Research projects and activities (2022-2024)

Nicolae Lucian Mihet (Lucian Mihet-Popa on publications),

Professor in Energy Technology

Research group: Intelligent control of energy conversion and storage systems

The outline of my presentation

- Our **Research group activities (2022-2024): Intelligent control of energy conversion and storage systems**
- **Research projects granted in our group, last 2 years (9 projects)**
- **My ongoing research projects (8 EEA and Norway Grants)**
- **Project's Objectives, Tasks, Budget, Activities & Achievements**
- **Our research and teaching labs – S403 & S123**
- **Master courses connected with our research**

- **Questions + Round Table Discussion**

Our research group activities (2022-2023)

- We have published, only in 2022, 36 articles, and more than 20 in 2023.
- I have been editing a book: "*Smart Grids Technology and Applications*" where together with 2 former master students we have published one chapter "Hierarchical Control of an Islanded AC Micro Grid using FS-MPC and an EMS". This book will be published until the end of 2023 and is indexed in ISI Web of Knowledge.
- **2 new books** edited 2 years ago and published last year: Power Converters, Electric Drives and Energy Storage Systems for Electrified Transportation and Smart Grid + DC & Hybrid Micro-Grids
  - I am SI Guest Editor for Energies Journal (IF 3.25): "Recent Research on Design of Power Electronic Converters and Its Controllers"
  - I was SI Guest Editor for Sustainability Journal (IF 3.9):
- Prof. Nand submitted **2 project proposals, one was granted**
- We submitted in total 8 project proposals (5 EEA & Norway Grants + 3 Horizon Europe):

--All EEA projects have been granted (**DOITSMARTER, which** officially started on 1st of May2022 (***Kick-off meeting***) + 4 more project which officially starter in January, February and March 2022;

--With these five projects out of six were accepted for financing this year (2023), there are 8 ongoing projects in total, running until April 2024;

--One Horizon proposal was accepted and 2 rejected but obtained very high score (11.5)

EEA and Norway Grants financed by Innovation Norway (last 2 years)

1."Sun Power & Cooperation Fusion for Cheaper Electrical Devices Manufacturing - SPEED", Energy Programme in Romania-Focus area: Renewable energy: https://amiras.ro/projects/eea-norway-grants/

- Project Promoter : SC AMIRAS C&L Impex SRL,
- Project Partner 1: Østfold University College and Project partner 2: NxTech AS, country: Norway
- Total eligible budget: ***330,000 Euro***

2. Low emissions with high and sustainable efficiency in Sfântu Gheorghe Municipality key public buildings", Energy Programme-Focused area: Renewable energy, ***Energy efficiency call:*** ***https://www.hiof.no/iio/ing/english/research/news-events/news/2021/hio-research-team-will-contribute-to--increase-ind.html***

- Project Promoter: Sfântu Gheorghe Municipality Hall
- The Norwegian partner is Østfold University College (Høgskolen i Østfold)
- Total eligible budget: ***2,246,080 Euro, Total grant amount: 1,800,000 Euro***

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

--2 partners from Norway: HIOF and NxTech; 4 partners from Romania

--Total project budget: **Euro 565.000**

4. Increased knowledge on renewable energy and energy efficiency through training and best practice exchanges between professionals from Arad County and Norwegian partners; Project total budget: **Euro 235.000**

--5 partners (HIOF + 4 Romanian partners)

5. "EMPOWERING ENERGY EFFICIENCY AWARENESS THROUGH A HOLISTIC EDUCATIONAL APPROACH"- ENERGEIA, Project total budget: **Euro 200.000**

--4 partners (HIOF + 3 Romanian partners)

EEA and Norway Grants financed by Innovation Norway (last 2 years)

6. “Increasing Energy Efficiency in Municipal Buildings by using PV System Solutions”

Project Promoter: Cluj-Napoca Municipality Hall

- Project Partner 1: Østfold University College (Norway)
- Project partner 2: Technical University of Cluj-Napoca (Romania)
- *Total eligible budget:* ***761 771 Euro***

7. EEA & Norway Grants: ***Mobility for students and staff*** on circular economy

-Partners: University of Bacau (Romania) & HIOF (Norway)

8. “**Mobility** for Sustainability” - 22-MOB-0032, under the EEA Grants financing mechanism

-Partners: TUCN (Romania) & HIOF (Norway)

EEA and Norway Grants financed by Innovation Norway-Bilateral Call on Green Energy Transition (2024-2025)

9. Bilateral cooperation promoting cost-effective solutions based renewable energy in green transition: 2024/392571;

-Total budget: Euro 125.150

-Partner: University Politehnica Timisoara/UPT-Faculty of Automation and Informatics Technology

10. Bilateral cooperation for a long-term collaboration: 2024/392572;

-Total budget: Euro 142.650

-Partner: UBc

Short review of the ongoing projects, partners and budget

- **10 EEA projects with 22 partners** in total: 8 universities, 3 SME, 2 research centers, 7 municipalities, 2 regional associations
- 4 research and innovation projects, 3 projects-based investments, 2 projects-based mobility

- >4.5 million Euro in EEA and Norway Grants
- 2.6 million Euro in Horizon Project & 14 partners

- **Horizont Europe-SNUG** project, 17 partners, 3 demonstrators (1 in Fredrikstad-NO in a new apartment); Total SNUG budget: € 8 267 575
- **BIM-LCA Erasmus+ project;** Collaboration between HIOF (Project leader), UPCT (Spain), UTCN (Romania), EVOZON (Romania), and CTCON (Spain). HIOF project coordinator, HiOF Budget: 89.535€

Project: PERSIST
Call: Driving Urban Transition (DUT)

https://dutpartnership.eu/funding-opportunities/dut_call_2(

Areas:
ovation-oriented approach (IOA)
D Transition Pathway - Energy communities, Energy fle
ergy efficiency in existing urban structures

get:
Project Costs in EUR: 2.618.763,58
ested funds in EUR: 1.764.335,85

tion:
on of the Project in months: 36
ted start: November/December 2023

PERSIST Consortium



HSLU Hochschule Luzern
Lucerne of Applie and Arts
Riga Tech
HIOF Østfold U College
UTCN Technica of Cluj-N
UPV/EH Unoversi of the Ba
Universit
SmartCit
ST Sadales

Projects closed in 2023

EEA and Norway Grants:

- **Project 1** granted (April 2020-***July 2023***), EEA and Norway Grants Financial Mechanisms 2014-2021, Energy Programme in Romania, Focused area: Renewable Energy: Call 3 RES, Other renewable resources: Project number:2019/104287, Applicant name: SC AMIRAS C&L IMPEX SRL, Project name: ***Sun Power cooperation fusion for cheaper Electrical Devices manufacturing – SPEED***,Partners: NO1: HIOF; NO2: NxTech

- **Project 2**-(January 2022 - ***April 2024***), Project Name: ***Low emissions with high and sustainable efficiency in Sfantu Gheorghe key public buildings***

Ongoing projects (would be closed this year)

- **Third EEA Research Project** granted (May 2022-***April/July 2024***), Energy Programme in Romania, Call for project proposal: Increased capacity to deliver renewable energy. Focus area: Renewable Energy; Project title: ***Design and development of an Energy Efficiency Management and Control System with cost-effective solutions for residential and educational buildings-DOITSMARTER***

- **Fourth EEA Project** granted (February 2023- ***April/June 20***24): Mobility project in higher education on Circular Economy;

- **Fifth EEA Project granted** (February 2023-***April 2024/(Reporting: July 2024***): "Increased knowledge on renewable energy and energy efficiency through training and best practice exchanges between professionals from Arad County and Norwegian partners"; Ref. 2022/346705

- Sixth EEA Project : "Empowering Energy Efficiency Awareness through a Holistic Educational Approach-ENERGEIA", Ref. 2022/346660. (April 2023-March 2024 (Reporting deadline-***June 2024***)

Project's Objectives, Tasks, Budget, Resources needed and Deadlines

Project 1 (January 2020 - ***September 2023***)

- Total project budget: Euro 318.400

- HIOF budget: **EUR 23 300** (including co-finance ***EUR 11.650*** (approx. **300.000 NOK**) Prof. at the hourly rate of EUR 89

- The Project partners in this project are **Høgskolen i Østfold** and **NXTECH AS** and the maximum amounts of eligible costs for them respectively is **EUR 23 300, from which** Co-finance ***EUR 11.650*** at the hourly rate of EUR 89 and EUR 25 700 + Co-finance EUR 12.850 at the hourly rate of EUR 82. *The reimbursement of the partners shall be based on invoices addressed to the project promoter*.

Project 1: *Sun Power cooperation fusion for cheaper Electrical Devices manufacturing – SPEED*

- Partners: NO1: HIOF; NO2: NxTech
- Official webpage: https://amiras.ro/projects/eea-norway-grants/

Project Objectives

The project have contributed to the following focused area and outcome(s):

- **Focus area**: Renewable Energy; Outcome 1 - Increased Renewable Energy production
  - The project will contribute to the outcome by putting into operation a number of 7 new PV installations with a total estimated installed power of: 129.44kWp and the potential to reduce 47.04Tones of CO2 emissions: https://amiras.ro/new-pv-installation-operational/

➢ **Outcome indicators**:

a) Estimated annual CO2 emissions reductions (in tones CO2 eq./year): 47,04 tons of CO2eq/;

b) Electric energy produced from other renewable sources- solar (in MWh/year): 153,713 MWh/year.

➢ **Output indicators**:

a) Number of new or refurbished installations for production of energy/electricity from other RES: 7 new PV installations.

b) Installed capacity for production of energy/electricity from other RES: 129.44 kW.

Project 1: Partnership Agreement

HIOF-PP1 Tasks

-- Consultancy for energy efficiency solutions

-- Products eco-design, Industry 4.0 based cloud computing

-- **Strengthening bilateral cooperation** between RO and NO sides, strategic partnership.

The Project Partner 1 has supplied the following inputs at the project level:

1)Deliverables: Models for optimizing/increasing PV usage

2)Project promotion – dissemination activities

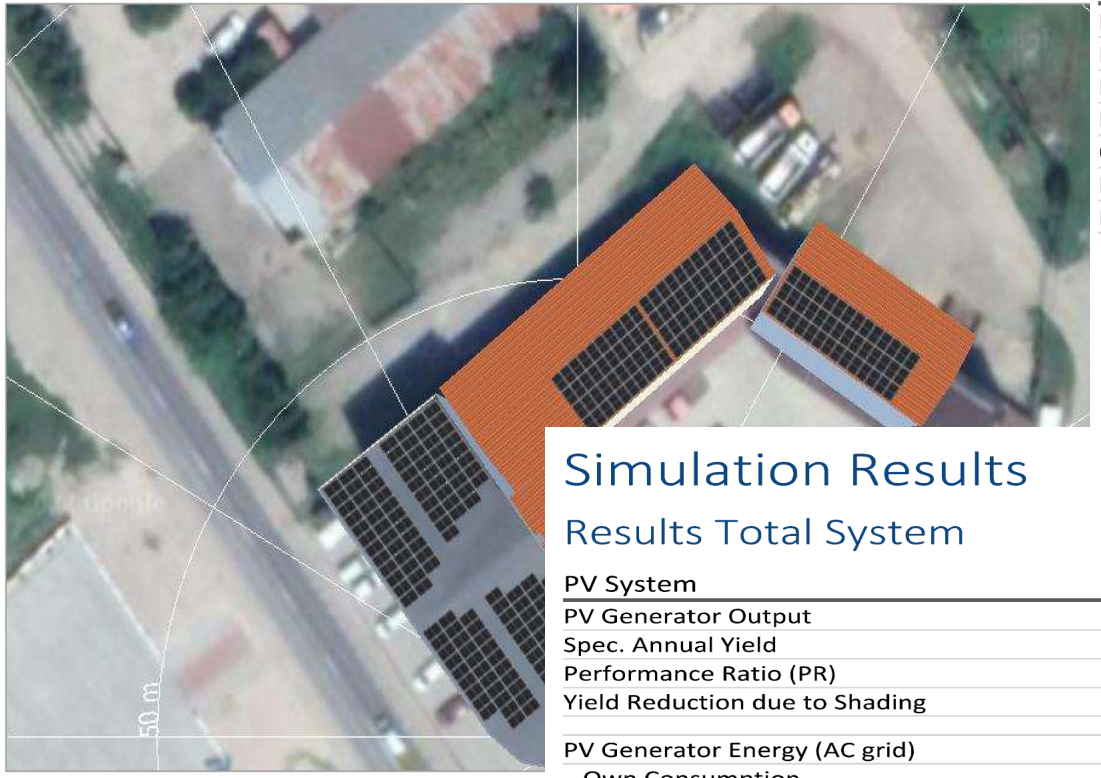
NxTech – PP2

- - Consultancy for how to integrate three different electrical systems under one EMS (ModBus communication open protocol availability / designed solution based on Victron and Fronius proven functionalities),
- - Consultancy for generation forecasting and consumption prediction,
- - Technical know-how transfer with AMIRAS,
- - Strengthening bilateral cooperation between RO and NO sides on explicit technical issues.

The Project Partner 2 will supply the following inputs at the project level:

- Deliverables: EMS integrating PV plant with storage and loads for higher PV energy absorption - Project design.

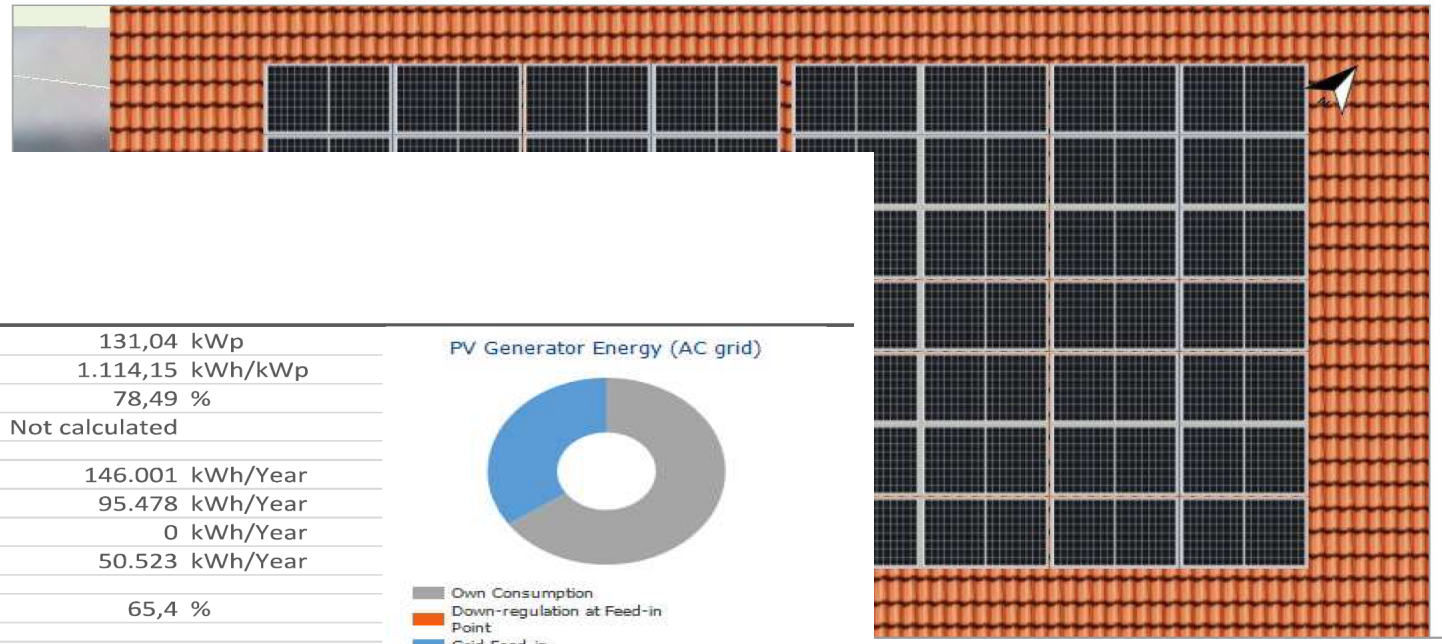
Project Overview



4. Module Area - C6-Roof Area Southeast

PV Generator, 4. Module Area - C6-Roof Area Southeast

Name	C6-Roof Area Southeast
PV Modules	56 x TSM-420-DE09R.08 - 2022 (v1)
Manufacturer	Trina Solar
Inclination	12 °
Orientation	Southeast 141 °
Installation Type	Roof parallel
PV Generator Surface	111,9 m²



