Energy Transition Research Center
EnTReC



Dan D. Micu

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

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



MISSION

EnTReC mission is to significantly contribute through evidenced based research to the energy transition in the energy sector, industry, buildings and local communities, in a sustainable approach focused on development, testing and replication of innovative instruments, energy and digital technologies.



TEAM MEMBERS

ENTREC
Energy Transition Research Center

+ 10 YEARS OF EXPERIENCE
in

+ 30 INTERNATIONAL PROJECTS
with

+ 60 TEAM MEMBERS
from

10 RESEARCH GROUPS
within

8 FACULTIES

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

ENTREC
Energy Transition Research Center

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*


GREENER
supportinG incReasEd knowlEdge oN rEnewable eneRgy and energy efficiency in Alba Iulia
NET ZERO CITIES
SunHorizon
DOITSMARTER
MENS
REN+HOMES
Interreg Danube Region
REHEATEAST
VELIXIA
BUILDINGS AS ACTIVE UTILITY NODES
Interreg Danube Region
Danube GeoHeCo
DR-BOB
persist
positive energy districts driven by citizens
cognition
EnTRAINER
SME mPower Efficiency
Gear@SME
ENERGEIA
LGA
hOLIstic Green Airport

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



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

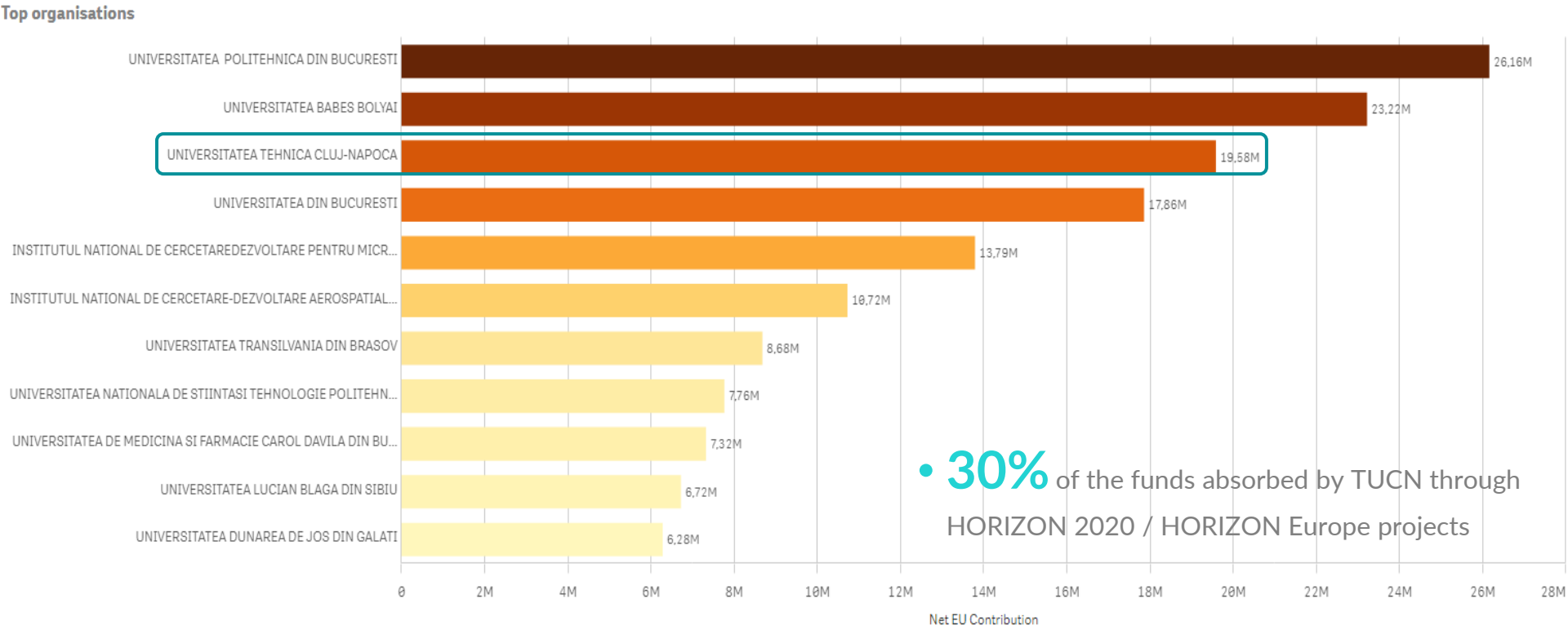
Project Title: ENERGEIA - 2023 – 2024
Empowering Energy Efficiency Awareness through a Holistic Educational Approach
Time: 12 months (2023-2024)
Project value: 199,987 EURO
Project Link: https://www.linkedin.com/company/energeia-project-2023/about/

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

TUCN IMPACT



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

EU - PARTNERS


SEA
Milan Airports
AIT
AUSTRIAN INSTITUTE OF TECHNOLOGY
TOMORROW TODAY
ifp Energies nouvelles
ARC
AIRPORT REGIONS COUNCIL
envisa
AIRFRANCE
LP
snam
BUREAU VERITAS
dgac
Direction Générale de l'aviation civile
EUROCONTROL
PROAVIA
Parco Ticino
SAFETY LINE
Big Data applied to Aviation
ENGIE
ARMINES
transdev
the mobility company
SAS
ZAGREB AIRPORT
infra plan konzalting
UPEC
ECATS
ASSAIA
Cluj Avram Iancu International Airport
COMOTI
ROMANIAN RESEARCH & DEVELOPMENT INSTITUTE FOR GAS TURBINES
Air Liquide
UNIVERSITATEA TEHNICĂ
DIN CLUJ-NAPOCA
ADDAIR
WaltR
batiRIM
Ressource Information Modeling
ITW GSE
ERICSSON
FSB
Sveučilište u Zagrebu
Fakultet strojarstva i brodogradnje
GDi
PRIMĂRIA ȘI CONSILIUL LOCAL CLUJ-NAPOCA
RINA
ICOOR
CENTROCOT

