirements





Pilot Site #2 : Romania, Student Campus, Cluj-Napoca

- Plans for the next 6 months – implementation schedule:

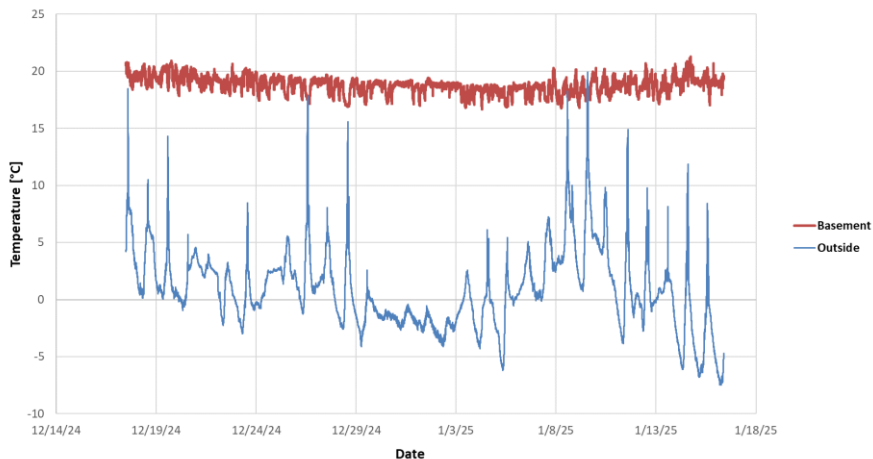
2023			2024												2025											
10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27
T5.1																										
T5.2																										
Introducing innovative solutions																										
Monitoring plan definition																										
GeoWall																										
Defining the solution and technical specifications																										
Subcontracting and procurement phase																										
Installing the solution at the pilot																										
Operators training																										
Basic tests def. and execution																										
Monitoring phase																										
Reporting activity																										