Simulation Results

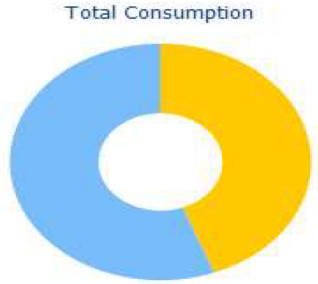
Results Total System

PV System

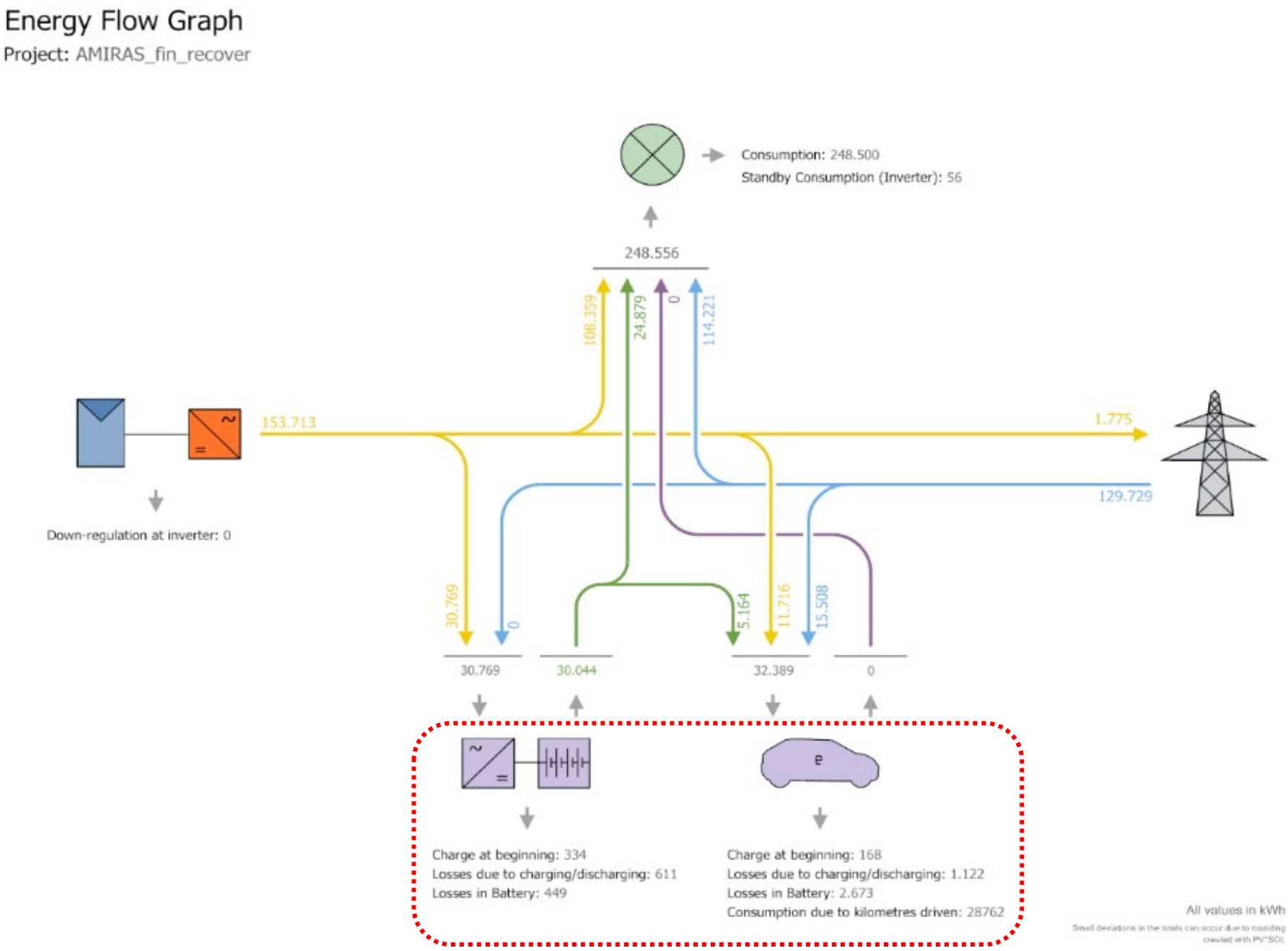
PV Generator Output	131,04	kWp
Spec. Annual Yield	1.114,15	kWh/kWp
Performance Ratio (PR)	78,49	%
Yield Reduction due to Shading	Not calculated	
PV Generator Energy (AC grid)	146.001	kWh/Year
Own Consumption	95.478	kWh/Year
Down-regulation at Feed-in Point	0	kWh/Year
Grid Feed-in	50.523	kWh/Year
Own Power Consumption	65,4	%
CO_2 Emissions avoided	68.619	kg / year

Appliances

Appliances	215.999	kWh/Year
Standby Consumption (Inverter)	3	kWh/Year
Total Consumption	216.002	kWh/Year
covered by PV power	95.478	kWh/Year
covered by grid	120.524	kWh/Year
Solar Fraction	44,2	%



Amiras PV system model configuration

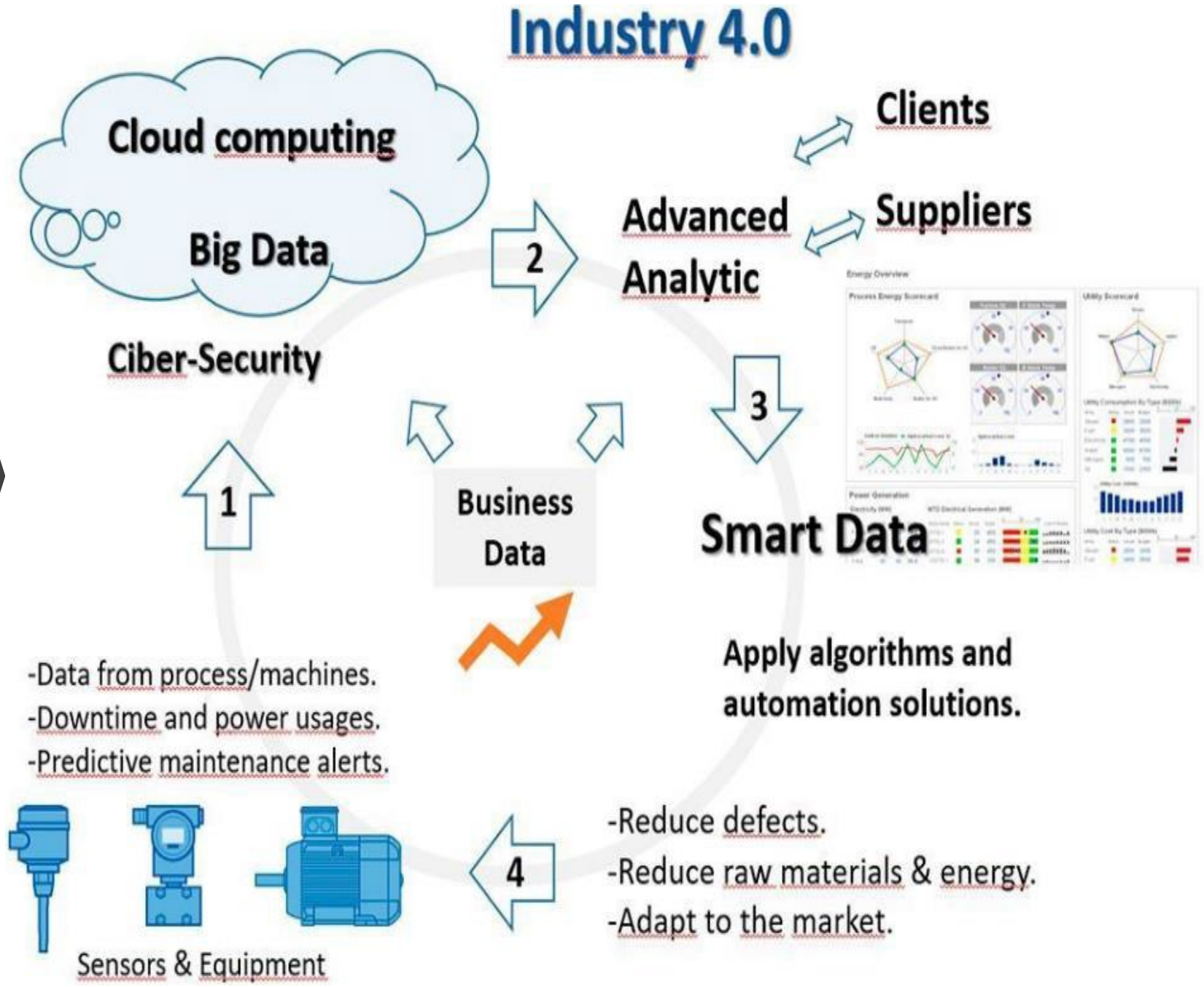


AMIRAS buildings PV system roof-top installation + Hybrid Solution (PV + Battery)

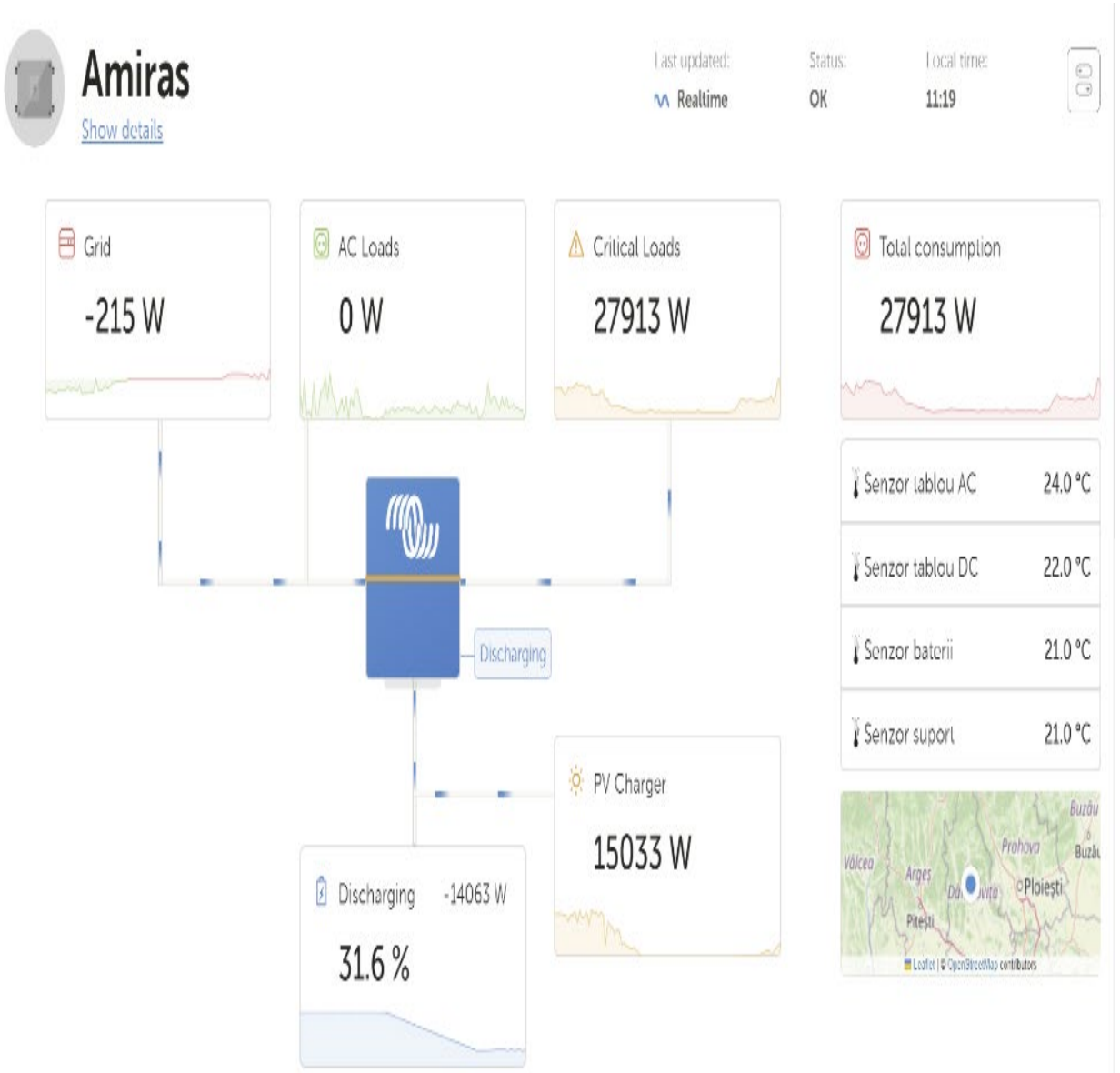




Industry 4.0 based cloud computing solution



Energy Monitoring and Optimization System based Industry 4.0







We successfully closed this project in September 2023 🥳 RO-NO 🥂 🤝

Project 2: Low-emission with high and sustainable efficiency (April 2021-April 2024)

HIOF's role and Budget:

1) Research and Development conducted by HIOF (43.955 EUR/500.000 NOK):

--Development of simulation models, algorithms, and tools for BEMS (***Deadline – June 2023***).

--Testing of IoT, communication platform for BEMS (***Deadline – September 2023***).

--Validation of specific devices and tools for control and monitoring (***Deadline – December 2023***).

-- Writing an internal report regarding the tools, equipment's, and solutions with the suggestion for modernizing of proposed buildings of Romanian partner, with an easy extension with flexible storage system and smart prosumers (***Deadline – March/April 2024***).