EU - PARTNERS


energiada
Innovate UK
Knowledge Transfer Network
ARISTOTLE UNIVERSITY OF THESSALONIKI
Brunel University London
University of Cyprus
Teesside University
CSTB
SIEMENS
R2M SOLUTION
nobatek
UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA
D.I.T
EC Network
rtbf.be
GRIDPOCKET
DuneWorks
POLIAMBULANZA
SERVELECT
UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA
ULB UNIVERSITÉ LIBRE DE BRUXELLES
UNIKASSEL VERSITÄT
UNIVERSITAT POLITÈCNICA DE VALÈNCIA
POLITECNICO DI TORINO
energy@work
WINDCITY
ZH spin off
CERTH
ARISTOTLE UNIVERSITY OF THESSALONIKI
OEB
Ομοσπονδία Εργοδοτών & Βιομηχάνων Κύπρου
adelphi
UNIVERSITY OF WESTERN MACEDONIA
energiada
intracom
HELLENIC PETROLEUM
University of BRISTOL
Electric Corby
Switched on thinking
UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA
Teesside University
UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA
SERVELECT
ŠTAJERSKA GOSPODARSKA ZBORNICA
UNIVERSITAT POLITÈCNICA DE VALÈNCIA
SERVELECT
EPFL
csem centre suisse d'électronique et de microtechnique
MTT
ETREL
TNO innovation for life
CCS
CNA
Certimac
SERVELECT
UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA
SYNYO

EU - PARTNERS


ITeC
EVOWALL TECHNOLOGY
WORLD SENSING
TAL TECH
matek MODULES - PLUG AND PLAY
Roofit.Solar
PRISTIS
NHT
CERTH CENTRE FOR RESEARCH & TECHNO HELLAS
RINA
cea
circe
UBITEC
HAEE WWW.HAEE.GR HELLENIC ASSOCIATION for ENERGY ECONOMICS
IES R&D IRELAND
Universit di Genov
SOLVUS CYPRUS
ENERGIE INSTITUT
R2M SOLUTION
FH Burgenlan
FORSCHUNG Burgenland
EUROPEAN GREEN CITIES
Energie GÜSSING
ÖKOENERG ENERGIE IN BEWEGUNG
SUSTAIN
UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA
Distribuție Energie Electrică Romania
Entech smart energies
SDEF territoire d'énergie
PINK
EUROPÄISCHES ZENTRUM FÜR ERNEUERBARE ENERGIE GÜSSING GMBH
TERMOFICARE NAPOCA
KOLSTRUP BOLIGFORENING
Manzaneda Estación de Montaña
BluEnergy Revolution
NEOGRID TECHNOLOGIES
XO χρυσός οδηγός
vrisko
ΔΕΔΔΗΕ HEDNO
instituto tecnológico de galicia
NTT DATA Trusted Global Innovator
TURUN AMMATTIKORKEAKOULU TURKU UNIVERSITY OF APPLIED SCIENCES
Naantalin Energia
Hes·so Haute Ecole Spécialisée de Suisse occidentale
Høgskolen i Østfold
NORSK ENERGI Energy • Environment • Safety

RESULTS OBTAINED

Finished Projects

Ongoing Projects

EnTReC - EU Projects

Topics

Positive energy building; Energy efficiency; Demand response; Renewable sources integration; Energy management, control and optimization; Forecasting algorithms; Innovative lighting; Autonomous landside mobility

PILOT SITES

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Dr. BOB
Demand Response
in Blocks of 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

REnewable COGeneration and storage techNologies IntegraTIon for energy autONomous buildings



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**

BEMS interface

entrec.utcluj.ro

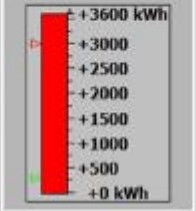
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Total consumption:

Power: 169,0kW



Energy: 109895kWh



Trends PAC Chiller

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

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

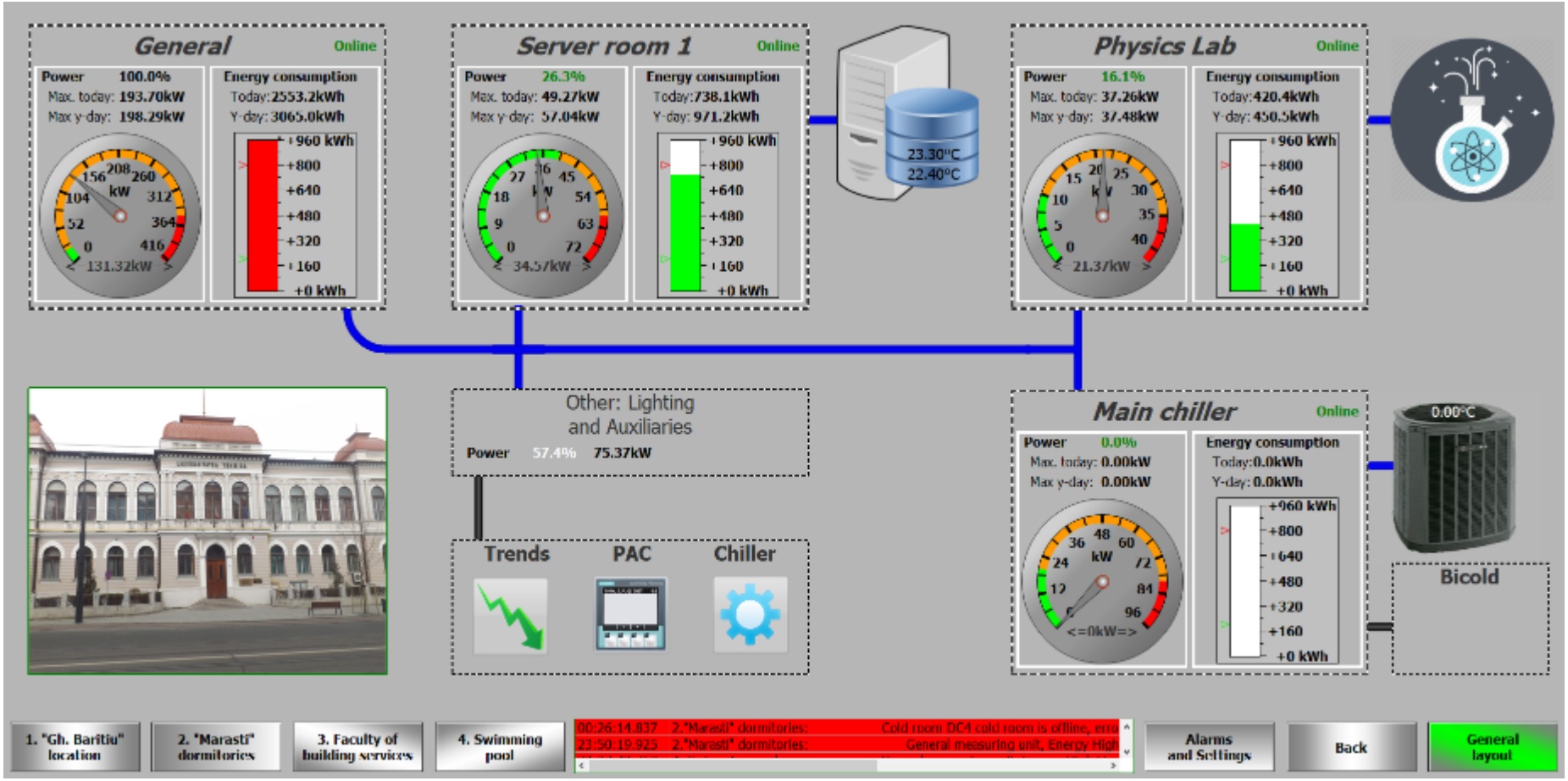
Auxilliary chiller
Power: 0,00kW
Energy: 0kWh