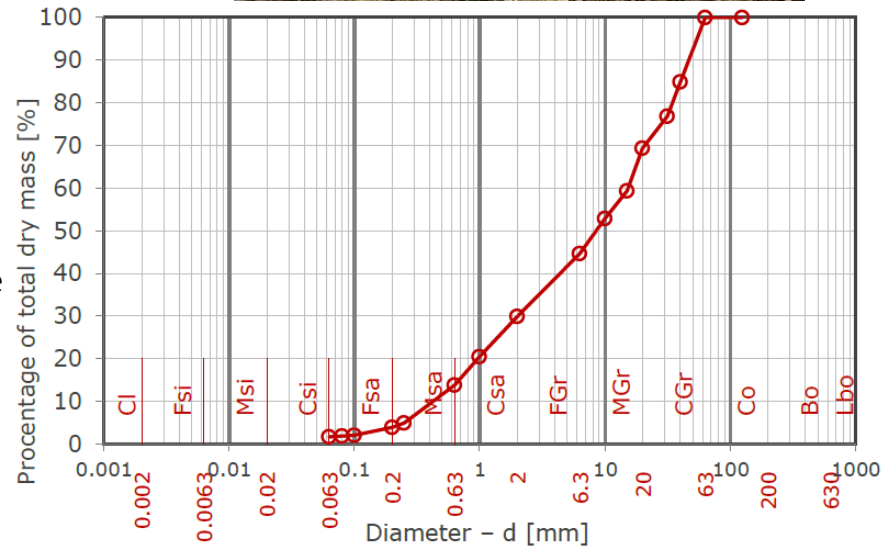


❖ SITE INVESTIGATIONS AND PRELIMINARY NUMERICAL MODELLING

Temperature comparison between exterior temperature and basement temperature



Temperature inside the basement compared to exterior temperature

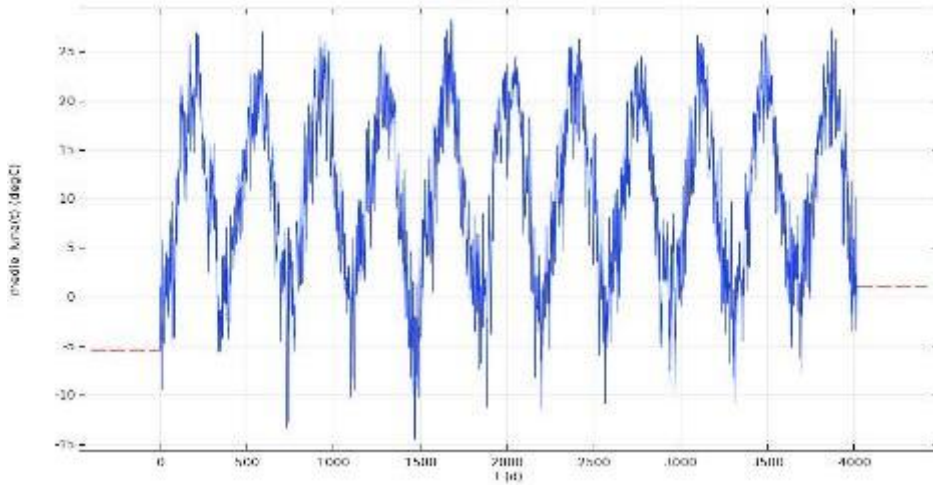


Granulometric curve of tested material

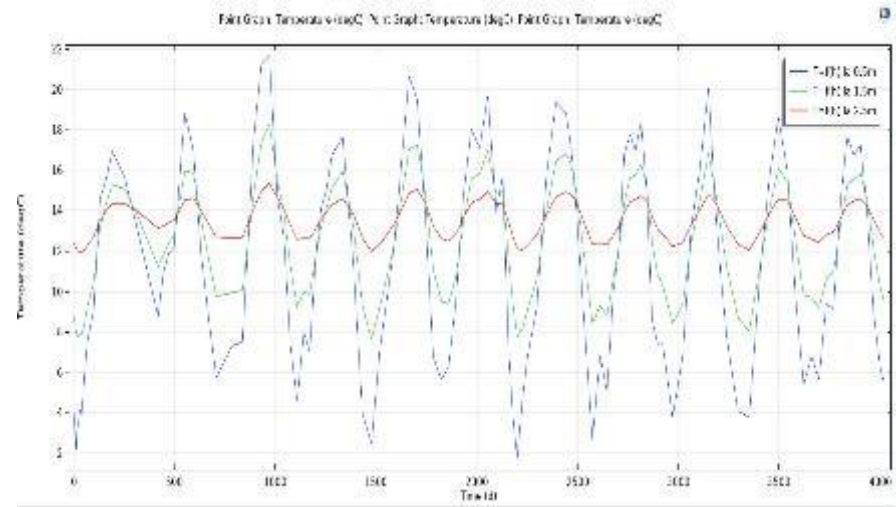




❖ SITE INVESTIGATIONS AND PRELIMINARY NUMERICAL MODELLING



The daily medium external temperature, 2013-2023 interval, from Cluj-Napoca



The variation of the temperature at three different depths in the soil

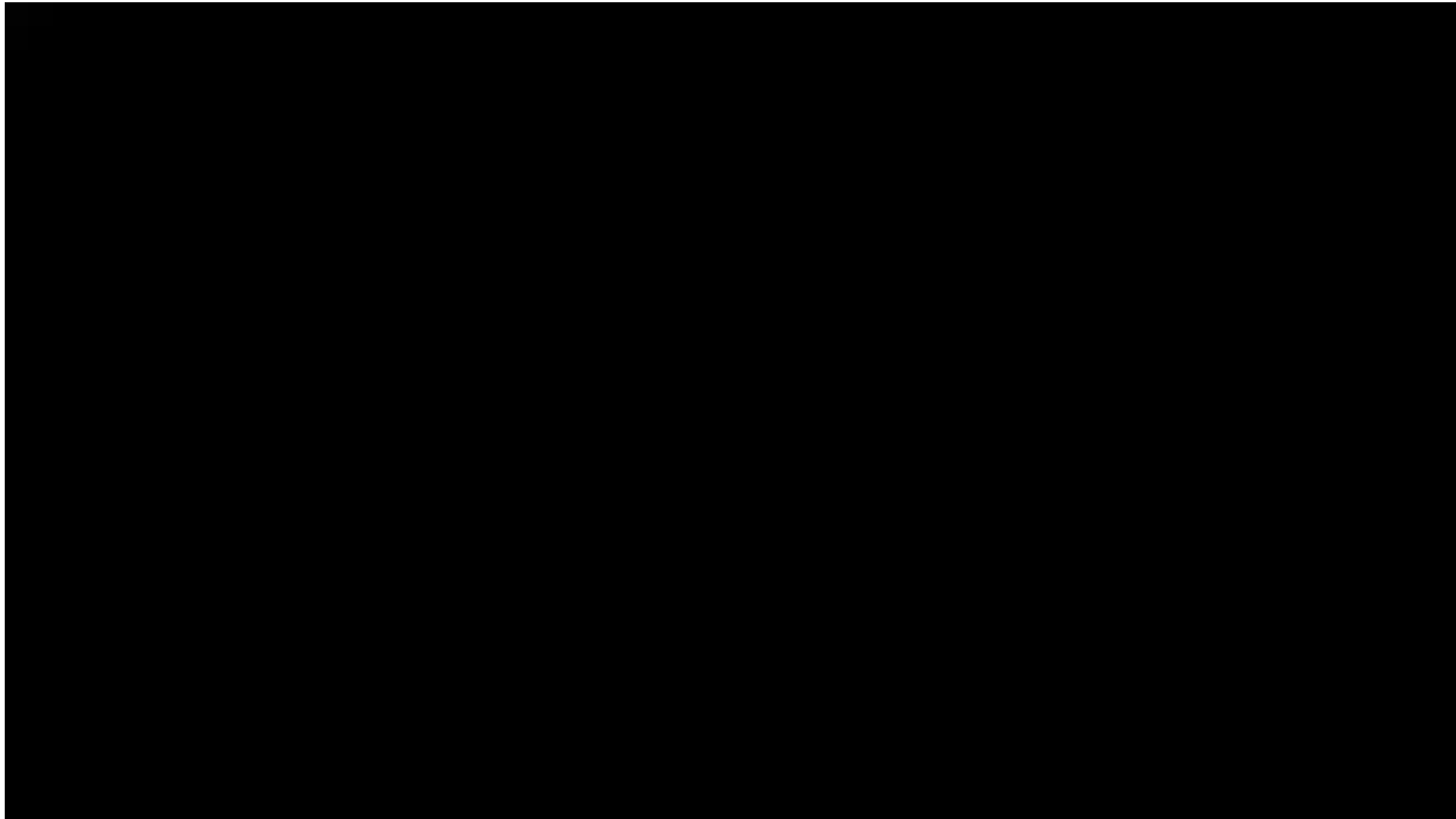




❖ EXECUTION OF GEOWALL SYSTEM (1 September 2024 - 17th of December 2024)

- Execution of radiant panels inside the dorm room (surface of radiant heating - 21.35 sqm)
- Execution of exterior GeoWall system (35.10 sqm, spliced into 2 types where the pipe layout is different)
- Execution of interior GeoWall system (2 basement rooms were equipped, with a total surface of 60 sqm)
- Connections of the systems to the heat pump system (7 kW brine-water heat pump)







Pilot Site #2 : Romania, Student Campus, Cluj-Napoca

- Plans for the next 6 months – implementation schedule:

	2023			2024												2025												
	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20	M21	M22	M23	M24	M25	M26	M27	
T5.1																												
T5.2																												
Introducing innovative solutions																												
Monitoring plan definition																												
BIPV																												
Defining the solution																												
Identifying the electrical faults																												
Technical specifications																												
Getting the approvals																												
Installing the solution at the pilot																												
Basic tests def. and execution																												
Monitoring phase																												
Reporting activity																												



Partial RESULTS

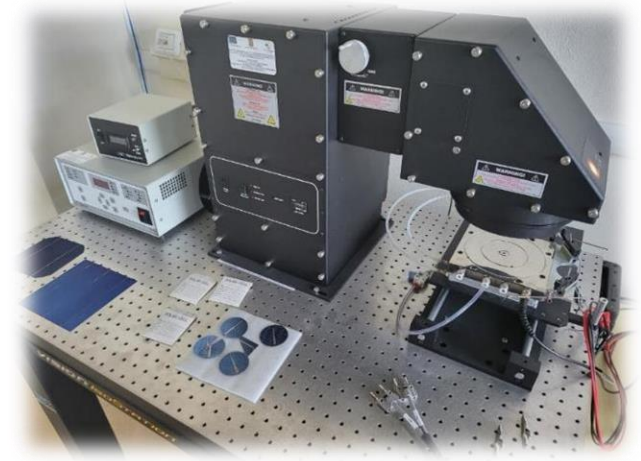
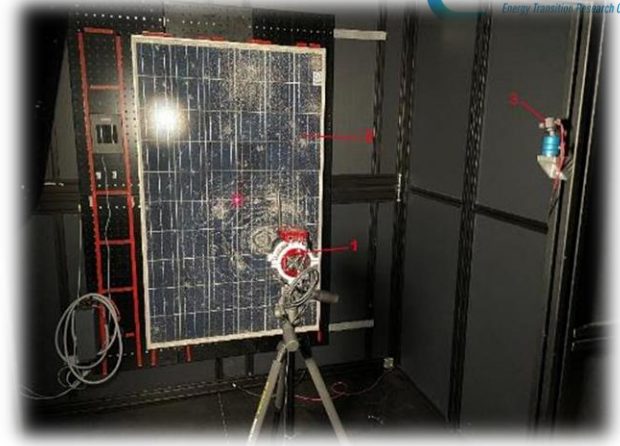