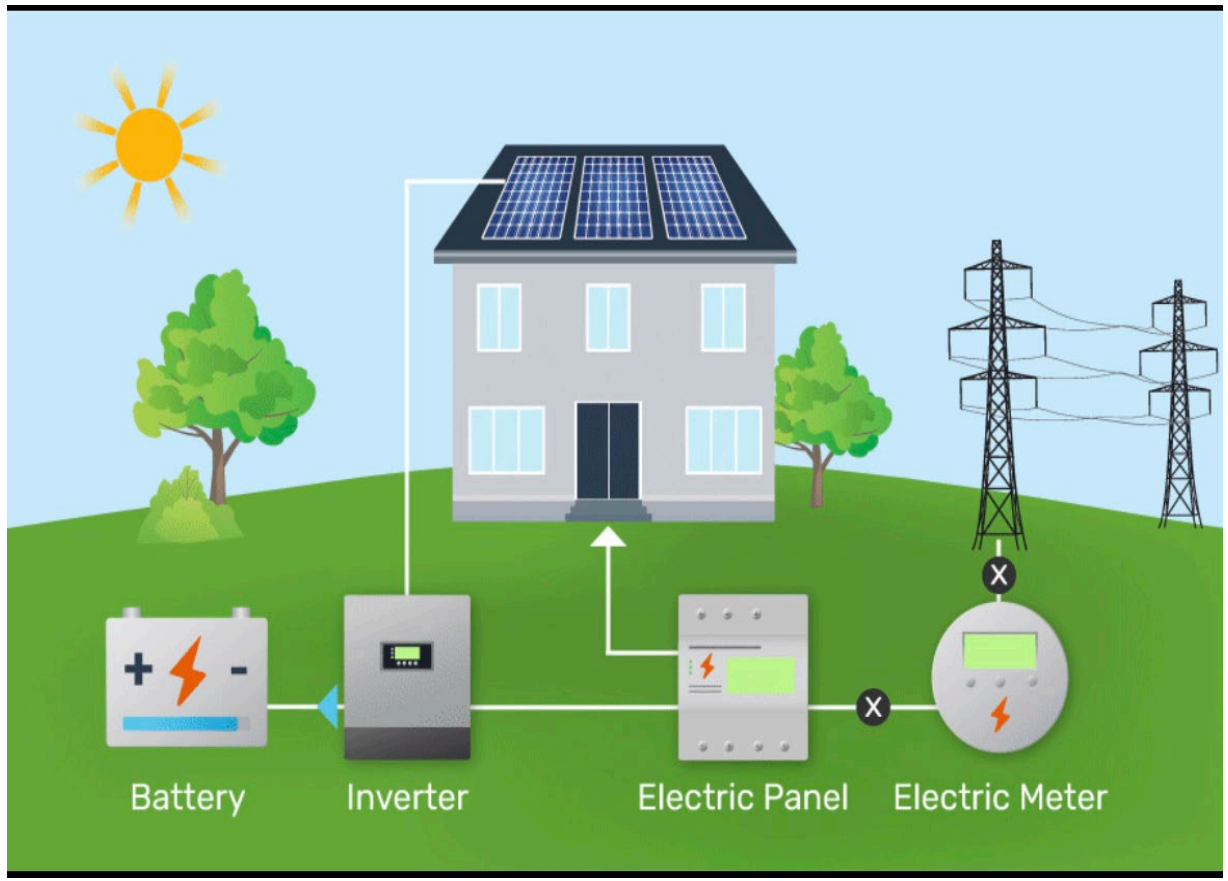
2) Dissemination and exploitation of the research results (Publicity: 5.850 EUR/60.000 NOK, Grant: 4.855 EUR)

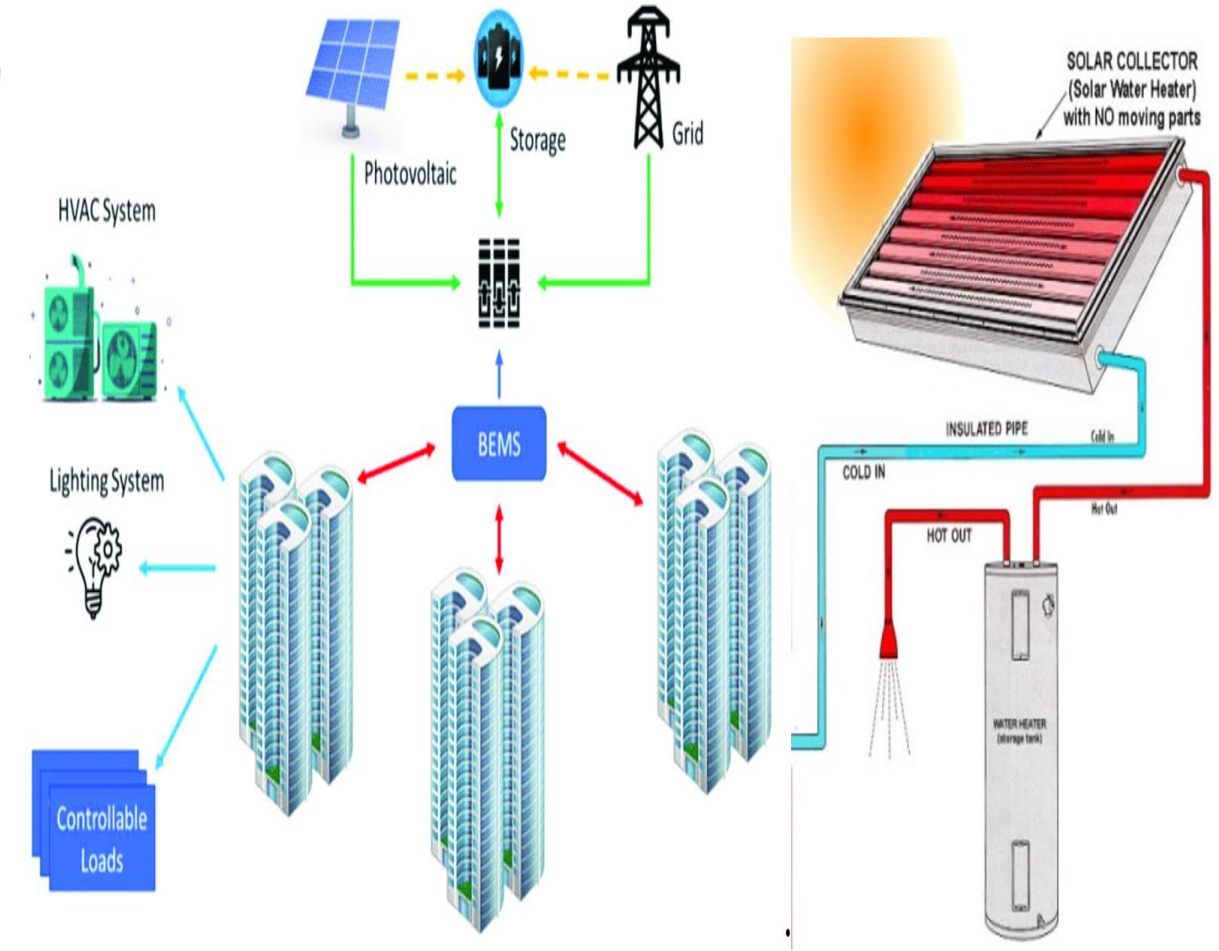
--Organization of a workshop in Norway to promote the project objectives, solutions and measures which must be consider for energy efficiency increasing (Winter 2023/Spring 2024).

--Conference and networking for target groups (Winter 2023/Spring 2024).

Project 2: *Low emission with high and sustainable efficiency (in Sfantu Gheorghe Municipality)*

The project will design, develop and implement the deep renovation of one public building, a gym with swimming pool, to significantly enhance indoor comfort.





Project 3 (May 2022-April 2024//Last reportings in July 2024):

Project title: Design and development of an Energy Efficiency Management and Control System with cost-effective solutions for residential and educational buildings- DOITSMARTER, Ref. 2022/337335

https://www.innovasjonnorge.no/en/start-page/eea-norway-grants/success-stories/romania-developing-an-ai-management-and-control-system-for-energy/

DOITSMARTER

DISBURSEMENTS and DEADLINES

- 31 October 2022 – First interim & financial reports submitted to Innovation Norway (**DONE**)
- 31 January 2023 – Yearly research report submitted (**DONE**)

- 30 April 2023 – Second research and financial report (**DONE**)
- 31 October 2023 – Third research report (**DONE**)
- **30 April 2024** – Final disbursement / Financial eligibility deadline
- **May-July**: Final research/technical implementation and financial reports

Financing source:
EEA and Norwegian Financial Mechanisms
Energy Programme in Romania
Focus area: Research & Development

Iceland Liechtenstein Norway grants — Norway grants

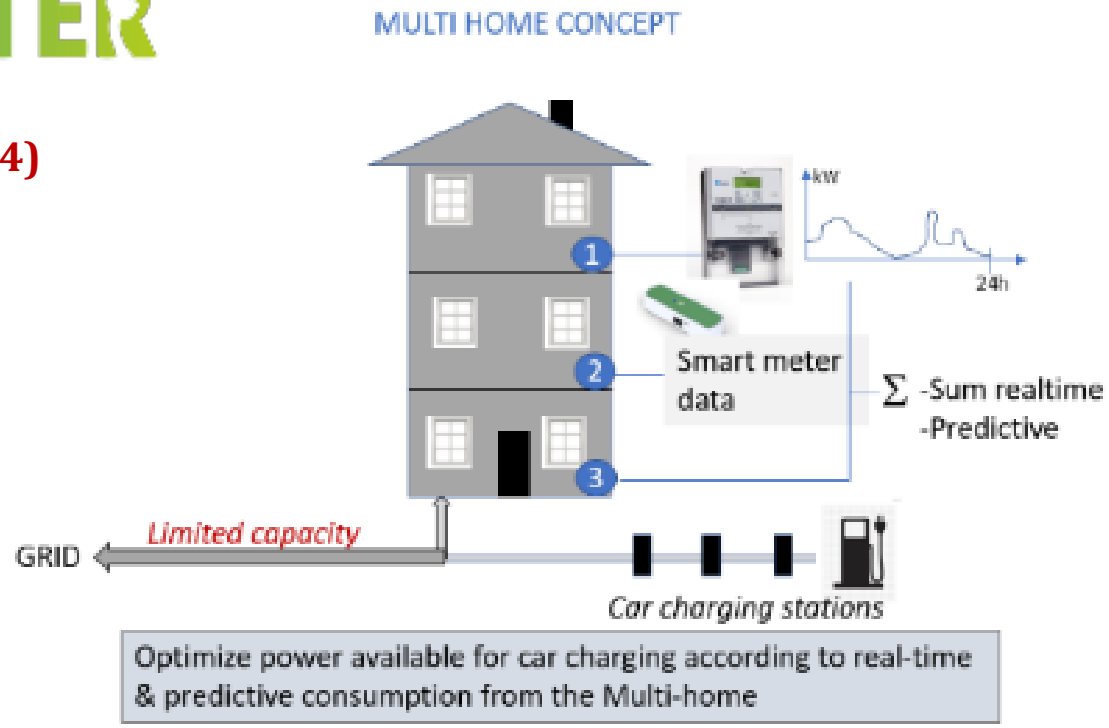
Innovation Norway

DOITSMARTER

ONGOING PROJECT
(May 2022 – April 2024)

Objectives:

- To design, develop and test **Energy Management and Control algorithms** and **tools** for **Building's optimization**;
- To develop, test and demonstrate **cost-effective power-to-heat solutions** using heat pumps and heat boosters with relay plug-in communication modules (for district heating and cooling systems);
- To install and **demonstrate cost-effective and user-friendly solutions in three Demo pilots** in Norway and Romania.



Partners:

TECHNICAL UNIVERSITY OF CLUJ-NAPOCA ROMANIA

Høgskolen i Østfold

nxtech

Universitatea Politehnica Timișoara

Primăria Municipiului Alba Iulia

Project 3 (May 2022-April 2024):

1) Research and Development conducted by HIOF:

--Specification analysis/requirements, standardization, business models (**DONE**)

--Development of simulation models, AI algorithms, and tools for Energy Management and Control Systems (***Deadline – 31 October 2022***). (**DONE)**

--Development and Testing of AI, ML tools, in the lab & industrial environment (Demo Pilot) based on an IoT communication platform for BEMS (***Deadline: September 2023 - April 2024***).

--Validation of specific low-cost solutions, APPS and tools for monitoring and control using Demo Pilots' resources (***Deadline: November 2023-April 2024***).

-- Workshops organization, Dissemination, Networking & Exploitation of project results

--Writing the interim and final reports regarding the tools, equipment's, and solutions with the suggestion for modernizing of proposed pilot buildings, with an easy extension with flexible distributed storage systems and smart prosumers (***Deadline: May-July 2024***).

Project 3 (May 2022-April/July 2024):
Dissemination and exploitation of the research results

--Organization of two ***workshops in Norway*** + short visits to promote the project objectives, solutions and measures which must be consider for increasing energy efficiency (26-28 **June 2023/DONE**).

--Conference and networking for target groups

1) May 2023 (IEEE SACI'23 Conference-DONE)

2) September 2023-SEIA Conference-**DONE**),

3) Workshop and Networking in Fredrikstad-15 December 2023), **DONE**

4) Conference for Dissemination & Networking of project results-IEEE SGRE'24 Conference in Qatar]; **DONE**.

--Dissemination and exploitation of project results (**Denmark, April 2024**) at Aalborg University and DTU.

Papers published

1) Elsevier Energy Reports Journal, February 2023 (Published). "A New Optimized Demand Management System for Smart Grid-Based Residential Buildings Adopting Renewable and Storage Energies" , Energy Reports, Elsevier Journal, EGYR_EGYR-D-22-03707, Gold and Green Open-Access Journal; **ISI Web of Knowledge, SCOPUS, Google Scholar**

2) "Hierarchical Control of an Islanded AC Micro Grid using FS-MPC and an EMS", Book Chapter, InTech Open 2023 (Published in open access); **ISI Web of Knowledge, SCOPUS, Google Scholar**

3) IEEE/SACI Conference (published): "Model Predictive Control of a Packed-U-cells Inverter with PV, Boost and Bidirectional Rectifier for Solid-State Transformer"; **ISI Web of Knowledge, SCOPUS, Google Scholar**

4) „An IoT communication platform for interactive buildings energy management system", the 9th International Conference on Sensors and Electronic Instrumentation Advances (SEIA' 2023), 20-22 September 2023, Funchal (Madeira Island), Portugal, **ISI Web of Knowledge, SCOPUS, Google Scholar.**

5) "Cost-optimization in a Microgrid using Deep Reinforcement Learning by utilizing the Energy Storage Systems", SGRE'24 - IEEE Conference; **ISI Web of Knowledge, SCOPUS, Google Scholar.**

Workshop and Seminars in Norway (26-28 June 2023)

	26·JUNE:·SEMINARS·AND·TRAINING·SESSIONS
FIRST/MORNING·SESSION	**Renewable·Energy·Sources·and·Applications**
9·-·9.30	Welcome·&·Introduction·to·the·workshop (Professor·Lucian·Mihet)
9.30·-·10.15	Renewable·Energy·Systems:·Challenges·and·Opportunities·(Professor·Nand·Kishor)
10.15·-·10.45	Pumping·systems·powered·by·solar·panels (Assistant·Prof.·Dorin·Bordeasu)
10.45·-·11.00	**Coffee·break**
11.00:11.45	Solar·and·Wind·Energy·Systems:·Tools·for·Initial·Design (Prof.·Nand·Kishor)
11.45-14.15	Visit·and·Lunch·in·Hvaler·Island·(Restaurant·Big·Fish·-·Torvet·6,·1680·Skjærhalden·-·https://www.bigfishcafe.no/·) https://www.google.com/search?q=hvaler%20norway&tbm=isch&rlz=1C1GCEA_enNO1022NO1022&hl=en&sa=X&ved=0CB4QtI8BKABqFwoTCIiH6ZSXjP8CFQAAAAAdAAAAABAH&biw=1266&bih=634&dpr=3
SECOND/AFTERNOON·SESSION	**Energy·efficiency·in·Smart/Green·Buildings**
14.15·-·14.30	Energy·efficiency·in·smart·buildings·(Prof.·Lucian·Mihet)
14.30-15.00	Green·Buildings·-·Horizon·Project (Prof.·Anna-Lena·Kjøniksen)
15.00-15.15	**Coffee·break**
15.15-15.45	Material·science·&·technology·in·green·buildings (Assoc.·Prof.·Susana·Garcia·Sanfelix)
15.45-16.15	Building·monitoring·and·control·systems (Senior·Scientist·Dorin·Let)
END·OF·THE·SEMINAR	**Have·a·nice·evening·and·see·you·tomorrow!**

Høgskolen i Østfold

DOITSMARTER

	AGENDA·for·27·June:·Sites·visit·and·relevant·industrial·companies·visit
8.45	Meeting·in·front·of·the·faculty·building-S12
9·-·10.00	**NxTech·AS**·(Dokka·6)·-·Company·presentation·+·Industrial·Projects:·https://www.nxtech.no/
10.00·-·12.00	**Høiax·AS**·-·Water·Heater·Tanks·+·Smart·energy·efficiency·solutions:·https://www.hoiax.no/om-hoiax/articles/smart-varmtvannsbereder-med-skylosning-hoiax-connected
12.00·-·14.00	**Lunch·in·Old·Town/Fredrikstad** https://www.visitnorway.no/listings/gamlebyen-i-fredrikstad/23375/
14.00·-·16.00	**Arca·Nova·(Smart·Building-Future·Living·Pilot**:·https://www.arcanova.no/;·https://www.arcanova.no/future-living·)
	AGENDA·for·28·June·-·DOITSMARTER·Project
9·-·9.15	Welcome·+·Short·Introduction·(Prof.·Lucian·Mihet)
9.15·-·9.45	Østfold·University·College-HIOF·contributions·and·achievements·to·the·project·(Lucian·+·Ibrahim·+·Muhammad)
9.45·-·10.15	Technical·University·of·Cluj/Napoca-TUCN·contribution·to·the·project (Andrei·Ceclan·+·Timea)
10.15·-·10.45	University·Polyethnic·Timisoara-UPT·contribution·(Assoc.·Prof.·Cristian·Vasar)
10.45·-·11.00	**Coffee·break**
11.00·-·11.30	Alba·Iulia·Municipality·-·Demo·Pilot·(Valentin·Voinica)
11.30·-·12.00	Center·for·the·Study·of·Democracy·-·CSD·(George·Jiglau)
12.00·-·12.30	Light·lunch·(sandwiches·+·beverage)
12.30·-·13.00	NxTech·presentation·(John·Breiland·+Kristian·Sørlie+Terje·Wahlstrøm)
13.00·-·16.00	Future·work,·next·steps/reporting·(TUCN·+·HIOF)

Looking·forward·seeing·you·in·Fredrikstad,

Prof.· Dr.· Eng.· Lucian· Mihet,· https://www.hiof.no/iio/ing/english/people/aca/nlm/index.html·

ein Norway

Innovation Norway

Supported·by·a·grant·from·Iceland,·Liechtenstein·and·Norway·through·the·E Grants·Romania·2014-2021,·in·the·frame·of·the·Energy·Programme·Romania.