1. "Gh. Baritiu" location | 2. "Marasti" dormitories | 3. Faculty of building services | 4. Swimming pool

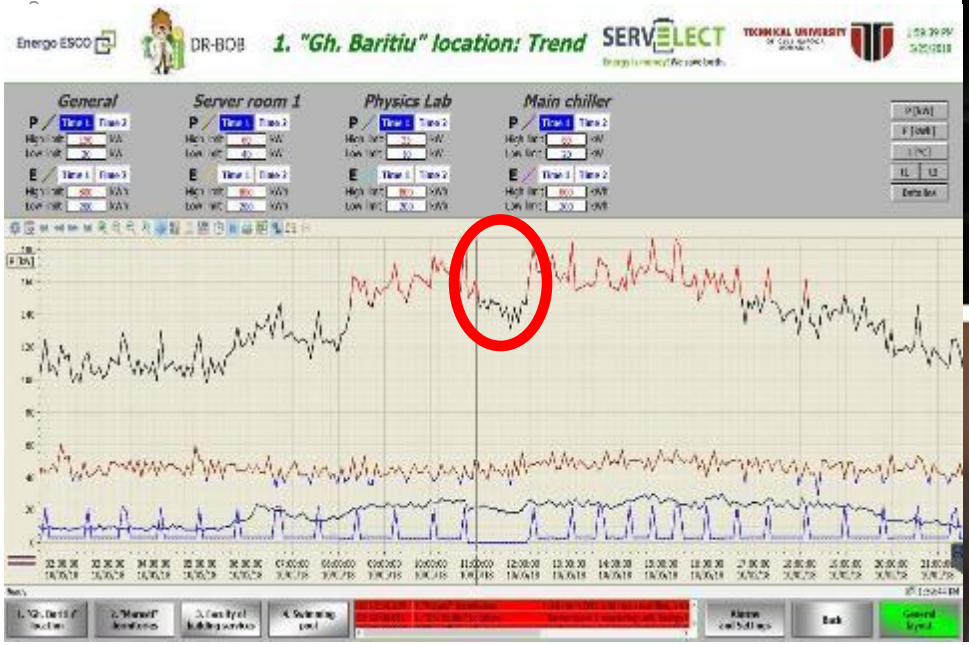
17:13:17.024 1."Gh. Baritiu" Location: Server room 2 measuring unit, Power Hi
17:08:12.017 1."Gh. Baritiu" Location: Main chiller measuring unit, Power High

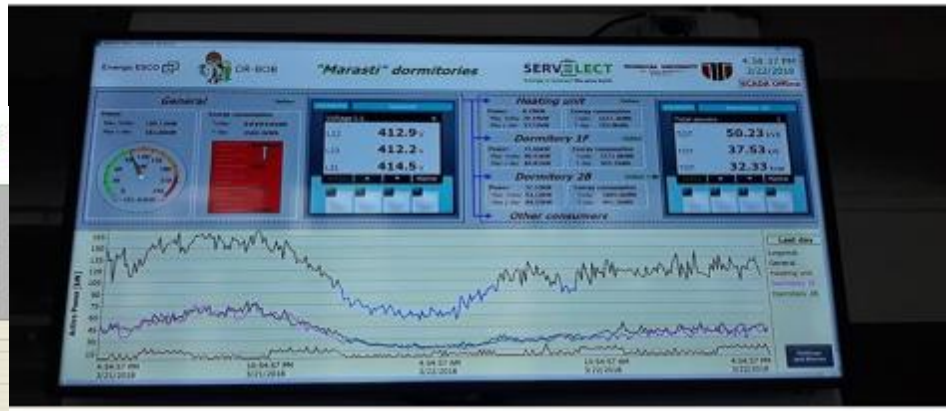
Alarms and Settings | User settings

BEMS interface



RESULTS

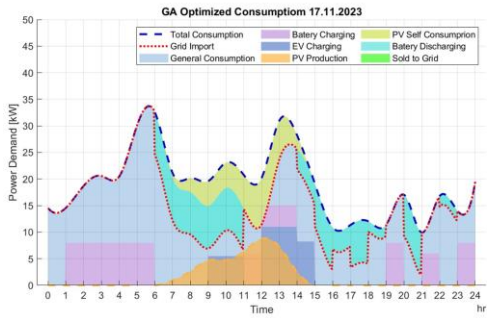

Energo ESCO
DR-BOB
1. "Gh. Baritiu" location: Trend
SERVELECT
TECHNICAL UNIVERSITY
General
Server room 1
Physics Lab
Main chiller


DR-BOB
"Marasti" dormitories
SERVELECT
General
Heating unit
Dormitory 1F
Dormitory 2F
Other consumers






Step 1: Crossover process
Step 2: Fill up next generation population
Step 3: Mutation process
Step 4: Add new random solutions
Step 5: Evaluate cost function values
Step 6: Repeat optimization process
Initial set of possible solutions
Optimized energy consumption


GA Optimized Consumption 17.11.2023
Total Consumption
Grid Import
General Consumption
Batery Charging
EV Charging
PV Production
PV Self Consumprion
Batery Discharging
Sold to Grid
Power Demand [kW]
Time
hr

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Expected RESULTS



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Energy Transition Research Center

OLGA
hOListic Green Airport

HORIZON EUROPE

- The OLGA project will help mitigate the ***environmental impact of the aviation sector***.
- It will develop ***innovative sustainable measures*** for:
  - *reducing both airside and landside emissions;*
  - *improving energy efficiency;*
  - *improving air quality;*
  - *improving biodiversity;*
  - *improving waste management.*
- These solutions support the European Union's (EU) ***carbon neutrality ambition*** and aim to ***improve quality of life***.