Smart Grid-Efficient
Interactive Buildings



HORIZON EUROPE

Integration of *BIPV modules* made from damaged PV panels



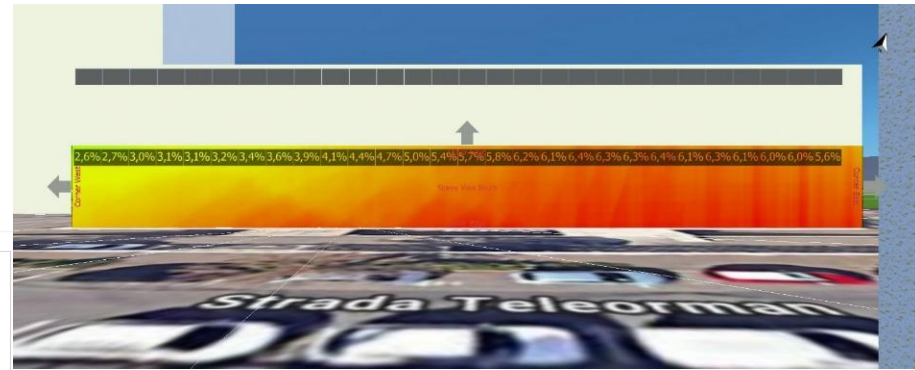
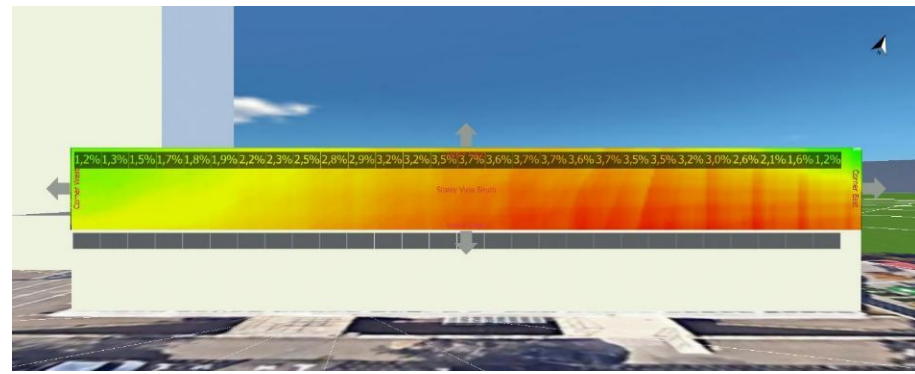
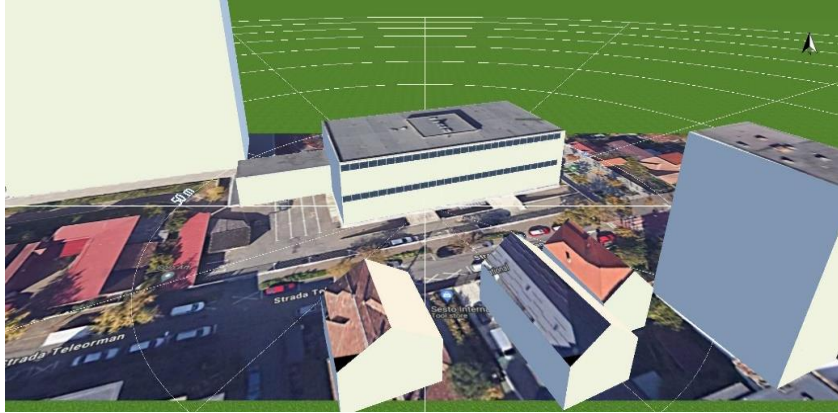
BIPVs designed integration in building facade



Module of 56 PV cells of averaged 300 Wp (16.8 kWp)

BIPVs simulation

3D Shading simulation results



Basic Data

Company: Example

Name: 300 Wp - Si monocrystalline

Description:

Version: 2

Created at: 10/11/2018 3:00:00 AM

User ID: None - System data record

Electrical Data

Cell Type: Si monocrystalline

Cell Count: 60

Number of Bypass Diodes: 3

Loss voltage per bypass diode in V: 1

Integrated power optimizer: no selection

Only Transformer Inverters suitable

Cell strings perpendicular to short side

I-V Characteristics at STC

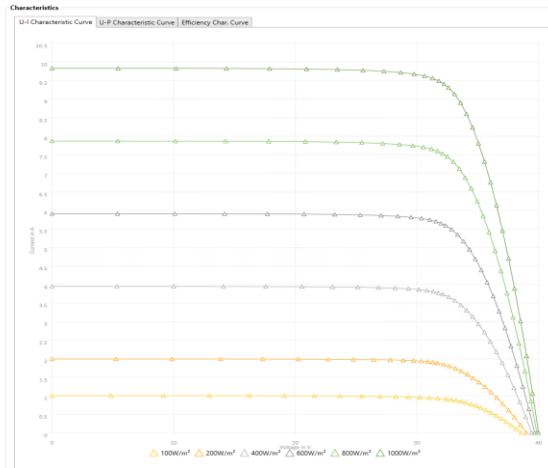
MPP Voltage in V: 32.6

MPP Current in A: 9.31

Open Circuit Voltage in V: 40

Short-Circuit Current in A: 9.83

Increase open circuit voltage before stabilization in %: 9



BIPVs simulation

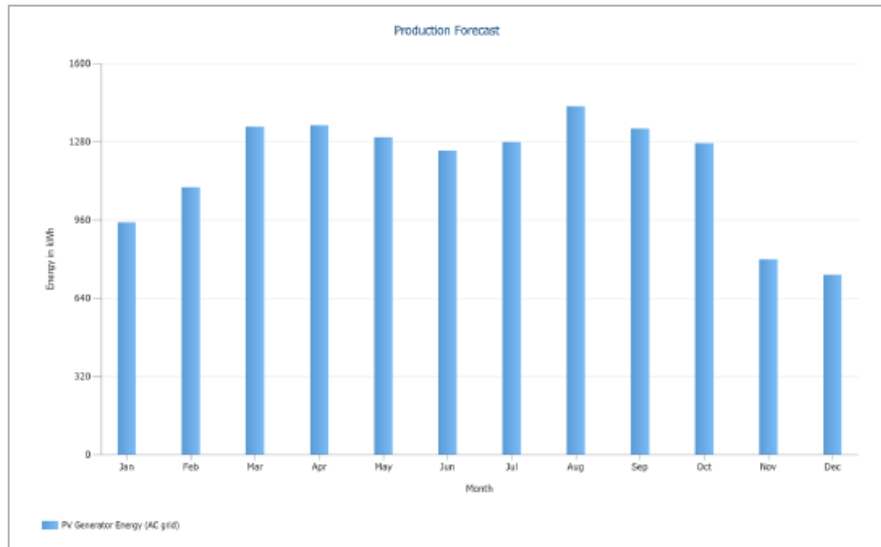


Figure: Production Forecast

Results per Module Area

Cantina-Storey2-Facade South

PV Generator Output	8,40 kWp
PV Generator Surface	46,95 m ²
Global Radiation at the Module	951,50 kWh/m ²
Global Radiation on Module without reflection	992,57 kWh/m ²
Performance Ratio (PR)	84,88 %
PV Generator Energy (AC grid)	7159,98 kWh/Year
Spec. Annual Yield	852,38 kWh/kWp

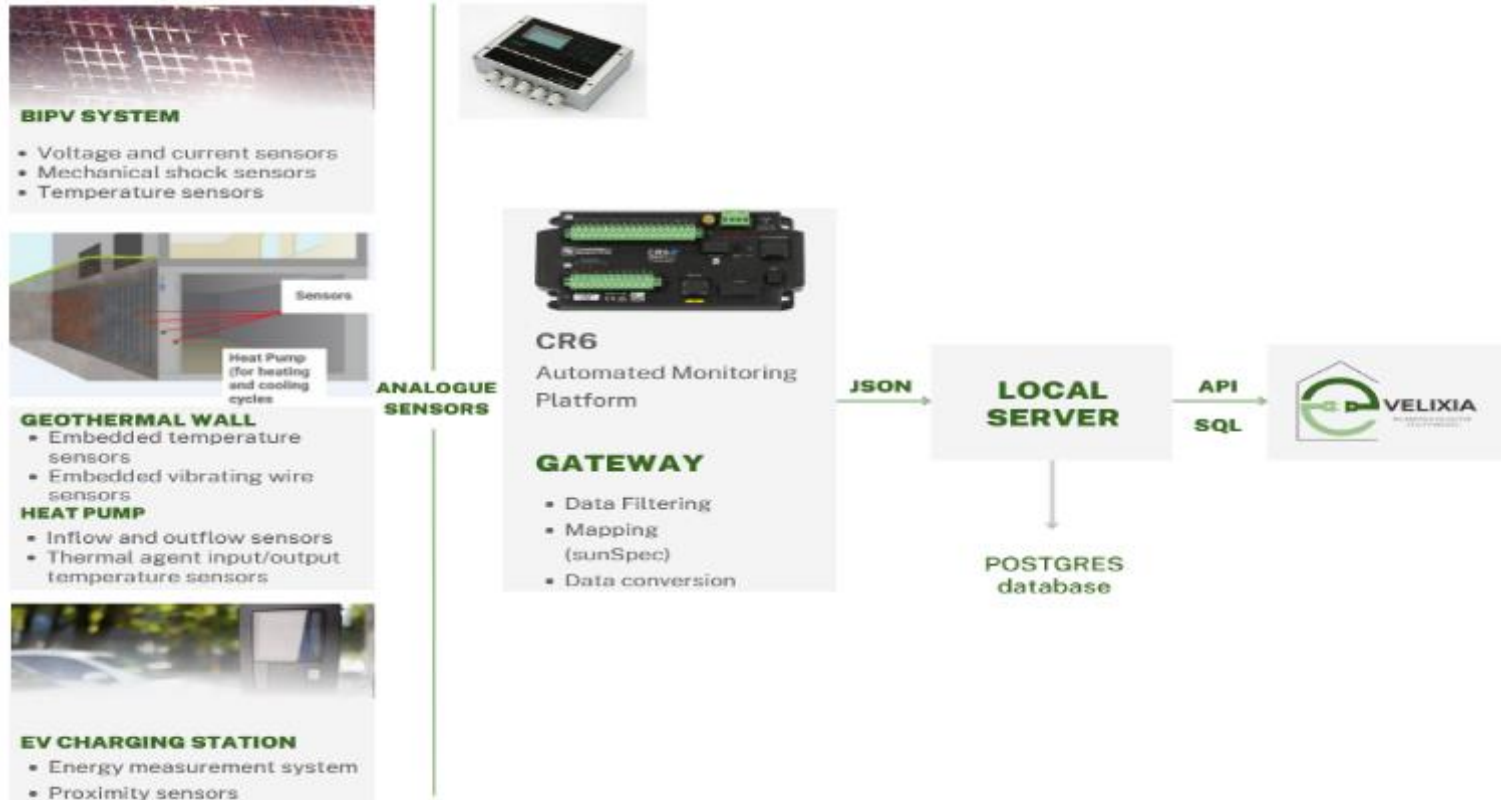
Cantina-Storey1-Facade South

PV Generator Output	8,40 kWp
PV Generator Surface	46,95 m ²
Global Radiation at the Module	951,50 kWh/m ²
Global Radiation on Module without reflection	992,57 kWh/m ²
Performance Ratio (PR)	82,54 %
PV Generator Energy (AC grid)	6962,62 kWh/Year
Spec. Annual Yield	828,88 kWh/kWp



Pilot Site #2 : Romania, Student Campus, Cluj-Napoca

• Monitoring plan for the Romanian pilot site



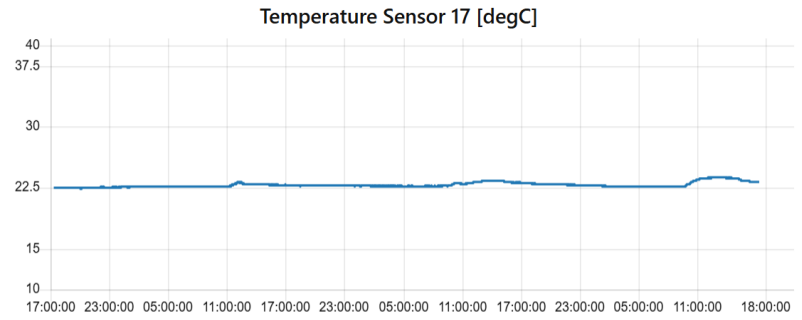
Monitoring system

Conectarea sistemului la pompa de caldura (7 kW soil-water heat pump)