Second Workshop in Norway-December 15

Høgskolen i Østfold ENERGEIA DOITSMARTER UNIVERSITATEA TEHNICA DIN CLUJ-NAPOCA

Workshop for Dissemination of results and Networking with partners from 4 EEA and Norway Grants:

--DOITSMARTER: Design and development of an energy management and control systems with cost-effective solutions for residential and university buildings

--SPEED: Sun Power & Cooperation Fusion for Cheaper Electrical Devices Manufacturing

--ENERGEIA: Empowering Energy Efficiency Awareness through a Holistic Educational Approach

--Increased knowledge on renewable energy and energy efficiency through training and best practice

Topics: Increasing Knowledge and Competences on Renewable Energy and Energy Efficiency during Energy Transition

Date: 15 December 2023

Venue: Østfold University College, Fredrikstad-Norway

Kobberslagerstredet 5, 1671 Fredrikstad

Meeting Room: Smia – S401

Iceland Liechtenstein Norway grants Norway grants Innovation Norway

Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the Energy Programme Romania.

WORKSHOP AGENDA

15 DECEMBER: SEMINARS AND TRAINING SESSIONS

MORNING SESSION	Energy efficiency-based RES in Smart Buildings
9 - 9.10	Welcome & Introduction to the workshop. (Professor Dr. Lucian Mihet)
9.10 – 9.50	**EEA & Norway Grants**: A short description of my 8 ongoing projects: DOITSMARTER, ENERGEIA, SPEED, Increased Knowledge etc. Outcomes – Results - Achievements (**Professor Dr. Lucian Mihet-HIOF**)
9.50-10.10	**Horizon Europe SNUG Project**: Innovative methodology based in circular economy and AI to foster the transition to sustainable and very high energy performance buildings at a cost optimal level; **Assoc. Prof. Susana Garcia Sanfelix-HIOF**
10.10-10.30	EEA & Norway Grants at HIOF, Research Projects and Network Partners **Harald Holone, Dean** Faculty of Computer Science, Engineering and Economics
10.30 – 10.50	**DOITSMARTER** Projects: IoT Platform Development based AI algorithms. PhD Student: Ibrahim Ahmed-HIOF
10.50-11.00	EMCS, **John Breiland, NxTech**-Norway

enstein Norway grants Innovation Norway

Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the Energy Programme Romania.

Høgskolen i Østfold ENERGEIA DOITSMARTER UNIVERSITATEA TEHNICA DIN CLUJ-NAPOCA

11.00 – 11.30	**Coffee break**
11.30 - 12.00	**ENERGEIA** Project: Energy efficiency toward decarbonization **Assoc. Professor Denisa Stet**, Technical University of Cluj-Napoca/TUCN-Romania
12-12.30	**SPEED** Project: Green manufacturing designed and developed as a microgrid system with PV generation and storage solutions. **Senior Scientist Dorin Let**, PhD, ICSTM-Romania (Institute of Multidisciplinary Research for Science and Technology from Valahia University of Targoviste)
12.30-13.00	**Increased knowledge on renewable energy and energy efficiency through training and best practice**: Pumping systems powered by solar panels (**Assistant Professor Dorin Bordeașu**, PhD; University Politehnica Timisoasa/UPT, Romania)
13.00-14.00	Lunch Break
AFTERNOON SESSION	**Lab Visits and Demonstration**
14.00 – 15.00	**NxTech** Labs Visit and Discussions-Dokka 6, Fredrikstad, https://www.nxtech.no/
15.00-16.00	HIOF Labs Presentation + Demonstration
END OF THE SEMINAR	**Thank you and have a nice evening!**

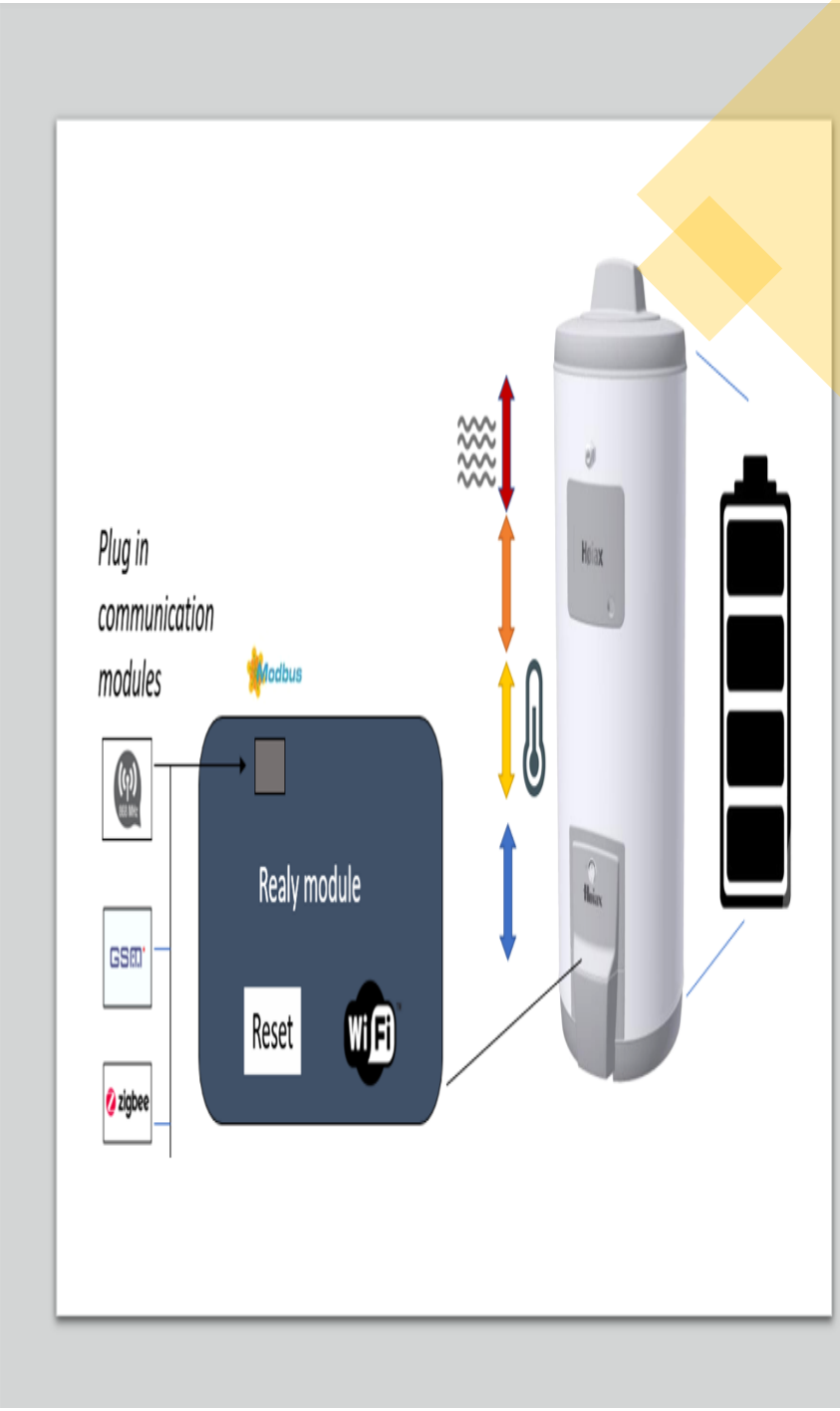
DOITSMARTER Objectives

- DOITSMARTER, will provide an end-to-end solutions for customers' energy management needs, based on demand side management for energy & cost savings.
- The cost of energy will be included into the proposed Energy Management and Control System (EMCS) so that control decisions to be evaluated from cost perspective.
- It will be developed as an autonomous concept which will integrate the existing building EMS, sensors and building infrastructure into one common cloud interface through Gateway based on machine learning (ML) and AI.
- The developed solution will bring novelty based on Edge computing and AI algorithms and will integrate sensors and building functionalities into one common Gateway, giving the possibility for different service providers to operate on the same hardware (BEMS), with open data source and scalability.

DOITSMARTer SYSTEMATIC approach

(planned; specific solution to a practical problem)

- A **smart relay plug-in communication module** for an existing water heater prototype (already on the market) will be developed and tested.
- **Power to Cooling** (P2C) solution at the TUCN pilot site by implementing the Demand Response scenarios for shifting the load, but also in the energy management of the building, to optimize the benefits from the local generation and from the minimum electricity prices in the market.
- DOITSMARTER will offer **business models** with a detailed economic analysis of benefits introduced by RES and storage systems in grid-connected for each proposed demo pilot, and a detailed cost analysis of each proposed solution.
- The DOITSMARTER project proposes a highly innovative and **integrated energy management approach** that aims at achieving a highly efficient management of heterogeneous energy resources. The goal is to integrate and combine the management of different energy technologies (RES with Storage technologies, HVAC system control, lighting, heating and cooling) into a BEMS, to ensure an efficient and optimized energy management and the coverage of the highest possible share of RES.



Ongoing steps of *DOITSMARTER* Project

Fleet Control

A part of a larger control system

NxtEnergy

Fleet control

Enfo

Flexibility markets

Power Companies

Or 1:1 Control

myUplink

API for remote fleet control

- *Aggregation*
- *User permissions, web API*
- *Which heaters, when*
- *SOC*
- *Estimated future consumption*



Owners



2 or 3kW pr unit x









Høiax

CONNECTED

How can a smart water heater contribute on a larger scale?

By making use of live AMS data

myUplink

Data 1x/24h

5G

Live data

Live data



Solar Export / Import data



Live data

Physical connection



PowerLink HAN Interface

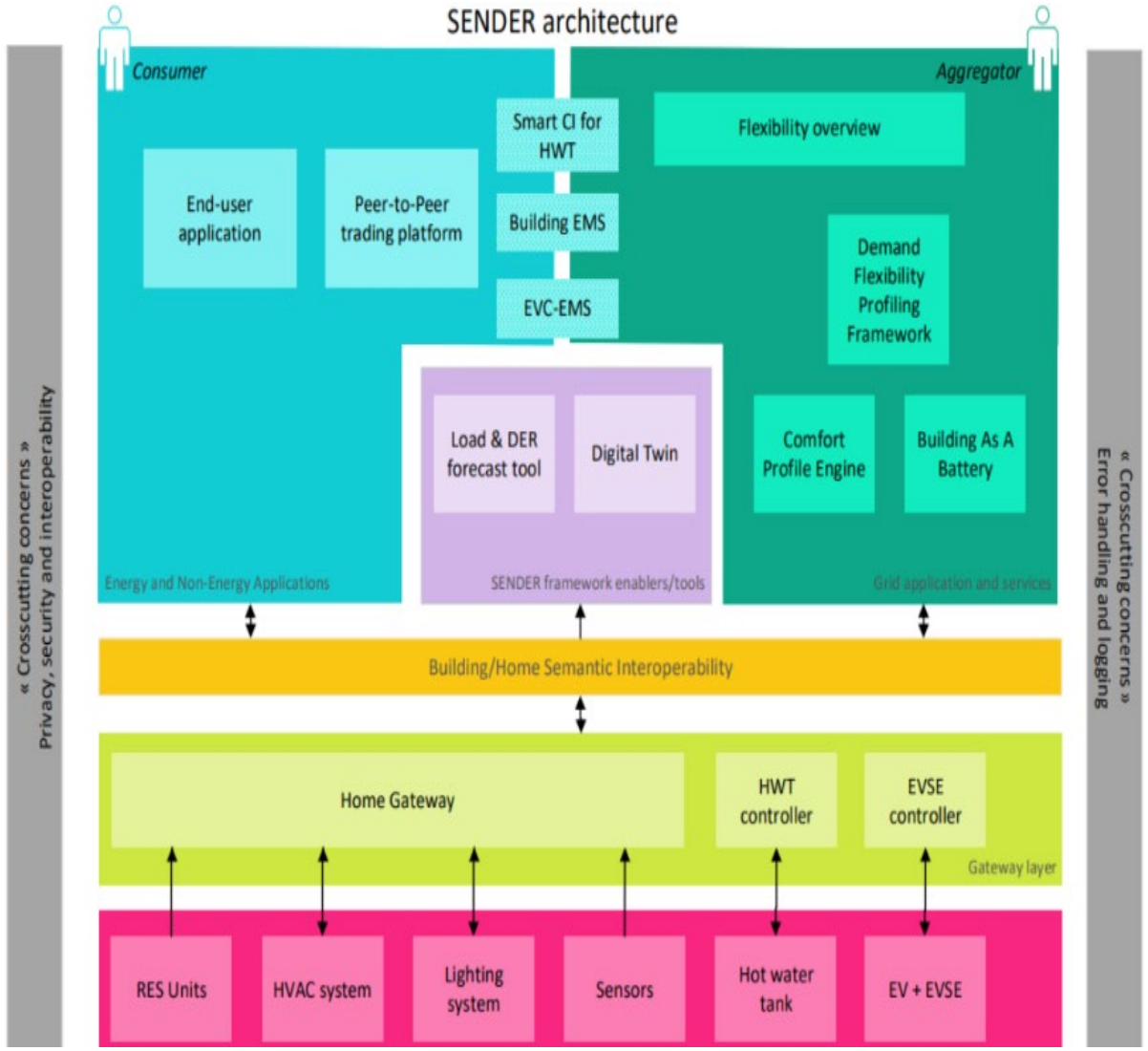


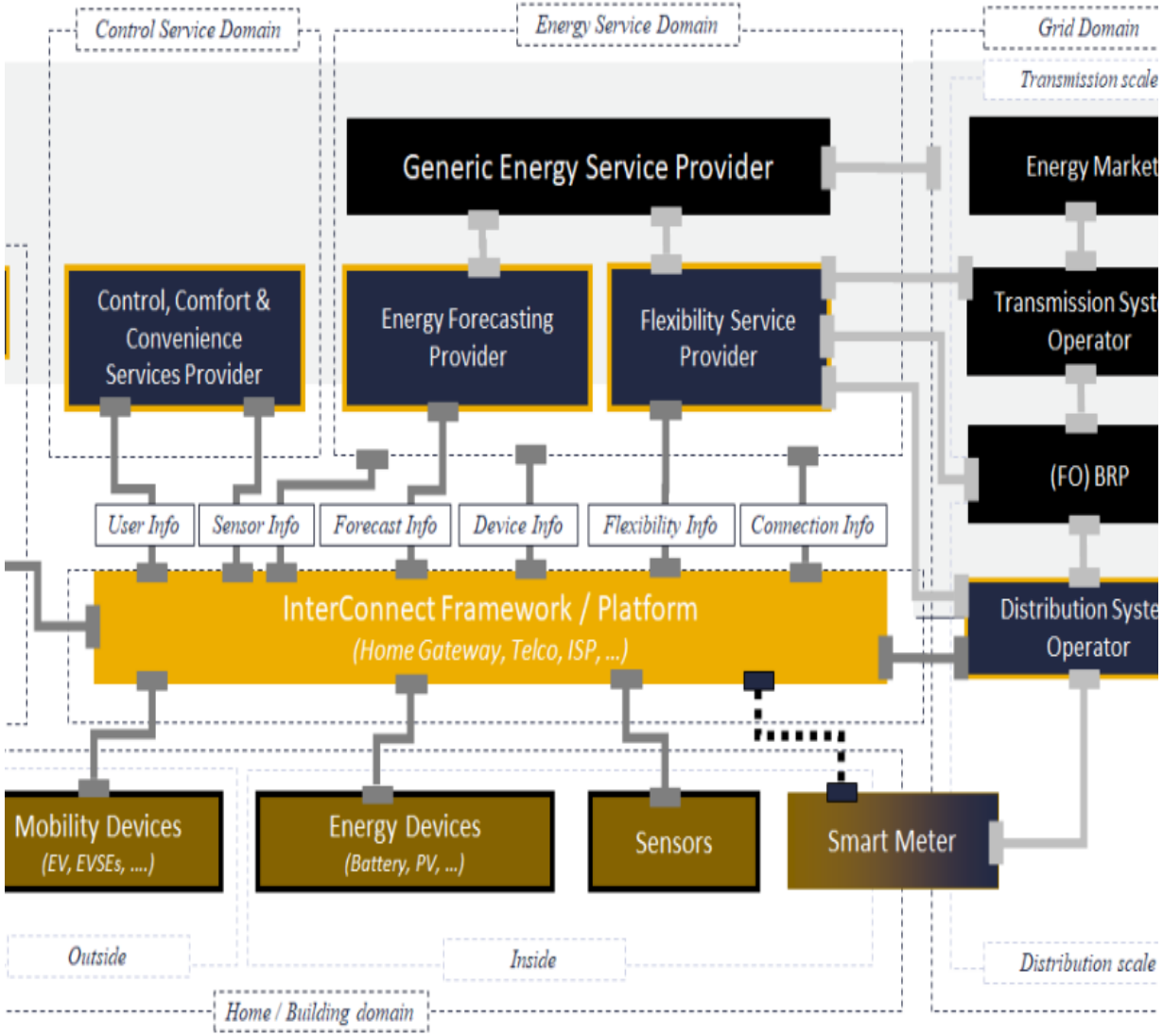
Thermal battery

- Monitor Power consumption in real time
- Local triggers and logic based on set parameters for each device
- Thermal battery storage functionality from local solar production
- Water heater Fleet control