Proposed METHODOLOGY

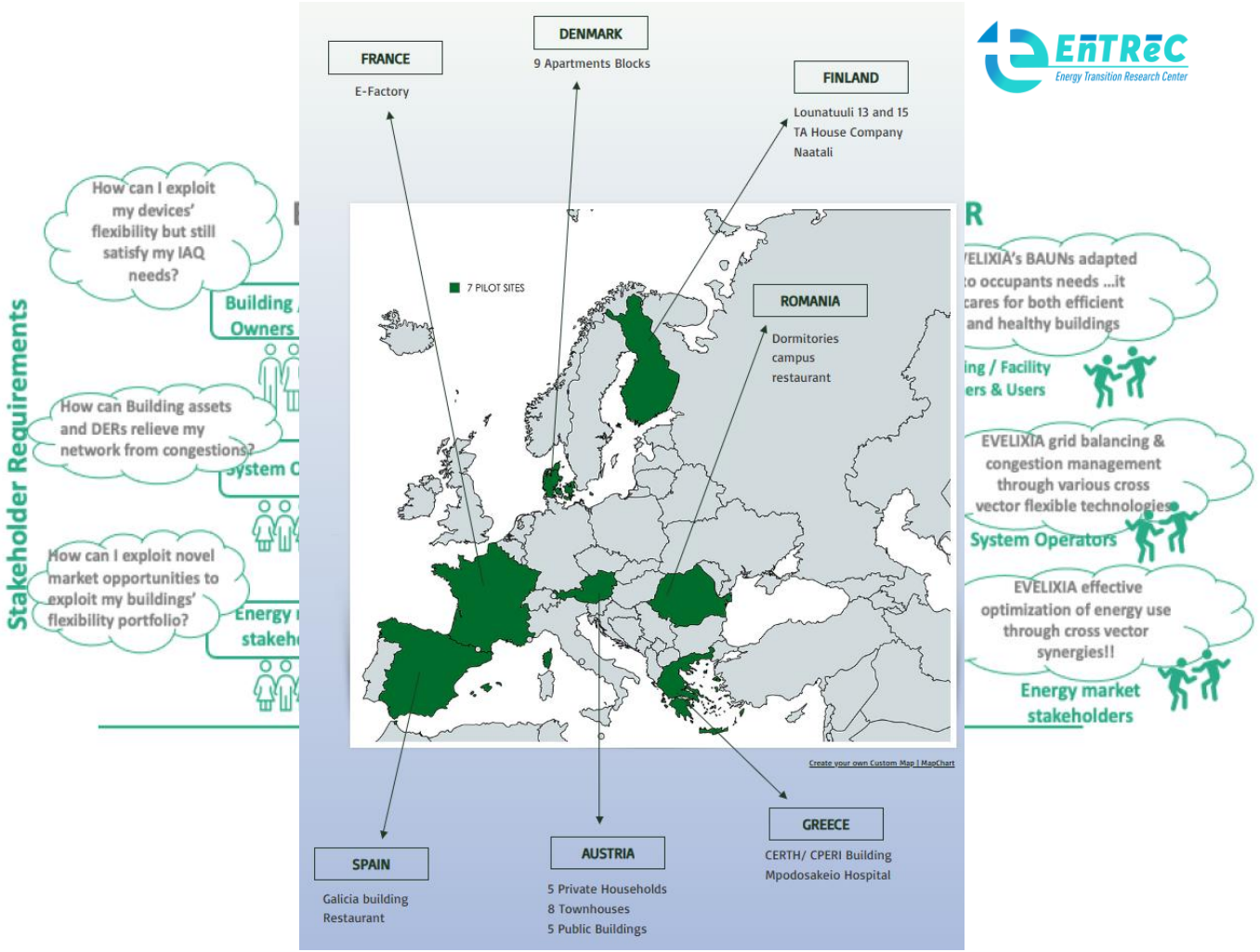
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VELIXIA
BUILDINGS AS ACTIVE UTILITY NODES

Smart Grid-Efficient Interactive Buildings

HORIZON EUROPE

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REN+HOMES

Reneawble Energy-based Positive Homes

HORIZON EUROPE

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Energy Transition Research Center



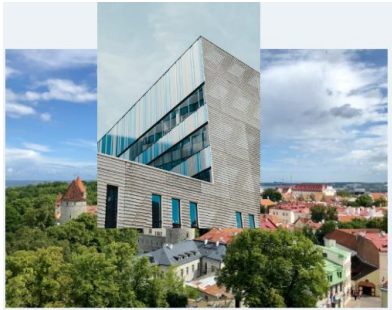
Innsbruck (Austria)

Young living apartment blocks



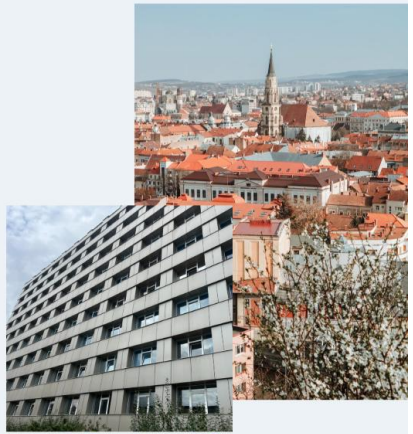
La Garriga (Spain)

Private apartment blocks



Tallin (Estonia)

Renovation of students dormitories



Cluj (Romania)

Renovation of students accommodations



EnTReC - EU Projects

Finished Projects









Topic

Education and training programs for energy professionals

Ongoing Project





RESULTS

MENS

Meeting the energy professionals' skills

HORIZON 2020

- To create and implement an ***innovative, interdisciplinary and international education and training program*** with an integrated approach, focusing on real case studies in 10 countries;
- To increase the knowledge and skills of > ***1800 building professionals in NZEB design***;
- To develop an ***online E-Learning platform and innovative ICT tools*** to enhance the learning process and to enable international cooperation and communication between participants.