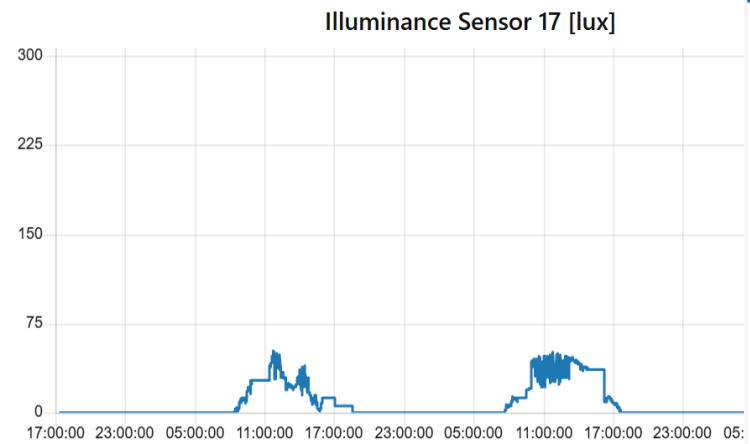


Temperature and humidity monitoring on rooms 17 and 18

Temperature Sensor 17 [degC] **23.2**



Illuminance Sensor 17 [lux] **8**



Teste rezerva

- Rooms temperature and humidity
- Rooms proximity and illuminance
- Rooms energy consumption
- Main heating system electrical parameters monitoring
- Recived Data json
- Transmitted Data json
- Teste rezerva
- Teste grupare

Active Power

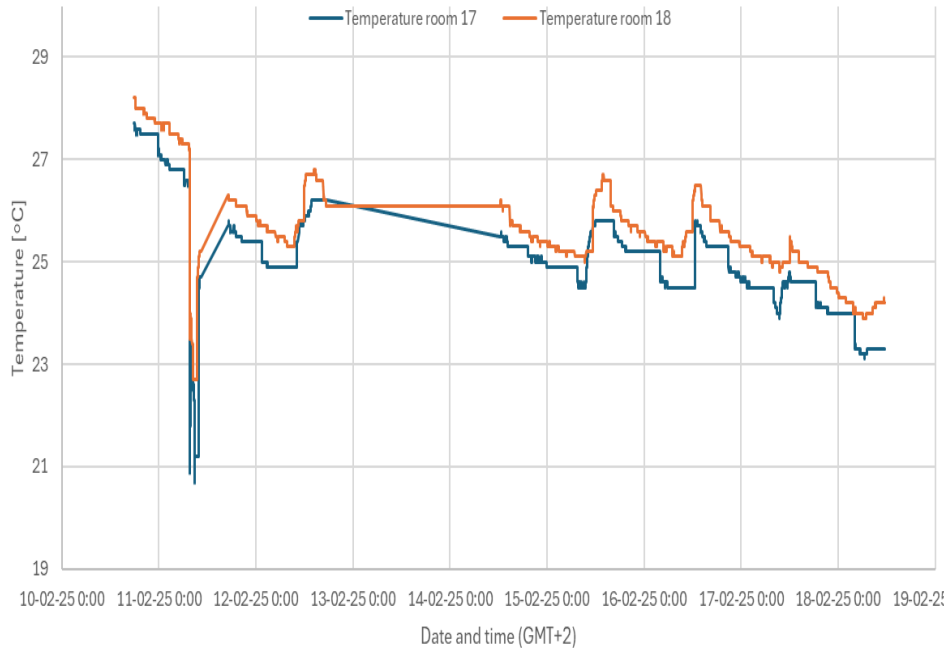
APower_Phase1 APower_Phase2 APower_Phase3

Time	APower_Phase1 [W]	APower_Phase2 [W]	APower_Phase3 [W]
07:00:00	~100	~100	~100
17:00:00	~100	~100	~100
19:00:00	~100	~100	~100
21:00:00	~100	~100	~100
23:00:00	~100	~100	~100
01:00:00	~100	~100	~100
03:00:00	~100	~100	~100
05:00:00	~100	~100	~100
07:00:00	~100	~100	~100
09:00:00	~100	~100	~100
11:00:00	~100	~100	~100

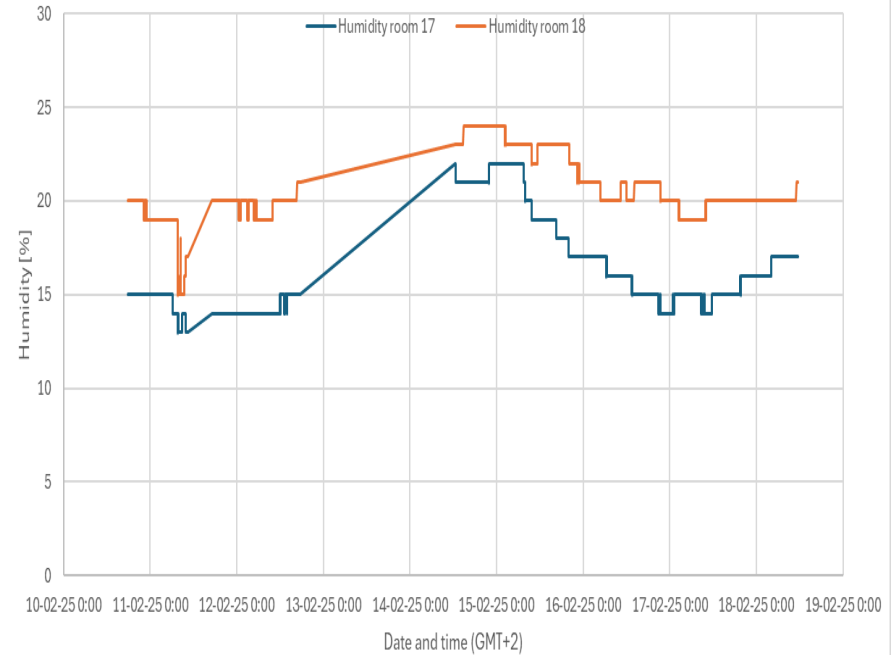


Pilot Site #2 : Romania, Student Campus, Cluj-Napoca

Temperature - room 17 and 18
10.02.2025 - 18.02.2025



Humidity - room 17 and 18
10.02.2025 - 18.02.2025



Finished Projects

EnTReC - EU Projects

Ongoing Project



Topic

*Programe de educație și formare
pentru profesioniștii din domeniul energiei*





Identificarea
grupului IMM
țintă



Evaluare energetică
preliminară



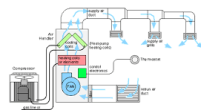
Analiza consumurilor
energetice deduse din
factura de energie



Identificarea
profilului energetic



Analiza infrastructurii
consumatorilor
principali



- ✓ Producție (Profil activitate)
- ✓ Sistem HVAC
- ✓ Sistem incalzire
- ✓ Sistem iluminat



Analiza culturii
energetice



- Chestionar personal tehnic
- Chestionar pentru angajații
fără cunoștințe tehnice



Concluzii și
acțiuni viitoare

ONLINE PLATFORMS



SMEmPower Platforma de training



SMEmPower Webinarii



SMEmPower Tutoriale



ONLINE PLATFORMS

entrec.utcluj.ro



Gear@SME
Saving energy together

Online Portal Launch



www.energyefficientsme.eu



This project has received funding from the European Union's H2020 Coordination Support Action under Grant Agreement No. 894356.