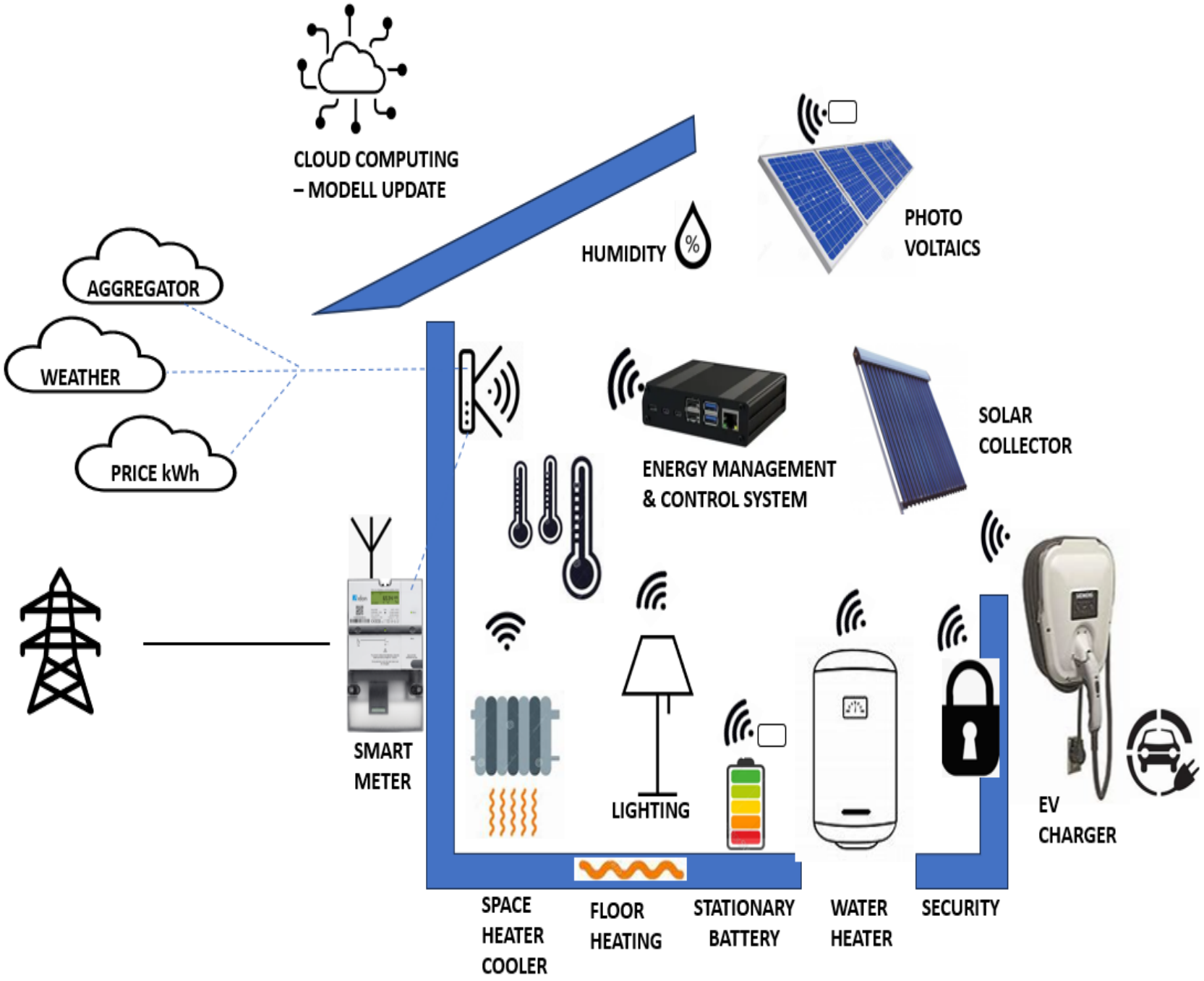
Høiax SYSTEMS

Smart House Framework and Architecture

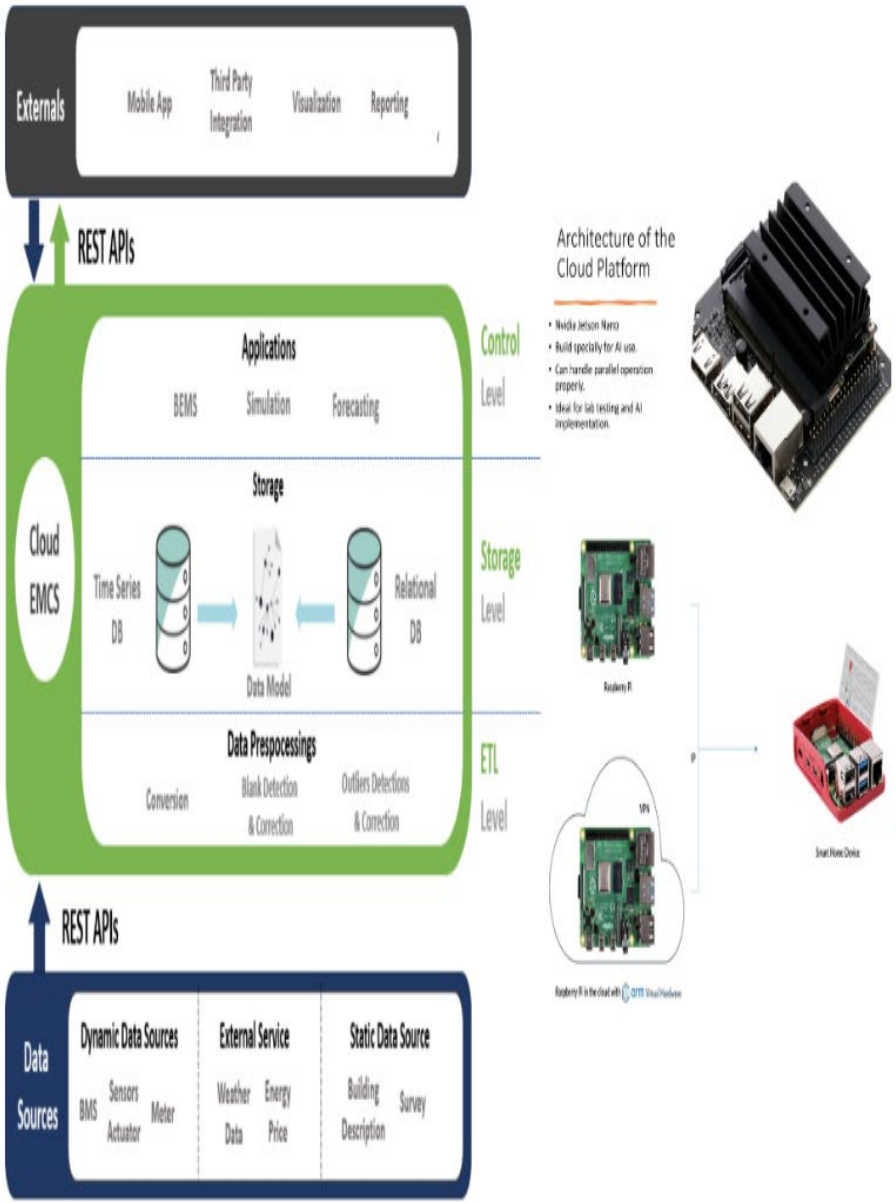


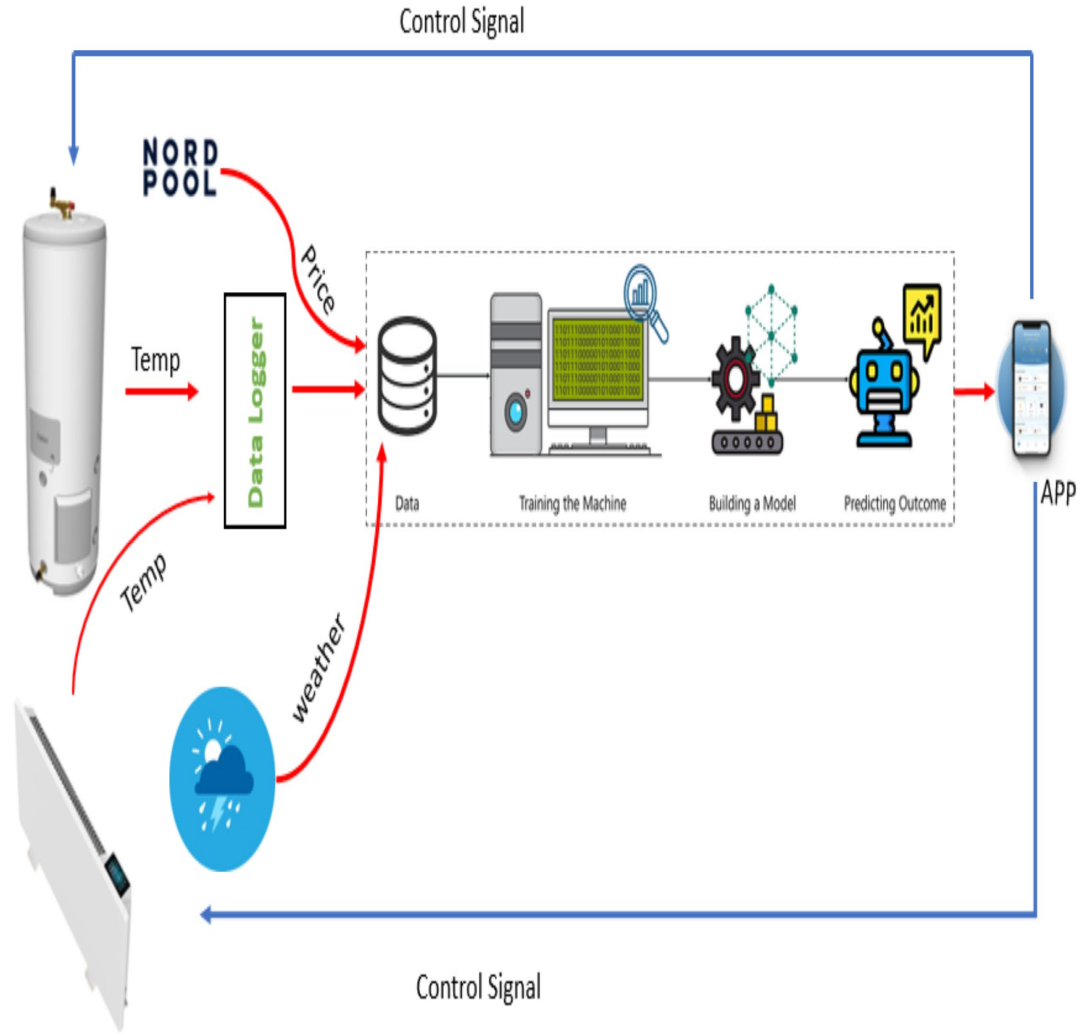


EMCS Approach for Design and Development



IoT Lab Platform Design and Development





Project 4: March 2023-April 2024

Title: Increased knowledge on renewable energy and energy efficiency through training and best practice exchanges between professionals from Arad County and Norwegian partners ; **Ref. 2022/346705**

The call aims to support **awareness-raising, training and competence-building** on renewable energy, energy efficiency and energy security (soft measures).

Total budget: Euro 235.128

HIOF budget: Euro 77.853 (NOK 900.000)

Name	Project activities	Own contribution	grant	Total costs
Partner 3 Høgskolen i Østfold	Activity 3 Training aid	EUR 9.810	EUR 55.590	EUR 68.400
	Activity 4 Training aid	EUR 0	EUR 0.00	EUR 0.00
	Management	EUR 517.97	EUR 2,935.16	EUR 3,453.13
	Publicity	EUR 900.00	EUR 5,100.00	EUR 6,000.00
	TOTAL	**EUR 11,228**	**EUR 63,625.2**	**EUR 77,853.13**

Project partners - Consortium

- Arad County Council-PP
- Buteni Commune-P1
- Aurel Vlaicu University of Arad-P2
- **Østfold University College-P3**
- Tomesti Commune-P4

Expected outcome and output indicators:

Expected outcome indicators

-- Level of self-reported desirability for renewable energy, energy efficiency and energy security (6/7);

-- Level of self-reported knowledge of renewable energy, energy efficiency and energy security (7/7);

-- People self-reporting enhanced capacity/skills related to renewable energy, energy efficiency and energy security: 150

-- People self-reporting on improved knowledge related to renewable energy, energy efficiency and energy security: 300

Expected output indicators

- Number of awareness raising campaigns: 6 (**DONE**)
- Number of people completing **comprehensive trainings** (*more than 2 days*) on renewable energy, energy efficiency and energy security implemented: 20 (>50); **DONE**
- Number of people completing credit giving education at tertiary level: 10 (40); **DONE**
- Number of people completing short (less than 2 days) trainings on renewable energy, energy efficiency and energy security : 150 (25+30+40+20+50>150); **DONE**
- Number of people reached by the awareness-raising on renewable energy, energy efficiency and energy security campaigns: 300.

Project objectives

- The main idea of the project is **to start and implement a training and awareness programme** addressed at several levels of people involved, starting from the top decision makers, local public authorities, together with the regional representative universities, executive employees from the same entities and general public from the local communities involved.

The approached topics are:

--how to initiate and build ***nearly zero energy buildings*** – nZEB,

--how to perform a ***deep renovation*** of a household or of a public or private building,

--how to adopt ***energy efficiency measures*** related to the technical systems, energy monitoring, behavioural change, energy contracting,

--how to install ***renewable energy sources*** at local level,

--***how to become a prosumer*** etc.