RESULTS

SME mPower Efficiency

A holistic framework for Empowering SME's capacity to increase their energy efficiency

HORIZON 2020

- Development of an ***online energy management platform*** that assist users in managing energy management data and facilitate communication between participants;
- Development of a ***Monitoring & Targeting (M&T) and Measurement & Verification (M&V) tools*** within an online platform;
- ***Technical assistance*** (energy savings proposals) in at least ***160 selected SMEs pilot sites***, to effectively implement energy management techniques and instruments (M&T, M&V).



ONLINE PLATFORMS

ntrec.utcluj.ro

SME mPower Efficiency

Welcome to SMEmPower Training Platform

Please click the following link to become a member:

Become a member

Instructions regarding the use of the platform are available here (link opens in a new tab):

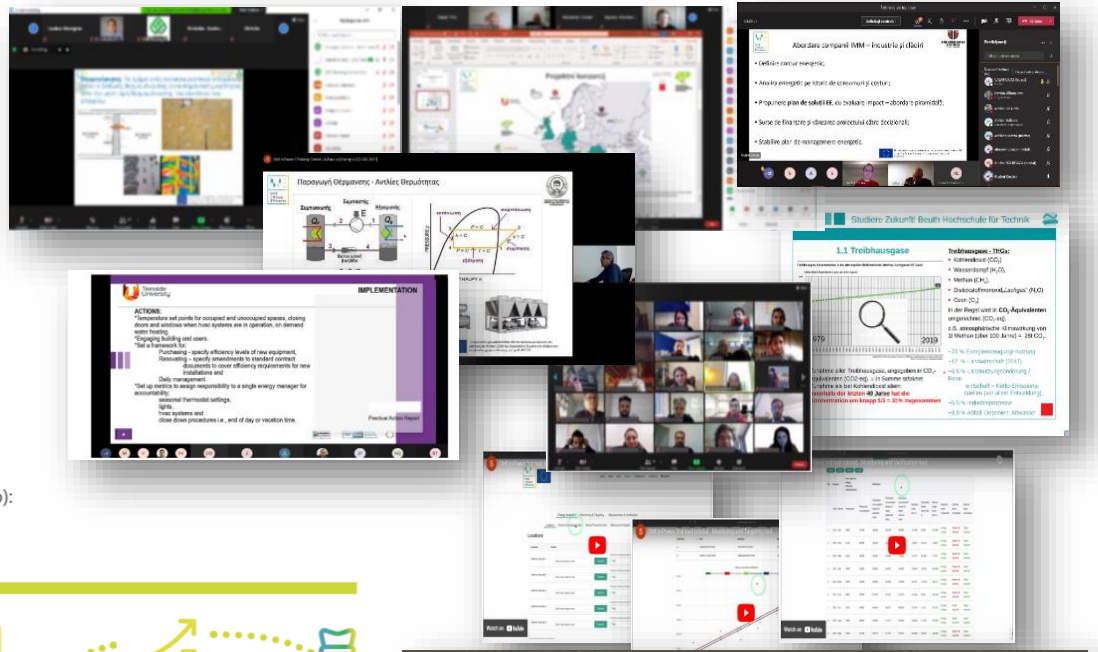
Instructions



- Integrated and accredited **Education & Training courses** for more than **700 SMEs' staff**.
- **Short trainings** for at least **800 SME persons**.
- Field work in at least **160 SMEs**.
- **Consultation** on funding options **for improving energy efficiency**.

All SMEs are welcomed to participate.
Contact us and you will also benefit from the **long lasting training tools** that SMEmPower Efficiency will deliver.

- **Training handbook** in 7 languages.
- **Web platform** for **energy analytics**.
- **Monitoring & Targeting** and **Measurement & Verification** tools.



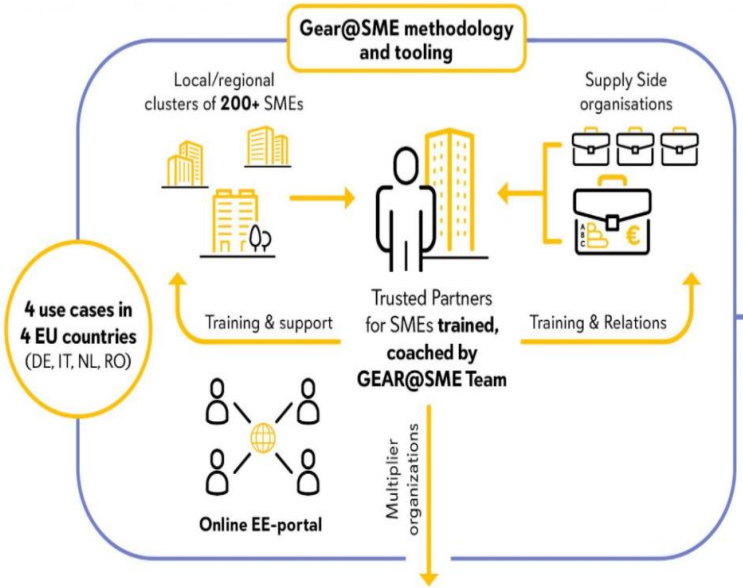


RESULTS

Gear@SME
Saving energy together

Generate Energy efficient Acting and Results at Small & medium enterprises

HORIZON 2020



Direct impact during project

200 SMEs (25% of use cases) enabled and taken measures. **40** energy service providers enabled.

Effective collective approaches embedded in **4** local/regionalclusters with qualified trusted partners.

80 more trusted partners prepared for upscaling.

Geared impact in 5 years

30.000 SMEs enabled and taken measures. 1200 energy service providers enabled.

GEAR@SME and tolling disseminated to **4** more EU countries.

600 trusted partners enabled to apply the GEAR@SME methodology.

Expected RESULTS

EnTRAINER

Energy Transition Audits towards Decarbonization

- To introduce a paradigm, shift from conventional energy audits to a new, holistic and complete methodology of ***"Energy Transition Audits" (ETA).***
- To provide a multi-benefit scheme and a complete action plan towards ***full decarbonization*** of the audited sites.
- The project will focus on ***energy intensive industries*** in 4 EU countries (GR, RO, IT, ES).