Implement

Find training materials and tools to support energy collectives



Germany



Romania



Austria



Netherlands



Italy



Sweden
(Coming Soon!)



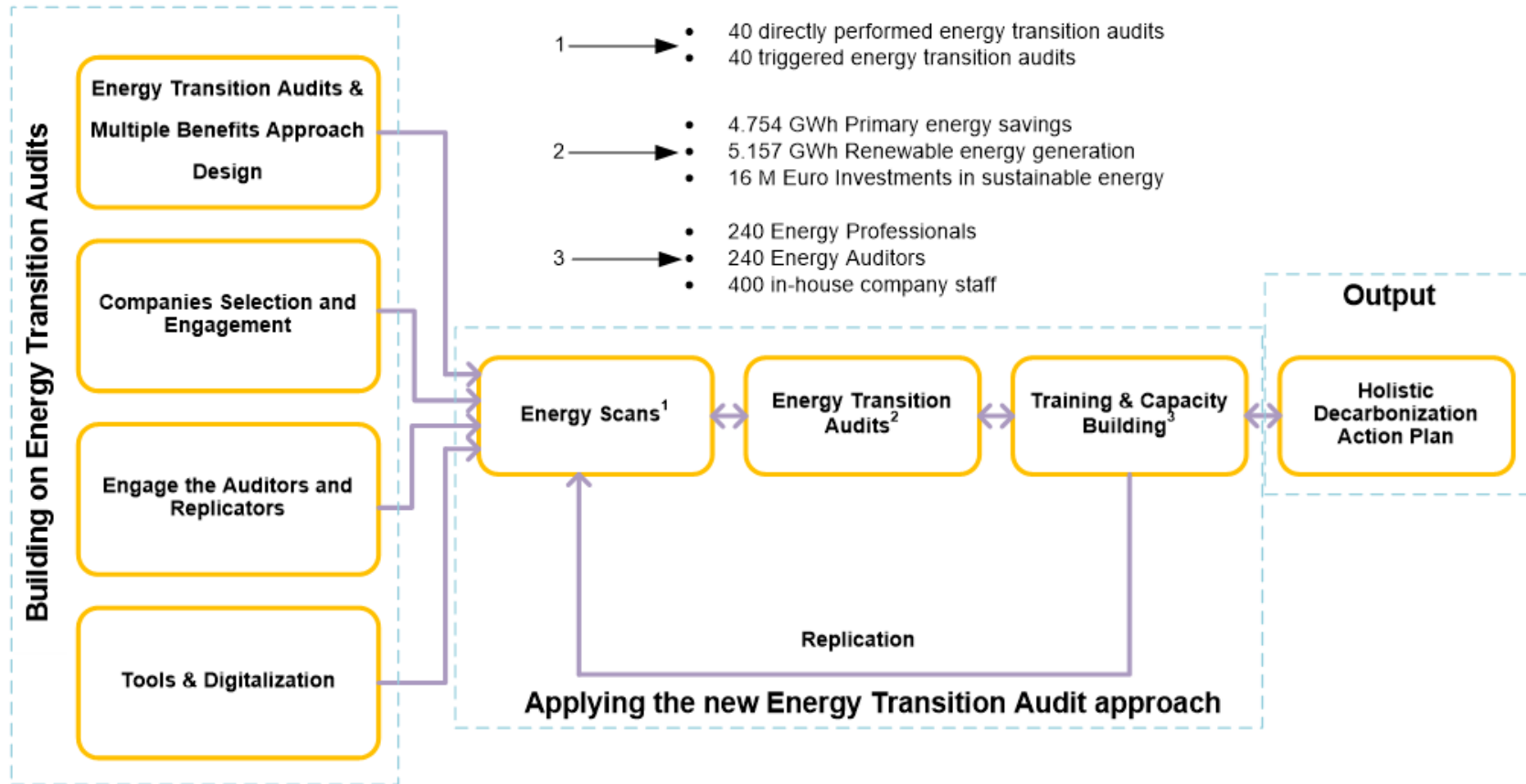
Training

Material to train Trusted Partners in the fundamental topics that relate to the GEAR@SME approach



Tools

Support tools that SMEs can use in the different stages and situation during the process of the improvement of energy efficiency



EnTReC - EU Projects

Topic

Programe de conștientizare și de formare pentru primării, comunitatea locală și profesioniștii din domeniul energiei

Ungoing Projects



Finished Projects



Iceland
Liechtenstein
Norway grants

Iceland
Liechtenstein
Norway grants

RESULTS

ENERGEIA

Empowering Energy Efficiency Awareness through a Holistic Educational Approach

- ✓ People trained within the project: >300
- ✓ People reached by the awareness activities: >3000
- ✓ People that self-report an improved knowledge related to renewable energy, energy efficiency and energy security: >1500



RESULTS

✓ People trained within the project: >200



GREENER

supporting increased knowledge on renewable energy and energy efficiency in Alba Iulia



First
TUCN Start-up

Renergia

Save energy
like no one else!



Forbes

decembrie 6, 2023, 1:28PM GMT+0200

Renergia, aplicația autohtonă care eficientizează consumul de energie, lansată la summit-ul COP28. Startup-ul a atras deja o investiție de peste 300.000 de euro



04

INOVAȚIE DE PRODUS

Renergia - prima aplicație de sustenabilitate lansată în România, care eficientizează consumul de energie și reduce costurile factorilor la energie

Renergia este prima aplicație de sustenabilitate lansată în România, care eficientizează consumul de energie și reduce costurile factorilor la energie.

Algoritmul proprietar, Renergia este...