Kick-off meeting: Arad, 4 April 2023

Project 4: Increased knowledge on renewable energy and energy efficiency through training and best practice exchanges between professionals from Arad County and Norwegian partners

- **Training courses** for ***top decision makers*** (2-3 days/10 hours); (Arad/August 2023)
- **Training courses** for ***administrative & technical staff*** (3-4 days/16 hours);
  --Buteni (November 2023), C.J. Arad (August 2023)

- **Short training + workshop** organized by HIOF in Norway (2 days): study cases, sites visits, relevant companies' visits, networking (DONE)

--2 **Workshops** with Training Sessions for **Dissemination & Networking** in Norway (June & December 2023)

- **Summer school** at UAV-Arad , 2-3 days/12 hours (October 2023)
- Dissemination & Conference fee (Aalborg University & DTU/Denmark + 2 Conferences)
- **Project Management** (PMs): Reportings, Dissemination & Networking Events,

The **Høgskolen i Østfold (HiOF – P3)** will handle the following:

- Project management on the partner side;
- **Provide short duration trainings (2 days)** on energy efficiency and renewable energy sources **for the top management teams** of: Arad County Council, Buteni Commune, Tomesti Commune and "Aurel Vlaicu" University of Arad; August 10-11 (**DONE**).
- **Provide short duration trainings (2 days)** on energy efficiency and renewable energy sources **for the administrative and technical teams** of: Arad County Council, Buteni Commune, Tomesti Commune and "Aurel Vlaicu" University of Arad; November 28-30. **DONE**
- **Provide trainings (3/4 days)** on energy efficiency and renewable energy sources **during a summer school** organized at the UAV for the academia, students and technical staff, involving the partners attendance as well; October 9-10. **DONE**
- **Organize and host a workshop with short trainings (2 days - 26, 27 June) in Norway** on energy efficiency and renewable energy sources. The training includes one day with seminars and lectures and one day with an ***exchange experience visit*** at several relevant sites/companies with relevant activities on renewable energy sources and building's energy efficiency-based RES (Demo Pilots), with the top management decision makers from the project partners (Rector, Directors, Mayers, etc). **DONE**

HIOF-P3 Activities/Contributions



Short training organized by HIOF in Norway for the Romanian delegation: 130 hours (**June 26-28, Fredrikstad**); **DONE (40 people)**



Training courses offered by the HiOF for the top decision makers of PP, P1, P2 and P4: 130 hours (**August 10, 11: CJ Arad**); **DONE (40 people)**



Long training workshop for the UAV academia and students: 64 hours (**October 9-11 at UAV Arad**); **DONE (15 Professors + 25 students)**



Training courses offered by HiOF for the administrative and technical staff of PP, P1, P2 and P4: 130 hours (**November 20-30, Buteni**);Short training organized by HIOF in Romania for the Romanian partners: 130 hours; **DONE (20 people)**



First Workshop in Norway at HIOF (June 26-28)

Training session for managers and top decision makers (August 2023-Arad)

Contents of my presentation/Continutul prezentării

Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the Energy Programme Romania.

First day-Energy Transition & Renewable Energy Storage

- Energy Transition – **Old vs new energy systems -** It's time to get real
- Green Deal & Circular Economy
- Tranziția la net zero
- Tranziția energetica la nivel național si european
- What is driving the need for smarter buildings
- The EU main directives concerning buildings and the transition to a more sustainable future

Second day-Microgrids/Smart Grids & Energy Storage Systems

- 7 Key Technology areas in Smart Grids
- Microgrids and MGs Components
- MG Control structures and Energy Management
- Energy Storage Systems vs Battery Storage Systems
- Battery Management Systems
- Applications for Storage systems

Training Session about Increasing Knowledge and Competences on

Renewable Energy Sources,

Energy Efficiency and

Energy Security

EEA & Norway Grant/project contract 2022/346705 :

"Increased knowledge on renewable energy and energy efficiency through training and best practice exchanges between professionals from Arad County and Norwegian partners"







Training session for managers and top decision makers (August 2023-Arad)

Summer school at University Aurel Vlaicu/UAV (October 2023)

40 participants:15 Professors & 25 students

Training Session – Summer School

9-10 October 2023 – Universitatea Aurel Vlaicu, Arad

AGENDA TRAINING

	ZIUA 1	Trainer/Speaker
9-9.15	Prezentarea sesiunii de training	**Prof. Lucian MIHET**
9.15-10.00	Tema 1: Noțiuni de baza despre modelare si simulare	**Prof. Lucian MIHET**
10-10.45	Tema 2: Noțiuni introductive despre energia solara si sisteme fotovoltaice	**Prof. Lucian MIHET**
10.45-11.00	Coffee brake	
11-11.30	Tema 3-Seminarul 1	**Dr. ing. Dorin LET**
11.30-13.30	Tema 3-Seminarul 2	**Dr. ing. Dorin LET**
13.30-14.00	Lunch brake	
14.00-14.30	Tema 4-Seminarul 1	**Dr. ing. Dorin BORDEASU**
14.30-17.00	Tema 4-Seminarul 2	**Dr. ing. Dorin BORDEASU**
	Sfârșitul sesiunii	

Programe software utilizate (necesare):

1) → **MATLAB-Simulink-Simscape**: https://se.mathworks.com/products/new_products/latest_features.html?s_tid=aom_newgravailable_R2022b

2) → **SISIFO**: https://www.sisifo.info/en/DataInput

3) → **PVSOL**: https://pvsol.software/en/

4) → **Ipump de la Caprari** (https://ipump.caprarinet.net – necesită creare cont)

OBS: Diferite materiale ajutătoare, tutoriale, exemple, vor fi puse la dispoziția studenților, cercetătorilor, personalului interesat de subiectele prezentate cu o săptămâna înaintea evenimentului

Ziua 1:

TEMA 1: Noțiuni de baza despre modelare si simulare

--modelarea sistemelor dinamice; tehnici de modelare, optimizare si simulare

--descrierea unor aplicații si tooluri dedicate analizei, prelucrării si filtrării datelor;

--Simulink si Simscape. Prezentare biblioteci si exemple

TEMA 2: Noțiuni introductive despre energia solara si sistemele fotovoltaice

--Noțiuni generale; Elemente componente; Soluții si aplicații ale surselor regenerabile

--Metode si tehnici de modelare, comanda si control

TEMA 3: Proiectarea sistemelor fotovoltaice on grid si off grid

(Design of PV systems with storage); CSII. Dr. ing. Dorin LET, (let.dorin@icstm.ro)

Seminarul 1: Sisteme de conversie a energie fotovoltaice (30 minute)

- → Prezentare trainer/speaker;
- → Introducere in mediul de simulare PVSOL;
- → Sisteme de conversie a energiei fotovoltaice;

Seminarul 2: Dimensionarea și Simularea instalației solare utilizând programul software PVSOL (2 ore)

1. → Dimensionarea generatorului fotovoltaic;
2. → Dimensionarea sarcinilor;
3. → Proiectarea generatorului fotovoltaic;
4. → Modelarea si simularea generatorului fotovoltaic.

Softuri folosite: **PVSOL** (https://pvsol.software/en)

Cunoștințe minime necesare:

- → Cunoștințe generale despre **conversia fotovoltaica** și **instalații fotovoltaice**.
- → Cunoștințe generale despre **electrotehnică** și **instalații electrice >0.4kV**.
- → Cunoștințe minime în folosirea calculatorului și a unui browser web.

TEMA 4: Sisteme de irigații alimentate de la sisteme de conversie a energie fotovoltaice

(Irrigation systems powered by photovoltaic energy conversion systems)

As. dr. ing. Dorin BORDEAȘU → → (dorin.bordeasu@upt.ro, bordeasu.dorin@gmail.com)

Seminarul 1: Noțiuni introductive ale sistemelor de irigații alimentate de la sisteme de conversie a energie solare/fotovoltaice (30 minute)

- → Prezentarea background Dorin BORDEAȘU;
- → Introducere;
- → Sisteme de pompare;
- → Sisteme de conversie a energiei fotovoltaice;
- → Sisteme de pompare alimentate de sisteme de conversie a energiei fotovoltaice.

Seminarul 2: Dimensionare și Simularea sistemului de irigații pentru 4 cazuri particulare utilizând programul software SISIFO (2:30 ore)

5. → Sistem de irigații la presiune constantă cu o singură pompă;
6. → Sistem de irigații la presiune și debit variabil;
7. → Sistem de irigații la presiune constantă cu 2 pompe;
8. → Sistem de irigații la presiune constantă cu 2 pompe.

Programe software folosite: **Sisifo** (https://www.sisifo.info/en/default)

Cunoștințe minime necesare:

- → Cunoștințe generale despre **mecanica fluidelor** și despre **turbo-mașini**.

Summer school at University Aurel Vlaicu/UAV (October 2023)

- → Cunoștințe·generale·despre·**electrotehnică**·și·despre·**mașini·electrice·și·generatoare·fotovoltaice**.¶
- → Cunoștințe·minime·în·folosirea·calculatorului·și·a·unui·browser·web.¶

¶

¶

Ziua·2:·¶

Agenda·sesiunii¶

¤	**ZIUA·2¤**	**Trainer/Speaker¤**	¤
9-9.15¤	Prezentarea·sesiunii·de·training¤	**Prof.·Lucian·MIHET¤**	¤
9.15-10.15¤	Tema·1:·Noțiuni·de·baza·despre·modelarea·dinamica,·simulare·si·programare·in·MATLAB-Simulink¤	**Prof.·Lucian·MIHET¤**	¤
10.15-11.00¤	Tema·2·–·Seminarul·1¤	**Dr.·ing.·Dorin·BORDEASU¤**	¤
11.00-11.15¤	Coffee·braker¤	¤	¤
11.15-13.45¤	Tema·2-Seminarul·2¤	**Dr.·ing.·Dorin·BORDEASU¤**	¤
¤	¤	¤	¤
13.45-14.15¤	Lunch·braker¤	¤	¤
14.15-14.45¤	Tema·3-Seminarul·1¤	**Dr.·ing.·Dorin·LET¤**	¤
14.45-16.45¤	Tema·3-Seminarul·2¤	**Dr.·ing.·Dorin·LET¤**	¤
¤	Sfârșitul·sesiunii¤	¤	¤

¶

¶

TEMA·1:·Noțiuni·de·baza·despre·modelarea·dinamica,·simulare·si·elemente·de·programare·in·MATLAB/Simulink¶

--instrucțiuni,·funcții·si·operații·de·baza·ale·MATLABului,·Calcul·grafic,·elemente·de·programare·si·prelucrare·a·datelor¶

--Elemente·de·proiectare·si·implementare·a·sistemelor·de·reglare·automata¶

--Introducere·in·Simulink·si·Simscape.·Modelarea·si·simularea·sistemelor·dinamice¶

¶

TEMA·2:·Sisteme·de·irigații·alimentate·de·la·sisteme·de·conversie·a·energiei·solare·fotovoltaice¶

Seminarul·1:·Specificațiile·Tehnice·și·Particularitățile·Irigațiilor·alimentate·fotovoltaic·(45·min)·¶

Sfaturi·pentru·o·bună·execuție·a·sistemelor·de·irigații·alimentate·fotovoltaic.¶

Cunoștințe·minime·necesare:·¶

- → Cunoștințe·generale·despre·**mecanica·fluidelor**·și·despre·**turbo-mașini**.¶
- → Cunoștințe·generale·despre·**electrotehnică**·și·despre·**mașini·electrice·și·generatoare·fotovoltaice**.¶

¶

Seminarul·2:·Acordarea·Variatoarelor·(2:00·ore)¶

Programarea·Variatoarelor·de·frecvență·pentru·acționarea·motorului·pompei·utilizând·MATLAB·și·Simulink:¶

a)→într-o·zi·senină,·¶

b)→și·la·apariția·umbrei·norilor.·¶

Softuri·care·vor·fi·folosite:·**Ipump·de·la·Caprari**·(https://ipump.caprarinet.net·–·necesită·creare·cont),·**MATLAB**·și·**Simulink**.¶

¶

Cunoștințe·minime·necesare:·¶

- → Cunoștințe·generale·despre·**mecanica·fluidelor**·și·despre·**turbo-mașini**.¶
- → Cunoștințe·generale·despre·**electrotehnică,·electronica·de·putere**·și·despre·**generatoare·fotovoltaice·și·unități·de·acționare·a·mașinilor·electrice**.¶
- → Cunoștințe·minime·în·**automatizări**·și·**programare**.¶
- → Cunoștințe·minime·în·utilizarea·mediului·de·simulare·**MATLAB/·Simulink**.¶

¶

TEMA·3:·Dimensionarea·si·simularea·Sistemelor·Fotovoltaice¶

¶

Seminarul·1:·Sisteme·de·conversie·a·energie·fotovoltaice··(30·minute)·¶

- → Interpretarea·datelor;¶
- → Criterii·de·optimizare;¶

¶

Seminarul·2:·Dimensionare·și·Simulare·(2:00·ore)·¶

Simulare·cu·PVSOL:¶

1.→ Performanta·generatorului·fotovoltaic;¶

2.→ Curbele·de·consum;¶

3.→ Optimizarea·rezultatelor.¶

Softuri·care·vor·fi·folosite:·**PVSOL**·(https://pvsol.software/en)¶

Cunoștințe·minime·necesare:·¶

- → Cunoștințe·generale·despre·**conversia·fotovoltaica**·și·despre·**instalații·fotovoltaice**.¶
- → Cunoștințe·generale·despre·**electrotehnică**·și·despre·**instalații·electrice·>0.4kV**.¶
- → Cunoștințe·minime·în·folosirea·calculatorului·și·a·unui·browser·web.¶

¶

¶

Summer school at UAV (October 2023)











Training session for people from administration and technical staff

Energy Programme in Romania, Focused area: **Renewable energy and Energy Efficiency** - EEA and Norway Grants from INNOVATION NORWAY

EEA & Norway Grant/project contract 2022/346705 : "Increased knowledge on renewable energy and energy efficiency through training and best practice exchanges between professionals from Arad County and Norwegian partners".

Sesiune training dedicat personalului administrativ si tehnic

"Training courses offered by the Østfold University College-HiOF (Norwegian partner) for the administrative and technical staff for all project partners"

Venue: 28 Noiembrie 2023 – Buteni City Hall (Primaria Buteni, jud. Arad)

AGENDA TRAINING

	TEMA	Trainer/Speaker
9.00-9.15	Prezentarea sesiunii de training	**Prof. Dr. ing. Lucian MIHET**
9.15-10.00	**Tema 1**: Prosumatori si Case/Clădiri inteligente si interactive	**Prof. Lucian MIHET**
10-12.00	**Tema 2**: Proiecte de succes. Optimizare multi-vectoriala a surselor regenerabile in vederea asigurării securității energetice	**Dr. ing. Dorin LET**
12.00-12.30	Coffee brake	
12.30-15	**Tema 3:** Sisteme de irigații alimentate de sistemele de conversie a energiei solare fotovoltaice. Studii de caz	**Dr. ing. Dorin BORDEASU**
15.00-15.30	Last remarks, next steps and conclusion	**Lucian Mihet**

Iceland Liechtenstein Norway grants
Innovation Norway
Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the Energy Programme Romania.

TEMA 1: Interactive and smart buildings

Abstract 1: Energy transition, Energy Efficiency, Eco-Design, Energy Performance.

Demand Response (DR) vs Demand-Side Management (DSM); Decarbonization-Decentralization-Digitalization in Smart Buildings; Building Energy Management Systems and Interactive Buildings.

TEMA 2: **Green manufacturing designed and developed as a microgrid system with PV generation and storage solutions**.

Abstract 2: Case study: energy security combined with green manufacturing in a synergetic and efficient way. Electronics manufacturing facility powered by rooftop PV with storage, minimizes production costs and empowers energy efficiency through EMS integration.

(Studiu de caz: securitatea energetică combinată cu producția ecologică într-un mod sinergetic și eficient. Unitate industriala de producție alimentată de panouri solare cu solutii de stocare, minimizează costurile de producție și sporește eficiența energetică prin integrarea EMS.)

TEMA 3: **Sisteme de irigații alimentate de sistemele de conversie a energiei solare fotovoltaice (Irrigation systems powered by photovoltaic energy conversion systems)**

Abstract 3: Notiuni introductive despre sistemele de pompare, sisteme de conversie a energiei fotovoltaice, si sisteme de pompare alimentate de sisteme de conversie a energiei fotovoltaice. Simulare sistemului utilizand programul software SISIFO pentru 3 cazuri particulare:

1. Sistem de irigații la presiune constantă cu o singură pompă;
2. Sistem de irigații la presiune și debit variabil;
3. Sistem de irigații la presiune constantă cu 2 pompe;

Softuri care vor fi folosite: Sisifo (https://www.sisifo.info/en/default)

Cunoștințe minime necesare:

- Cunoștințe generale despre mecanica fluidelor și despre turbo-mașini.
- Cunoștințe generale despre electrotehnică și despre mașini electrice și generatoare fotovoltaice.
- Cunoștințe minime în folosirea calculatorului și a unui browser web.