EnTReC - EU Projects

Topics

Awarness and short training programs for local municipality, local community and tomorrow's energy professionals

Ongoing Projects

NET ZERO CITIES

EU MISSION LABEL CLIMATE-NEUTRAL & SMART CITIES

Finished Projects

ENERGEiA
Empowering Energy Efficiency Awareness through a Holistic Educational Approach

Iceland Liechtenstein Norway grants

GREENER
supportinG incReasEd knowlEdge oN rEnewable eneRgy and energy efficiency in Alba Iulia

Iceland Liechtenstein Norway grants

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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

ENTREC
Energy Transition Research Center











RESULTS

✓ **People trained** within the project: >200

GREENER
supportinG incReasEd knowlEdge oN rEnewable eneRgy and energy efficiency in Alba Iulia

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First
TUCN Start-up

Renergia

Save energy like no one else!

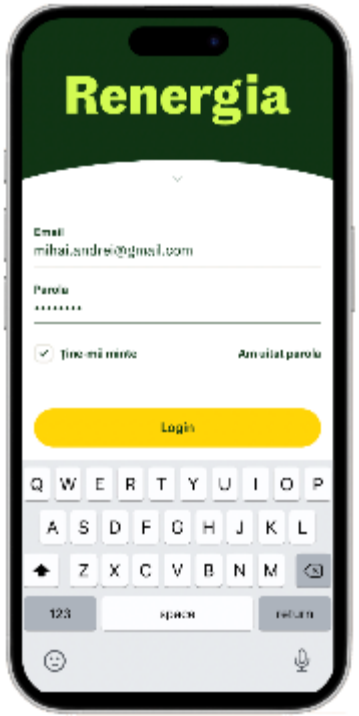


Forbes România

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

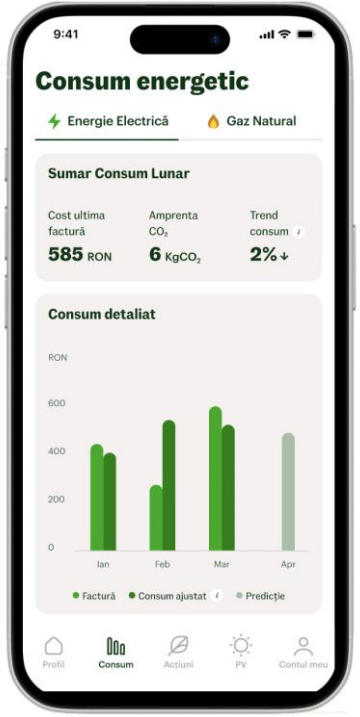






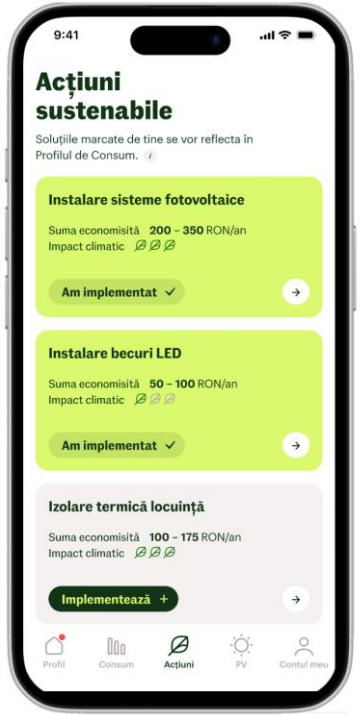