04

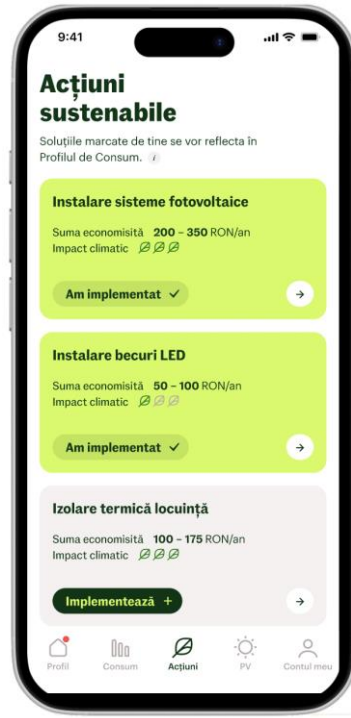
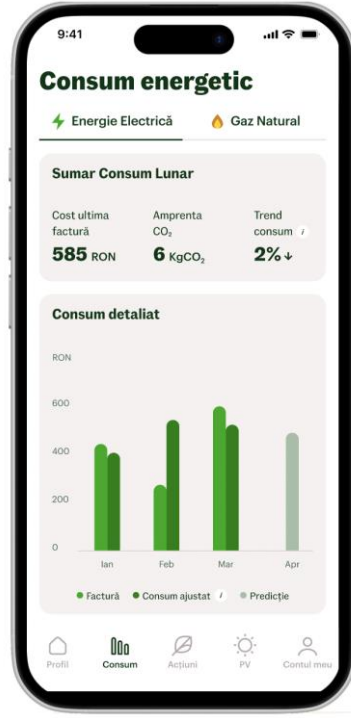
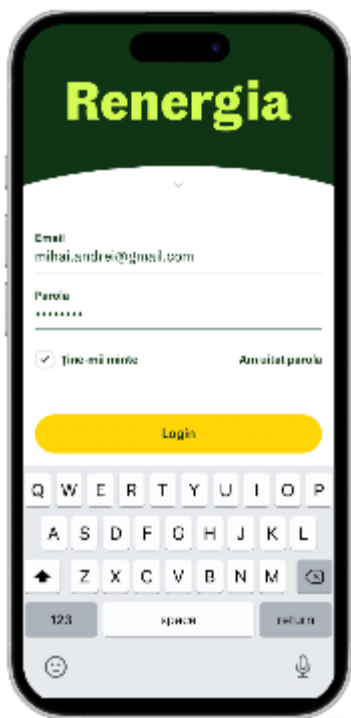
04



DESCOPERIILE INOVAȚIEI

Aplicația de sustenabilitate Renergia analizează consumul de energie în gospodărie și comercial și returnează o cantitate foarte mică de energie și oferă date despre potențialul de economisire la energie electrică și termică. Analiza realizată de Renergia are la bază un algoritm inovativ, care îmbină concepte de statistică și probabilitate cu algoritmi avansați, asistați de inteligență artificială. Algoritmul proprietar, Renergia este...

construcționare și accesorii deplasate 2.000 de kg de CO2/an, raportată la consumul de energie finală electrică și termică. Aplicația Renergia nu numai că oferă utilizatorilor informații despre economisirea de energie, ci este și un instrument de dimensionare pentru sistemele inovatoare, ajutându-i să proiecteze factorii și să proiecteze prețurile energiei. Renergia Active este o companie de energie care este în proces de lansare în România și este în proces de lansare în România.