Iceland Liechtenstein Norway grants
Innovation Norway
Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the Energy Programme Romania.

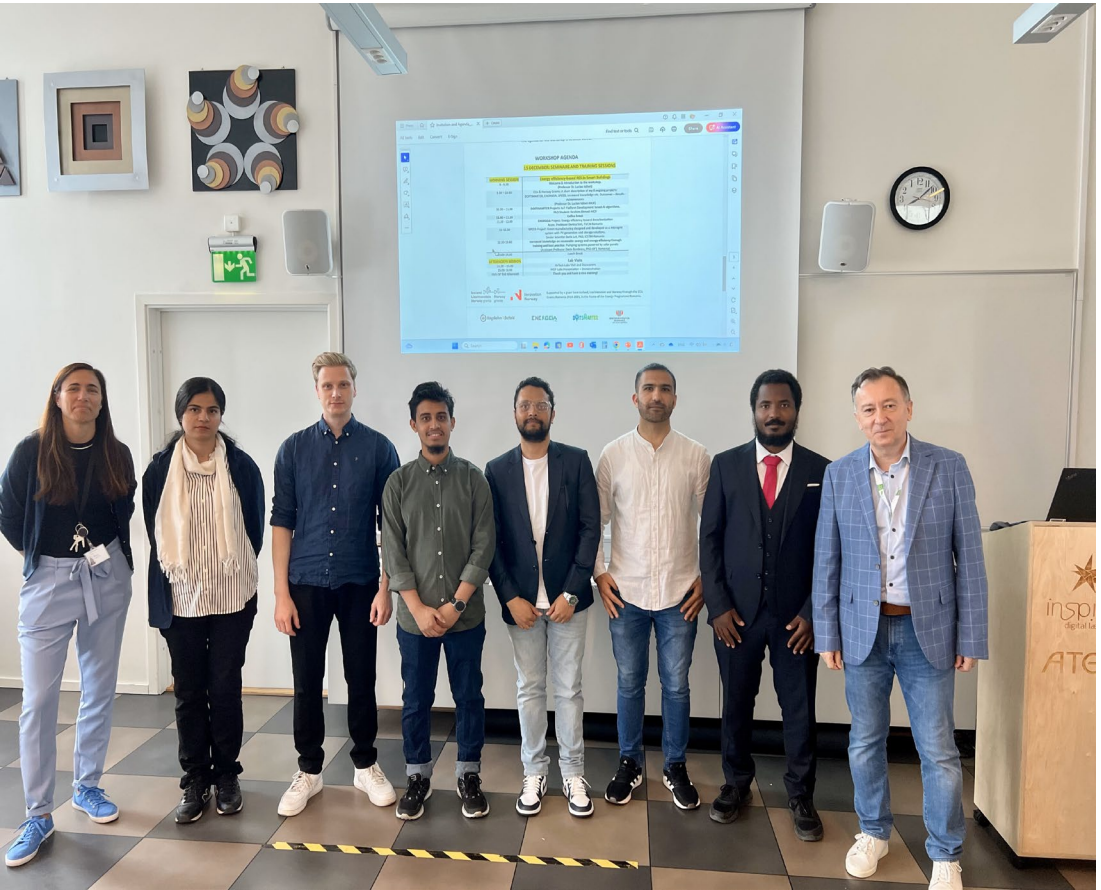
Training session in Buteni commune for people from administration and technical staff







Workshop in Norway for dissemination and networking (15 December 2023)



Høgskolen i Østfold ENERGEIA DOITSMARTER UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA

Workshop for Dissemination of results and Networking with partners from 4 EEA and Norway Grants:

--DOITSMARTER: Design and development of an energy management and control systems with cost-effective solutions for residential and university buildings

--SPEED: Sun Power & Cooperation Fusion for Cheaper Electrical Devices Manufacturing

--ENERGEIA: Empowering Energy Efficiency Awareness through a Holistic Educational Approach

--Increased knowledge on renewable energy and energy efficiency through training and best practice

Topics: Increasing Knowledge and Competences on Renewable Energy and Energy Efficiency during Energy Transition

Date: 15 December 2023

Venue: Østfold University College, Fredrikstad-Norway

Kobberslagerstredet 5, 1671 Fredrikstad

Meeting Room: Smia – S401

Iceland Liechtenstein Norway grants Norway grants

Innovation Norway

Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the Energy Programme Romania.

Dissemination & Networking

- Organized and hosted two workshops with short trainings in Norway (2 days - 26, 27 June & 15 December 2023)
- Workshop and Conference (EPE-ECCE'23) in Aalborg, Denmark with tutorial sessions for dissemination and networking (4-8 September 2023);
- „An IoT communication platform for interactive buildings energy management system", the 9th International Conference on Sensors and Electronic Instrumentation Advances (SEIA' 2023/Madeira), 20-22 September 2023.
- "Cost-optimization in a Microgrid using Deep Reinforcement Learning by utilizing the Energy Storage Systems", SGRE/Qatar - IEEE Conference; https://ieeexplore.ieee.org/document/10428874.
- Dissemination and exploitation of project results (**Denmark, April 2024**) at Aalborg University and DTU.

Dissemination and exploitation of project results (Denmark, April 2024) at Aalborg University and DTU/PowerLabDK











Project 5: March 2023-March 2024

Empowering Energy Efficiency Awareness through a Holistic Educational Approach – ENERGEIA

Budget summary

Partner name	Direct costs	Indirect costs	Co-financing	Grant value	Total budget
PP - TUCN	62496.00	8804.00	10695.00	60605.00	**71300.00**
P1 - ImmPACT	41635.00	4939.00	4657.00	41916.00	**46573.00**
P2 - HIOF	46603.00	6283.00	7937.00	44976.00	**52913.00**
P3 - ACoR	26657.00	2469.00	2913.00	26214.00	**29127.00**
TOTAL	**177391.00**	**22495.00**	**26202.00**	**173711.00**	**199913.00**

Name	Project activities	Project budget
Høgskolen I Østfold / Oestfold University College (HIOF)	**Activity 1: WP1 - Project management** As a partner, HIOF will implement and monitor the actions/ activities agreed with PP.	EUR 4.900
	Activity 2: WP 2 - Upscaling the awareness-raising and trainings in energy efficiency for companies – economic dimension As a WP assistant, HIOF will support the WP leader in actions aimed to achieve all the specific KPIs assumed in the project proposal for the economic dimension. **Task 2.2** – Support TUCN in creation of awareness/ training materials based on their vast experience in the field of renewable energy technologies and energy efficiency for companies. **Task 2.3** - Contributes to training activities within the workshops to increase public awareness on energy savings, renewable energy and energy efficiency for companies.	EUR 6.500
	Activity 3: WP 3 - Upscaling the awareness-raising in energy efficiency for general public – societal dimension As a WP contributor, HIOF will provide actions regarding: **Task 3.2** - Support TUCN in creation of awareness/ training materials based on their vast experience in the field of energy savings and energy efficiency for public bodies at local level. **Task 3.3** – Contributes to training activities within the campaigns/ events to increase public awareness on energy savings, renewable energy and energy efficiency for public bodies at local level.	EUR 6.500
	Activity 4: WP 4 – *Increasing knowledge and competence-building for students and energy professionals – educational dimension* As a WP assistant, HIOF will support the WP leader in actions aimed to deliver the actions and achieve all the specific KPIs assumed in the project proposal for the educational dimension. As a WP contributor HIOF will provide actions regarding: **Task 4.1 –** Organizing best practices training in Norway **Task 4.2 -** Contributes to training activities within the postgraduate course for staff with responsibilities in energy management in companies and local public authorities **Task 4.3 –** Design and deliver trainings in frame of the summer school **on** Green Energy Transition **Task 4.4 –** Contribution to comprehensive training for energy professionals "Sustainable integration of energy efficiency in strategic planning"	EUR 22.730
	Activity 5: WP 5 – Project communication, dissemination and sustainability As a WP leader, HIOF will lead the elaboration of the dissemination and communication plan and will provide actions related to: **Task 5.1** Development of dissemination material **Task 5.2** Development and implementation of dissemination and communication strategy **Task 5.3** Participating to specific events (conferences, workshops, presentations, fairs or others) in the field of renewable energy, energy efficiency, energy transition and digitalization of energy **Task 5.4** Plan for sustainability	EUR 6.000

Project activities	Project budget

Project partners-Consortium

- Technical University of Cluj-Napoca: PP
- SME’s Association-IMMpact: P1
- Østfold University College: P2
- Association of communes from Romania-AcoR: P3





Kick-off meeting: April 3, Cluj-Napoca

On Monday, April 03-2023, the kick-off meeting of the project "Empowering Energy Efficiency Awareness through a Holistic Educational Approach (ENERGEIA)" took place in Cluj-Napoca, funded with the support of grants awarded by Iceland, Liechtenstein, and Norway through the Financial Mechanism of the European Economic Area 2014-2021, under the "Energy Program in Romania". The total budget of the project is 199,987.00 euros, of which the granted amount is 169,987 euros.

Financing source:
EEA and Norwegian Financial Mechanisms
Energy Programme in Romania
Focus area: **Awareness & Education**

ENERGEIA - Empowering Energy Efficiency Awareness through a Holistic Educational Approach



Main objective:

ENERGEIA aims to increase the level of desirability and knowledge on renewable energy and energy efficiency in a holistic approach based on three dimensions: *1) economic (companies), 2) social (general public)* and *3) educational (tomorrow's energy professionals).*

- ***HIOF's role in the project:*** support in creation of awareness/ training materials; organizing best practices training in Norway; as a WP5 leader, HIOF will lead the elaboration of the dissemination and communication plan; as a WP2 assistant will support the WP2 leader in actions aimed to achieve all the specific KPIs of the project. It will support TUCN in creation of awareness/ training materials in WP3, as well as will design, contribute and deliver trainings in WP2/WP3 & WP4.

Consortium Partners:

WP2: Economic Dimension (*HIOF-WP assistant*)

HIOF Contributions (SMEs):

Objective: The consortium will support IMMPact in actions aimed to achieve specific KPIs

- Task 2.2 – Support TUCN in creation of awareness/ ***training materials*** in the field of ***renewable energy technologies*** and ***energy efficiency*** for companies (June-July). **DONE**

- Task 2.3 - Contributes to ***training activities within the workshop (2 days training-July 4-5)*** to increase public awareness on ***energy savings***, ***renewable energy*** and ***energy efficiency*** for companies. **DONE**
- **Deliverables: 2 newsletters (August-September); DONE**

WP3: Societal Dimension (HIOF-WP contributor)

HIOF Contributions:

- **Task 3.2 - Support TUCN in creation of awareness/ training materials in the field of *energy savings* and *energy efficiency* for public bodies at local level. (May-July), DONE**

- **Task 3.3 – Contributes to *training activities* within the campaigns/ events to increase public awareness on energy savings, renewable energy and energy efficiency for public bodies at local level (Sibiu, July 4-5). DONE**

- **Deliverables: 2 newsletters (September-October 2023); DONE**

WP3-Societal Dimension: *training activities* within the campaigns/ events to increase public awareness on energy savings, renewable energy and energy efficiency for public bodies at local level (Sibiu-Romania, July 3-5).

UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA | EUT+ EUROPEAN UNIVERSITY OF TECHNOLOGY | Høgskolen i Østfold | A.Co.R. 1997 | IMMpact

Training Session on Energy Transition & Renewable Energy Storage

Energy Transition Readiness Index

Indicele de pregătire/conștientizare pentru tranziția energetică

Contents of my presentation

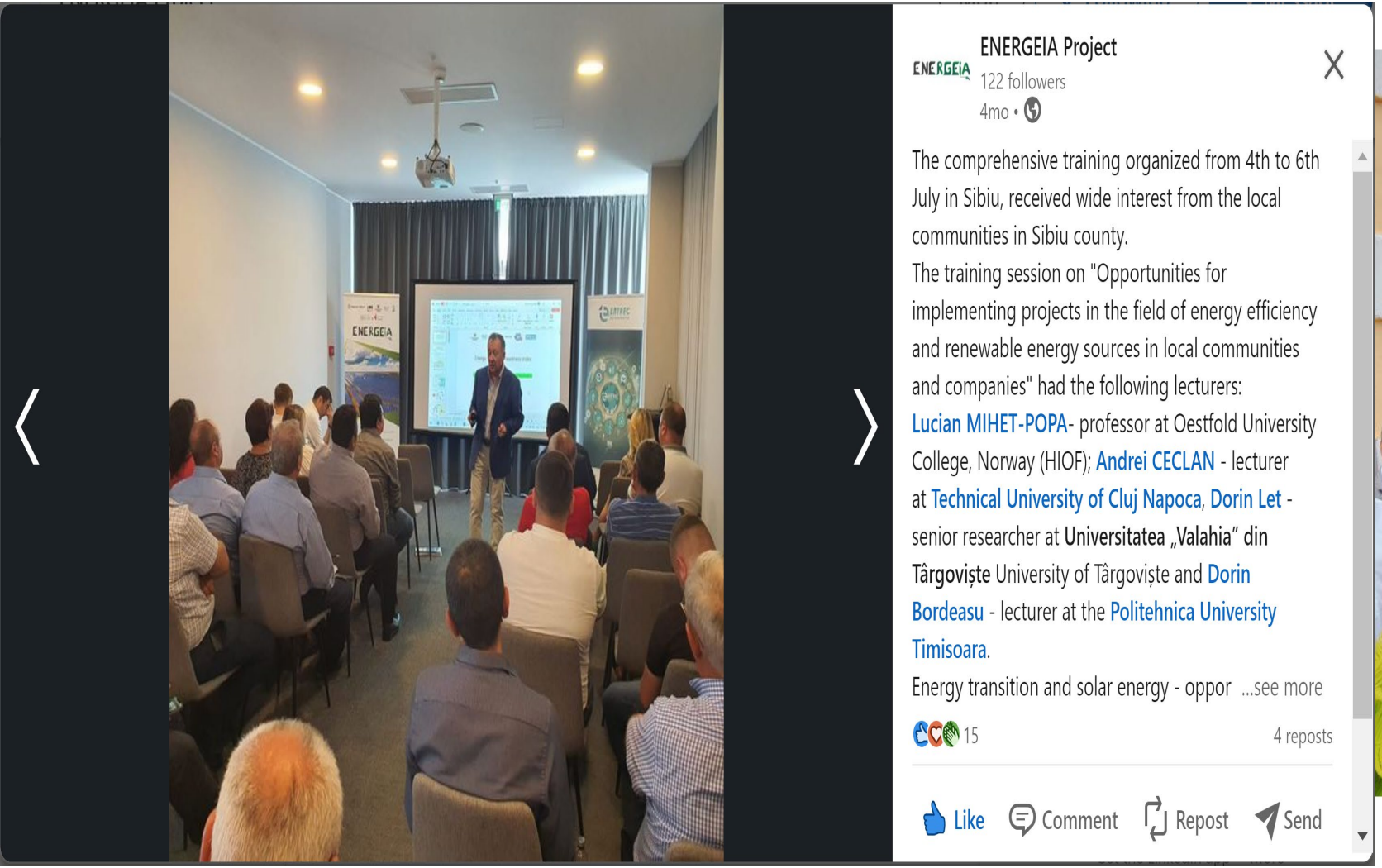
First day-Energy Transition & Renewable Energy Storage

- Energy Transition – **Old vs new energy systems -** It's time to get real
- Green Deal & Circular Economy
- Tranziția la net zero
- Tranziția energetica la nivel național si european
- What is driving the need for smarter buildings
- The EU main directives concerning buildings and the transition to a more sustainable future

Second day-Microgrids/Smart Grids & Energy Storage Systems

- 7 Key Technology areas in Smart Grids
- Microgrids and MGs Components
- MG Control structures and Energy Management
- Energy Storage Systems vs Battery Storage Systems
- Battery Management Systems
- Applications for Storage systems

WP3-Societal Dimension: *training activities* within the campaigns/ events to increase public awareness on energy savings, renewable energy and energy efficiency for public bodies at local level (Sibiu, July 3-5).