Google Play



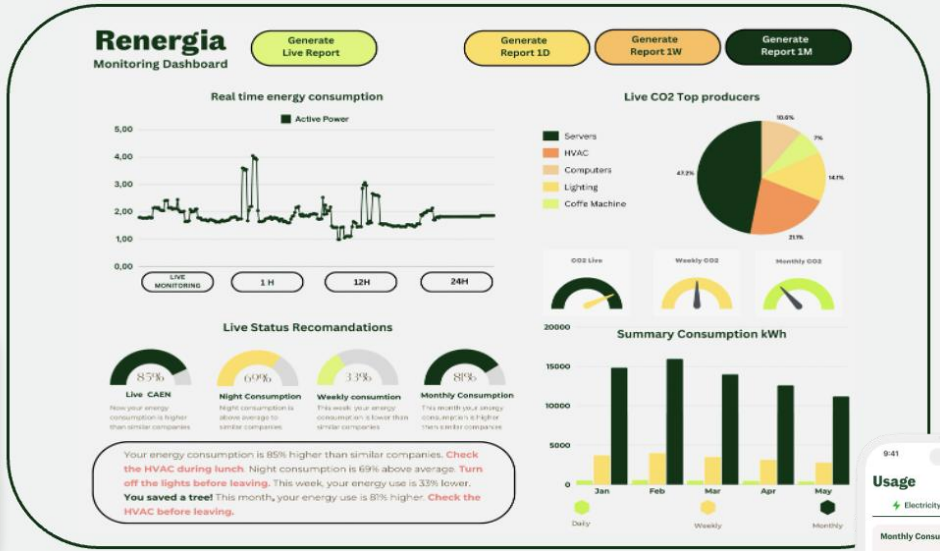


App Store

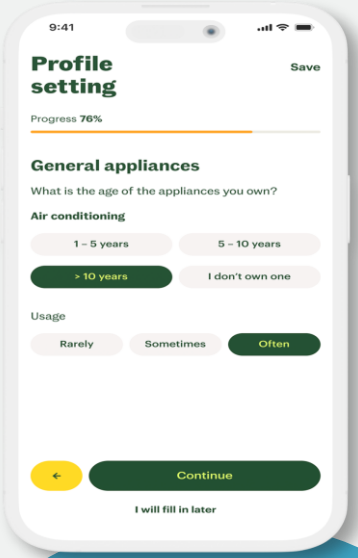




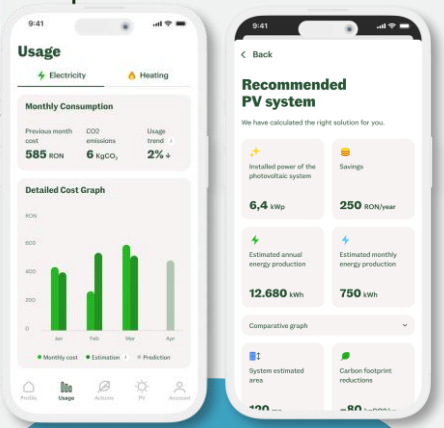
OUR PORTOFOLIO



RENEREGIA BOX
REAL TIME
MONITORING AUDIT



RENERGIA MOBILE APP
API INTEGRATION

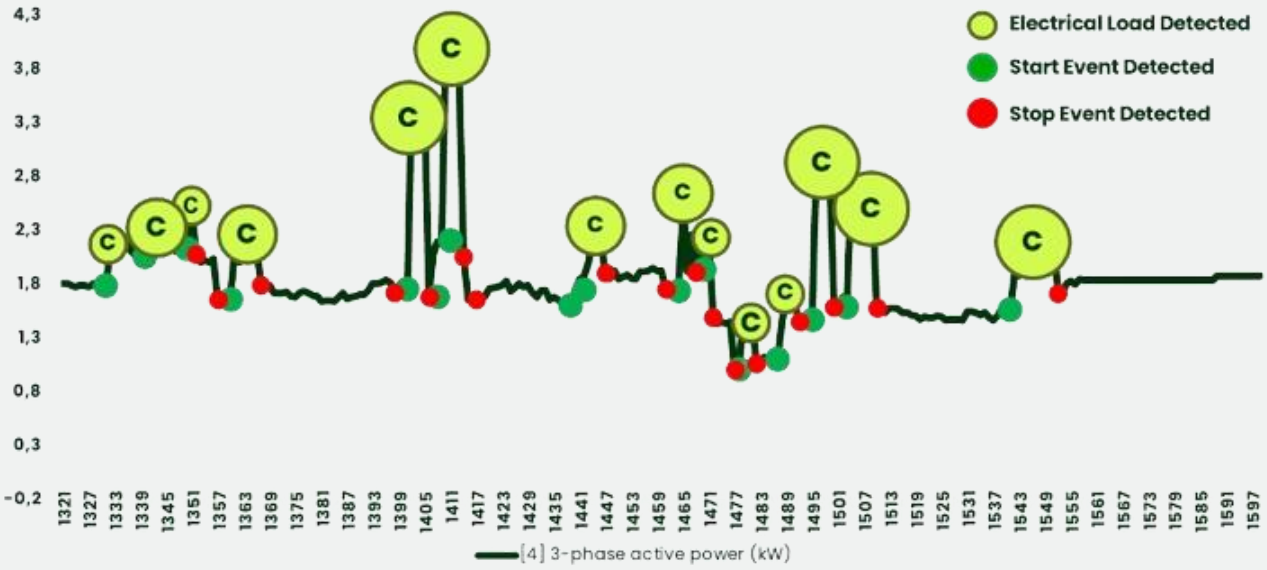


RENERGIA MOBILE APP
ONE STOP SHOP

Load Disaggregation Live Energy Audits

Improved Customer Engagement

Personalized Feedback



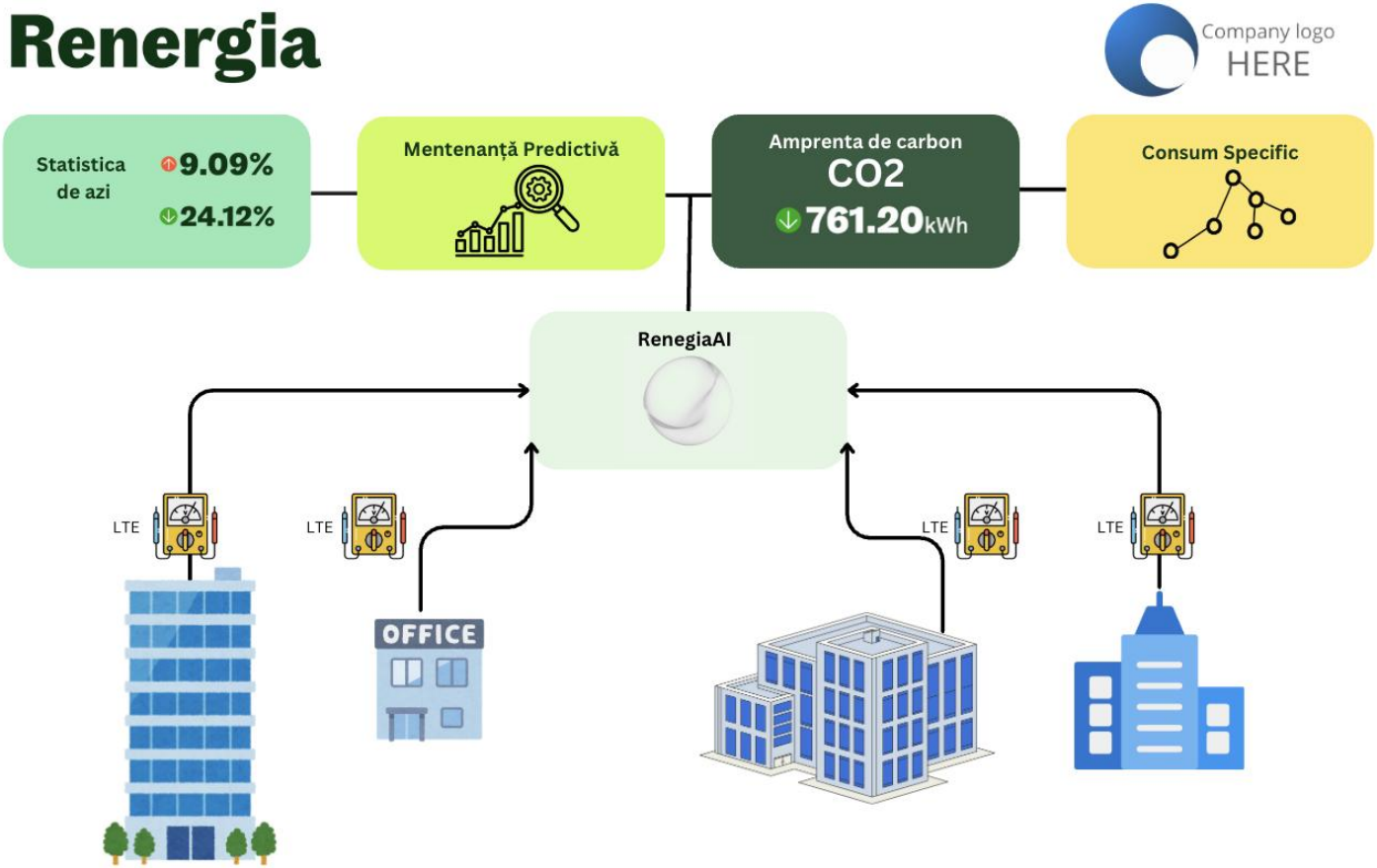
Enhanced Energy Efficiency

Automated Monthly Energy Audits

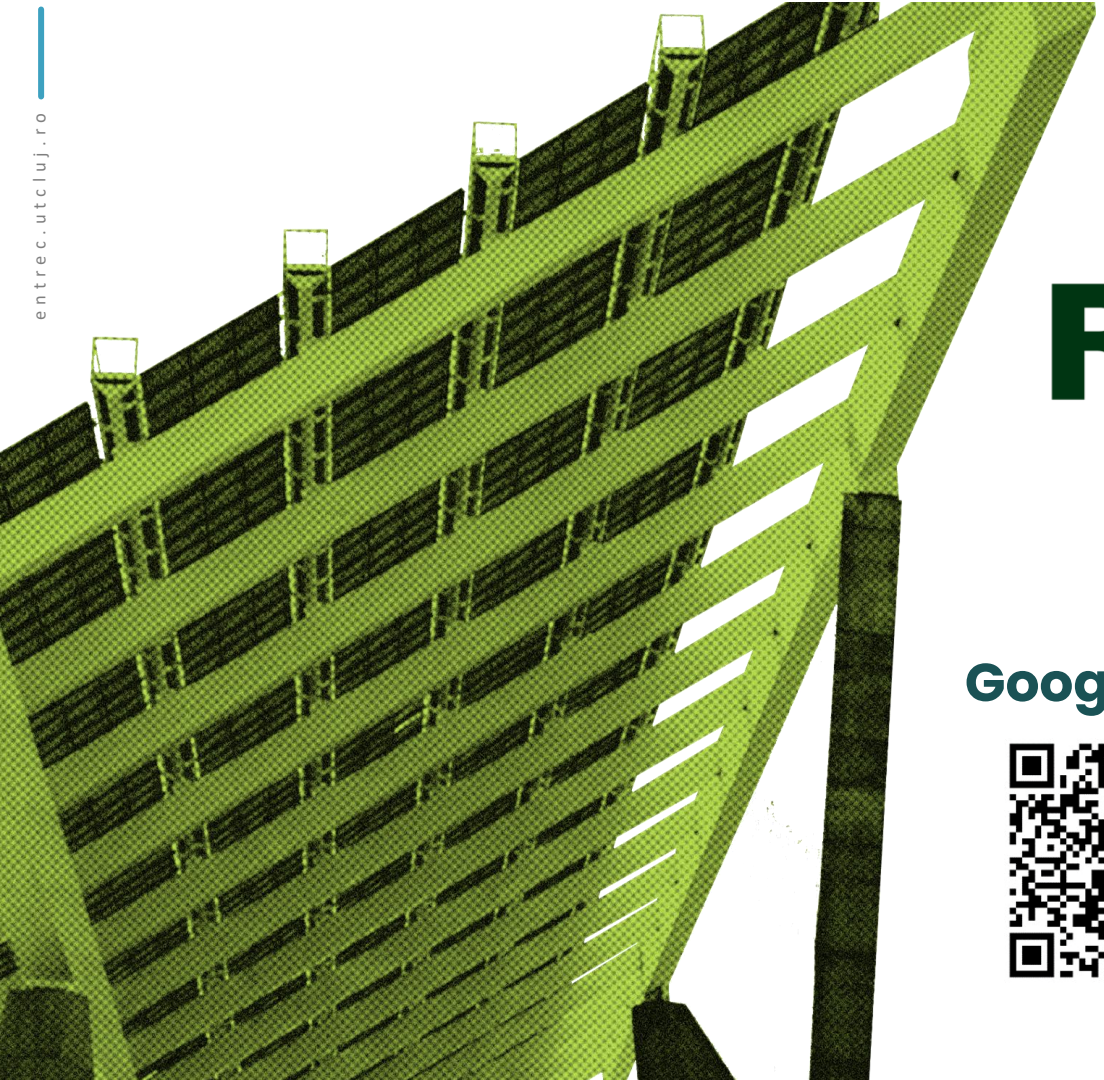
ESG reporting

CO2 Footprint Scope 2

What you cannot measure, you cannot improve
RENERGIA MONITORING PLATFORM



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AWARDS

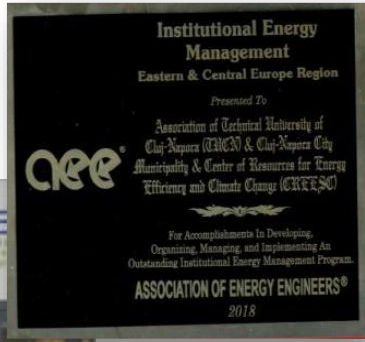
Best European Energy Service Project - 2019

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









Romanian Energy Award - 2015





Institutional Energy Management Award - 2018

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


SALONUL INTERNAȚIONAL AL CERCETĂRII ȘTIINȚIFICE, INOVĂRII ȘI INVENTICII

PRO INVENT