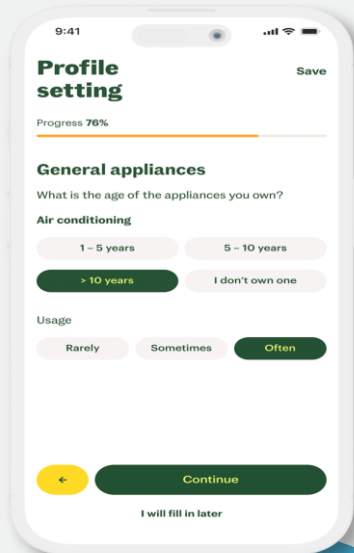
Google Play



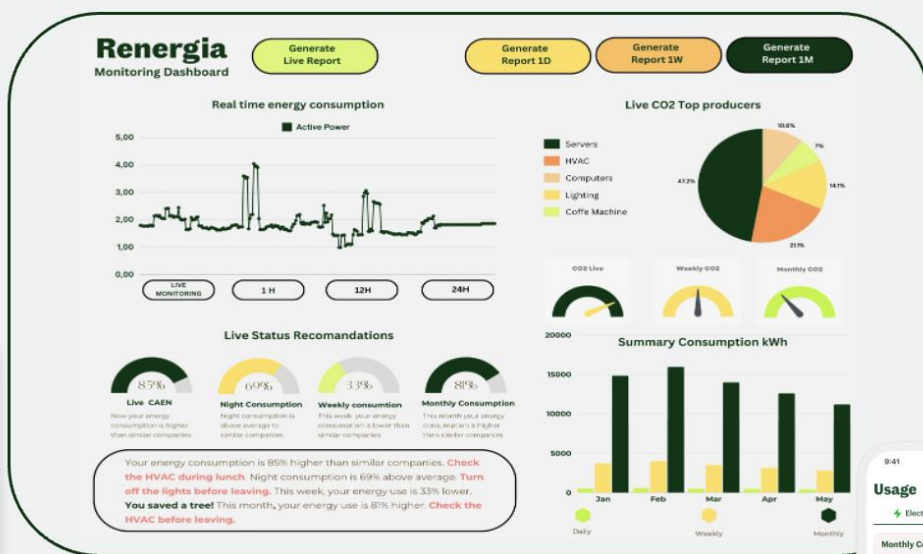
App Store



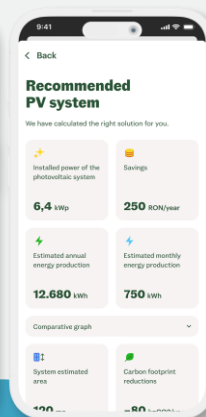
OUR PORTOFOLIO



RENERGIA MOBILE APP
API INTEGRATION



RENERGIA BOX
REAL TIME
MONITORING AUDIT



RENERGIA MOBILE APP
ONE STOP SHOP

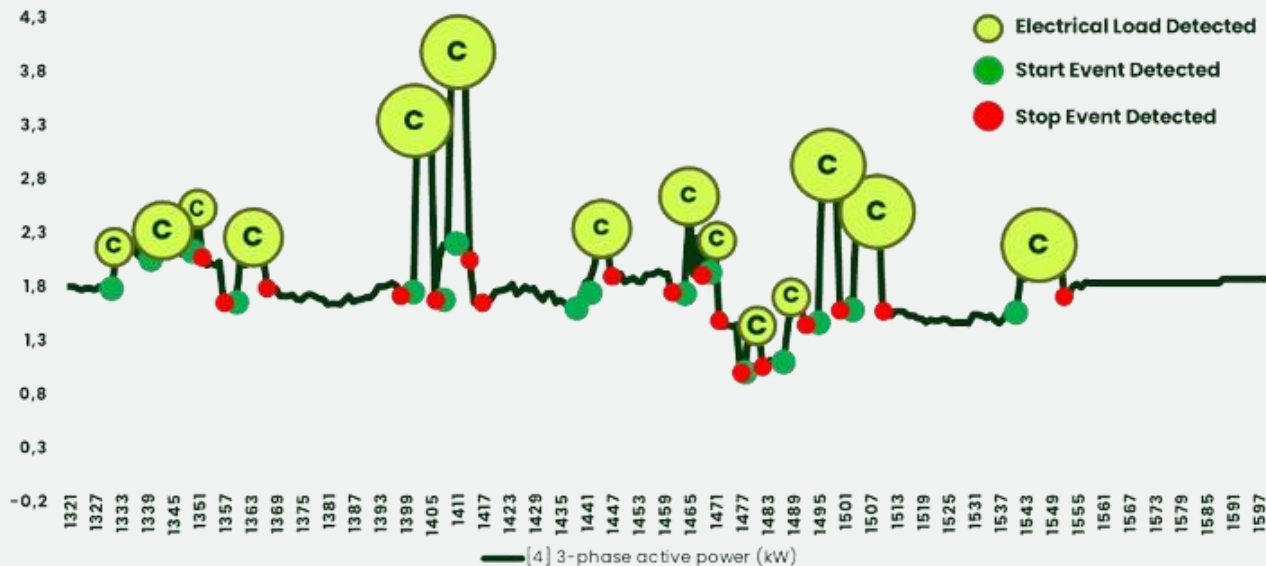
Load Disaggregation Live Energy Audits

● Improved Customer Engagement

Personalized Feedback

● Enhanced Energy Efficiency

Automated Monthly Energy Audits

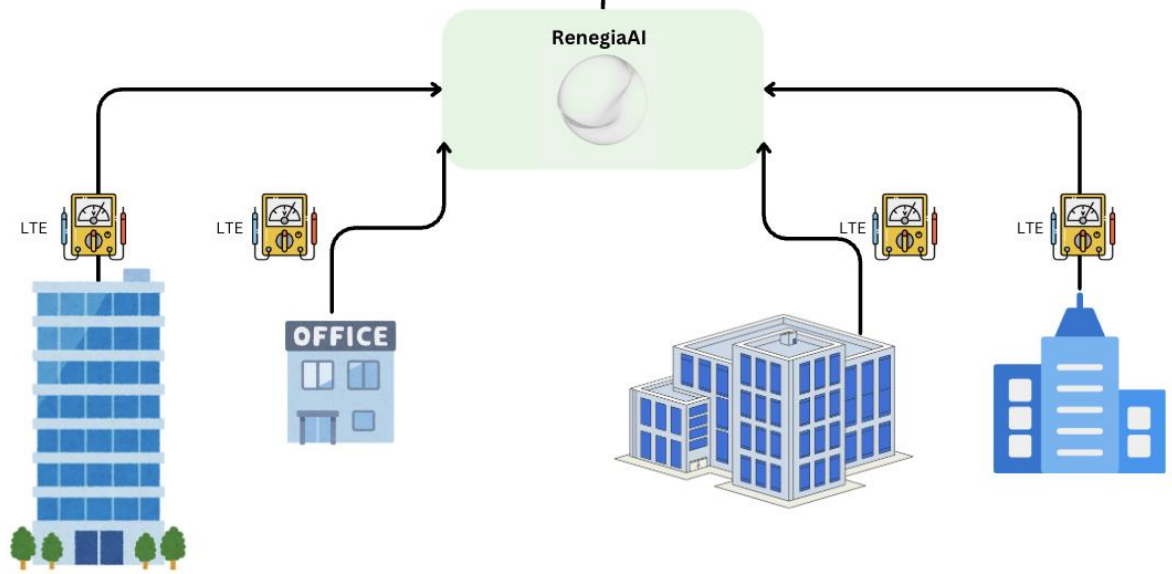
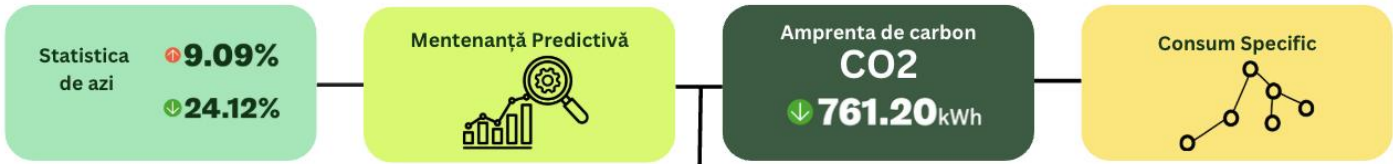


● ESG reporting
● CO2 Footprint Scope 2

What you cannot measure, you cannot improve RENERGIA MONITORING PLATFORM

Renergia

Company logo
HERE



Renergia

Save energy like no one else!

Google Play



App Store





INTERNATIONAL AWARDS

Best European Energy Service Project

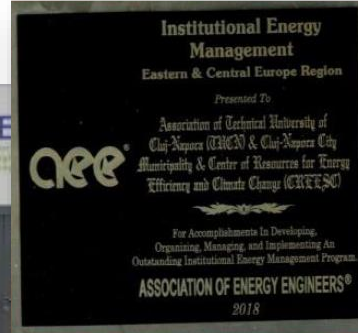
granted to Technical University of Cluj-Napoca & Cluj-Napoca City Municipality
by EU Commission in Brussels – February 2019



Romanian Energy Award



Gala Premiilor de Excelență în Energie
Romanian Energy Awards 2015



Institutional Energy Management Award

granted to Technical University of Cluj-Napoca & Cluj-Napoca City Municipality
by Association of Energy Engineers (AEE) – USA- October 2018

Best Newcomer - Central European Startup Awards



Secure, clean and efficient energy

Alliance to save energy

Carbon reduction commitment EU 2030

Engineering sustainability

Building future

Adding value to energy

Behavioral energy efficiency

Inspiring success

Living building lab

Research 2 Market

Research recognized as world leading

Sustainable building environment

Holistic approach

Adress grand societal challanges

Vă mulțumim și vă așteptăm alături de noi!

Entrec.Center@ethm.utcluj.ro
Dan.Micu@ethm.utcluj.ro



EnTReC



EnTReC




entrec.utcluj.ro



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400020, Romania