EDIȚIA XXI, 25-27 OCTOMBRIE 2023
CLUJ-NAPOCA

UNIVERSITATEA TEHNICĂ

DIPLOMA DE EXCELENȚĂ
ȘI MEDALIA PRO INVENT

Se acordă drd. Timea Farkas, drd. Alexandru Berciu, drd. Claudia Mureșan, drd. Ahmed Ahmed, drd. Mircea Lăncrănjan - Centrul de Cercetare pentru Tranziție Energetică (EnTReC)

Pentru DESIGN AND DEVELOPMENT OF AN ENERGY EFFICIENCY MANAGEMENT AND CONTROL SYSTEM WITH COST-EFFECTIVE SOLUTIONS FOR RESIDENTIAL AND EDUCATIONAL BUILDINGS - DOITSMARTER



Excellence prize and Pro Invent Medal – Young team EnTReC - 2023

Young Energy Trailblazer - Timea Farkas, European Sustainable Energy Week - 2022



Best Newcomer – 2024
Central European Startup Awards





Industry-University Collaboration Initiative Of The Year - 2025
ELECTRICA+RENERGIA+UTCN



Secure, clean and efficient energy

Alliance to save energy

Carbon reduction commitment EU 2030

Engineering sustainability

Building future

Behavioral energy efficiency

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Holistic approach

Sustainable building environment

Adress grand societal challanges

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