WP4: Educational Dimension (HIOF-WP assistant leader)

HIOF Contributions:

- **Task 4.1 – Organizing best practices workshops with training activities, in Norway (26-28 June 2023, 15 December); DONE**
- **Task 4.2 - Contributes to training activities within the postgraduate course for staff with responsibilities in energy management in companies and local public authorities (online), November/ December 2023**
- **Task 4.3 – Design and deliver trainings in the frame of summer school on *"Green Energy Transition" (11-13 October 2023 – at UTCN); DONE***
- **Task 4.4 – Contribution to comprehensive training for energy professionals "Sustainable integration of energy efficiency in strategic planning", 3 trainings for 3 days each (October/December)**

Task 4.3 – Design and deliver trainings in the frame of summer school on *Green Energy Transition (11-13 October 2023 – at UTCN)*

Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the Energy Programme Romania.

Energy Programme in Romania, Focused area: **Renewable energy and Energy Efficiency** - EEA AND NORWAY GRANTS FROM INNOVATION NORWAY

„Empowering Energy Efficiency Awareness through a Holistic Educational Approach - (ENERGEIA)"

ENERGEIA

Sesiune Training- Curs de vară/toamnă

11-12 Octombrie 2023 – Universitatea Tehnica, Cluj-Napoca

Programe software utilizate (necesare):

1) **MATLAB-Simulink-Simscape**: https://se.mathworks.com/products/new_products/latest_features.html?s_tid=aom_newgravailable_R2022b
2) **SISIFO**: https://www.sisifo.info/en/DataInput
3) **PVSOL**: https://pvsol.software/en/
4) **Ipump de la Caprari** (https://ipump.caprarinet.net – necesită creare cont)

OBS: Diferite materiale ajutătoare, tutoriale, exemple, vor fi puse la dispoziția studenților, cercetătorilor, personalului interesat de subiectele prezentate cu o săptămâna înaintea evenimentului

Ziua 1:

TEMA 1: Noțiuni de baza despre modelare si simulare

--modelarea sistemelor dinamice; tehnici de modelare, optimizare si simulare

--descrierea unor aplicații si tooluri dedicate analizei, prelucrării si filtrării datelor;

--Simulink si Simscape. Prezentare biblioteci si exemple

TEMA 2: Noțiuni introductive despre energia solara si sistemele fotovoltaice

--Noțiuni generale; Elemente componente; Soluții si aplicații ale surselor regenerabile

--Metode si tehnici de modelare, comanda si control

TEMA 3: Proiectarea sistemelor fotovoltaice ongrid si offgrid

(Design of PV systems with storage); CSII. Dr. ing. Dorin LET, (let.dorin@icstm.ro)

Seminarul 1: Sisteme de conversie a energie fotovoltaice (30 minute)

- Prezentare trainer/speaker;
- Introducere in mediul de simulare PVSOL;
- Sisteme de conversie a energiei fotovoltaice;

Seminarul 2: Dimensionarea și Simularea instalației solare utilizând programul software PVSOL (2:30 ore)

1. Dimensionarea generatorului fotovoltaic;
2. Dimensionarea sarcinilor;
3. Proiectarea generatorului fotovoltaic;
4. Modelarea si simularea generatorului fotovoltaic.

AGENDA TRAINING

	ZIUA 1	Trainer/Speaker
9-9.15	Prezentarea sesiunii de training	**Prof. Lucian MIHET**
9.15-10.00	Tema 1: Noțiuni de baza despre modelare si simulare	**Prof. Lucian MIHET**
10-10.45	Tema 2: Notiuni introductive despre energia solara si sisteme fotovoltaice	**Prof. Lucian MIHET**
10.45-11.00	Coffee brake	
11-11.30	Tema 3-Seminarul 1	**Dr. ing. Dorin LET**
11.30-13.30	Tema 3-Seminarul 2	**Dr. ing. Dorin LET**
13.30-14.00	Lunch brake	
14.00-14.30	Tema 4-Seminarul 1	**Dr. ing. Dorin BORDEASU**
14.30-17.00	Tema 4-Seminarul 2	**Dr. ing. Dorin BORDEASU**
	Sfârșitul sesiunii	

Task 4.3 – Design and deliver trainings in the frame of summer school on *Green Energy Transition (11-13 October 2023 – at UTCN)*







Høgskolen i Østfold ENERGEIA DOITSMARTER UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA

DOITSMARTER

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

Energy Programme in Romania
Focus area: Research & Development

Energy Programme in Romania, Focused area: Renewable Energy: Call 3 RES, Other renewable resources: Project number:2019/104287, Applicant name: SC AMIRAS C&L IMPEX SRL, Project name: *Sun Power cooperation fusion for cheaper Electrical Devices manufacturing – SPEED*

ENERGEIA

Empowering Energy Efficiency Awareness through a Holistic Educational Approach-ENERGEIA

Focused area: **Renewable energy and Energy Efficiency**

EEA AND NORWAY GRANTS FROM INNOVATION NORWAY

Iceland Liechtenstein Norway grants Norway grants Innovation Norway

Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the Energy Programme Romania.

Høgskolen i Østfold ENERGEIA DOITSMARTER UNIVERSITATEA TEHNICĂ DIN CLUJ-NAPOCA

Workshop for Dissemination of results and Networking with partners from 4 EEA and Norway Grants:

--DOITSMARTER: Design and development of an energy management and control systems with cost-effective solutions for residential and university buildings

--SPEED: Sun Power & Cooperation Fusion for Cheaper Electrical Devices Manufacturing

--ENERGEIA: Empowering Energy Efficiency Awareness through a Holistic Educational Approach

--Increased knowledge on renewable energy and energy efficiency through training and best practice

Topics: Increasing Knowledge and Competences on Renewable Energy and Energy Efficiency during Energy Transition

Date: 15 December 2023

Venue: Østfold University College, Fredrikstad-Norway

Kobberslagerstredet 5, 1671 Fredrikstad

Meeting Room: Smia – S401

Iceland Liechtenstein Norway grants Norway grants Innovation Norway

Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the Energy Programme Romania.

WORKSHOP AGENDA

15 DECEMBER: SEMINARS AND TRAINING SESSIONS

MORNING SESSION	Energy efficiency-based RES in Smart Buildings
9 - 9.10	Welcome & Introduction to the workshop. (Professor Dr. Lucian Mihet)
9.10 – 9.50	**EEA & Norway Grants**: A short description of my 8 ongoing projects: DOITSMARTER, ENERGEIA, SPEED, Increased Knowledge etc. Outcomes – Results - Achievements **(Professor Dr. Lucian Mihet-HIOF)**
9.50-10.10	**Horizon Europe SNUG Project**: Innovative methodology based in circular economy and AI to foster the transition to sustainable and very high energy performance buildings at a cost optimal level; **Assoc. Prof. Susana Garcia Sanfelix-HIOF**
10.10-10.30	EEA & Norway Grants at HIOF, Research Projects and Network Partners **Harald Holone, Dean** Faculty of Computer Science, Engineering and Economics
10.30 – 10.50	**DOITSMARTER** Projects: IoT Platform Development based AI algorithms. PhD Student: Ibrahim Ahmed-HIOF
10.50-11.00	EMCS, **John Breiland, NxTech**-Norway

Supported by a grant from Iceland, Liechtenstein and Norway through the EEA Grants Romania 2014-2021, in the frame of the Energy Programme Romania.

11.00 – 11.30	**Coffee break**
11.30 - 12.00	**ENERGEIA** Project: Energy efficiency toward decarbonization **Assoc. Professor Denisa Stet**, Technical University of Cluj-Napoca/TUCN-Romania
12-12.30	**SPEED** Project: Green manufacturing designed and developed as a microgrid system with PV generation and storage solutions. **Senior Scientist Dorin Let**, PhD, ICSTM-Romania (Institute of Multidisciplinary Research for Science and Technology from Valahia University of Targoviste)
12.30-13.00	**Increased knowledge on renewable energy and energy efficiency through training and best practice**: Pumping systems powered by solar panels **(Assistant Professor Dorin Bordeaşu**, PhD; University Politehnica Timisoasa/UPT, Romania)
13.00-14.00	Lunch Break
AFTERNOON SESSION	**Lab Visits and Demonstration**
14.00 – 15.00	**NxTech** Labs Visit and Discussions-Dokka 6, Fredrikstad, https://www.nxtech.no/
15.00-16.00	HIOF Labs Presentation + Demonstration
END OF THE SEMINAR	**Thank you and have a nice evening!**

Workshop speakers 15 December 2023











Workshop with training sessions, networking and field visits in Norway-26-28 June 2023

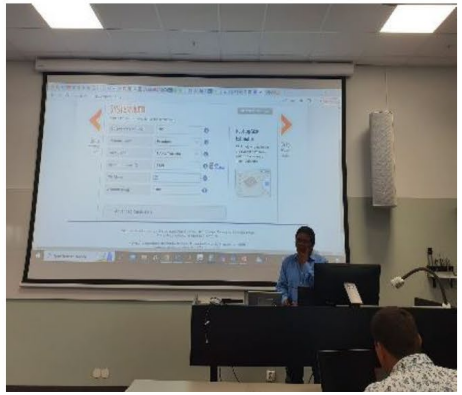












WP5: Communication, Dissemination & Sustainability (HIOF-WP leader)

WP Objective: HIOF ***will lead the elaboration of the dissemination and communication plan*** and will provide actions related to:

- **Task 5.1**: Development of dissemination materials, webpage, podcasts, newsletters; **DONE**
- **Task 5.2**: Development and implementation of dissemination and communication strategy plan;
- **Task 5.3**: Participating to specific events (conferences, workshops, presentations, fairs or other relevant activities) in the field of renewable energy, energy efficiency, energy transition and digitalization of energy:
  - Energy Future in Industry 2023, Goteborg (May 8-11): Awareness event- **DONE**
  - EnergyVille-Genk, Belgium (June 19-20), **DONE**
  - Participating in a special session & present a paper in an IEEE conference/SGRE'24
- **Task 5.4**: Plan for sustainability

Task 5.1: Development of dissemination materials, webpage, podcasts, newsletters;

List of newsletters for ENERGEIA projects:

- **Newsletter no. 1** (September 2023): Solar PV Systems and Their Applications
- Buletin informativ nr. 1 (Septembrie 2023): Sisteme Solare Fotovoltaice si Aplicatiile lor
- **Newsletter no. 2** (September 2023): Modelling, Simulation, Control and Validation of Isolated Pumping Systems Powered by Photovoltaic Energy Conversion Systems
- Buletin informativ nr. 2 (Septembrie 2023): Modelarea, Simularea, Conducerea/Controlul si Validarea Sistemelor Izolate de Pompare Alimentate de Sisteme de Conversie a Energiei Fotovoltaice
- **Newsletter no. 3** (October 2023): Modelling, Simulation and Control of Isolated Pumping Systems Powered by Wind Energy Conversion Systems
- Buletin informativ nr. 3 (Octombrie 2023): Modelarea, Simularea si Conducerea/Controlul Sistemelor de Pompare Izolate Alimentate de la sisteme de Conversie a Energiei Eoliene
- **Newsletter no. 4** (October 2023): Electric Vehicles Integration in Smart Grids
- **Newsletter no. 5** (November 2023): Successful projects on RES and Energy Efficiency in EEA & Norway Grants in the frame of the Energy programme Romania
- **Newsletter no. 6** (November 2023): Smart solutions for building monitoring and control systems
- **Newsletter no. 7** (December 2023): Building Energy Management System Solutions for Interactive Buildings in Smart Grids

Task 5.2. Plan for dissemination and communication of the project results

Objectives:

- Disseminate the scientific project outcome to the right target groups (e.g. Start-up companies, SMEs)
- Exchange experience and knowledge in the field of RES and EE with industry and international organizations
- Create a strong project image and establish the right dissemination tools (e.g. website, flyers, podcasts, newsletters, etc.)
- Ensure that the outputs of the project are taken up and extended after the end of the project
- Get feedback on the project activities from local partners and industry

Plan for dissemination and communication of the project results

- ***Channel 1) Public media: The project partners*** will set up a web-page with an online collaboration platform, project flyer and poster, and will participate in relevant European (national & international) events

- ***Channel 2) Information exchange with similar European and international projects:***

- ***Channel 3) Discussion with targeted stakeholder groups and networks (including general public):*** These activities will increase the project impact, by fostering a culture of cooperation between research infrastructures, grid operators and scientific communities. Therefore, meetings and workshops with various stakeholder groups are foreseen in the project.

- ***Channel 4) Scientific dissemination:*** This channel covers the dissemination of the project results within the research community. ENERGEA will publish its research results in the relevant scientific conferences and open-access journals

- **Communication Strategic Plan**:
  - **A. Use of standard communication tools: Website, Social media, Press releases**
  - **B. Specific individual activities based on identified target audiences**

Activities, Tasks and Events

- Kick-off meeting: 3rd of April/Cluj-Napoca
- Activities 2/WP2: T2.2 Creation of training materials (TUCN+HIOF), Creation of newsletters (IMMPact+HIOF), **Short training** (2 days) for companies (SMEs): 4-5 July
  - Tasks 2.3: Participating to specific awareness events – 8-12 May (week 19), Energy Future in Industry 2023 in Gothenburg; **>100 participants**
- Activities 3/WP3: T3.2 Creation of training materials (TUCN+HIOF), T3.3 Train and build competences for the decision makers and local public authorities (**2 short trainings: July 4-5 in Sibiu & online in November/December**)
  - Tasks 3.3: Participating to specific awareness events: EnergyVille-Genk, Belgium (June 19-20)
- Activities 4/WP4: **Training activities** for a postgraduate course on *Sustainable integration of energy efficiency in strategic planning* and a **summer school** at TUCN on *Green Energy Technology* for increasing knowledge and competences for students and energy professionals (Cluj-Napoca, 11-13 October); **>100 students**
- Activities 5/WP5:
  - Task 5.3 [SGRE/IEEE Conference, Qatar + SEIA'23, Madeira)
  - Submit/publish 2/3 research papers
  - Create synergy with other projects and network partners (workshops in Norway, presenting posters at different events and conferences, organizing a special session in a Conference)

Disbursement Plan

- **30 June 2023** (First disbursement-Financial and interim report)
- **30 September 2023** (Second disbursement-Financial and interim report)
- 31 December 2023 (Third disbursement-Financial and interim report)
- **30 June 2024** (Final technical report and Financial report)

Project 6: Mobility for students and staff on circular economy

- **One-week visits** (2 professors coming to Fredrikstad): 13-17 March (DONE)

- **One-week visits** (10 professors coming to Fredrikstad): 29.05—2.06 May/June (DONE)
  --Seminars + Round table discussions
  --Short visits at strategic partners
- **3 students coming to HIOF** in fall semester (autumn 2023) to attend 3 courses (DONE):

-- IRMGR40118 Adapting Technology to the Circular Economy/10 ECTS

-- IRMGR40218 Renewable Energy/ 10 ECTS

-- IRMGR40318 Materials for Energy Technology/ 10 ECTS

--IRMGR4211 Smart Grids Applications and Technology

Østfold University College partners from Romania in EEA and Norway Grants

Municipalities:

- Municipality Hall of Cluj-Napoca City
- Municipality Hall of Alba-Iulia City
- County Council of Arad
- Municipality Hall of Sfântu Gheorghe Town

SMEs:

- SC AMIRAS C&L Impex SRL
- SERVELECT SRL
- Energotrust SRL
- NxTech AS (Norway)
- Høiax AS (Norway)

Technical Universities:

- Technical University of Cluj-Napoca
- POLITEHNICA University of Timisoara
- Technical University of Iasi
- Valahia University of Targoviste
- “Aurel Vlaicu” University of Arad
- Vasile Alexandri University of Bacau

Project Partner: Østfold University College (HiOF)

- Located in Norway, in Fredrikstad and Halden;
- 6 Faculties, 25 Bachelor programs, 15 Master programs
- Provides education to approx. 7000 students and has around 667 staff members.

- **Research group activities**: in the area of Energy Technology, Smart Grid integration of renewable energy sources, energy efficiency, storage systems and electric vehicles, as well as artificial intelligence, big data analysis and machine-learning.
- HIOF Team Members
  - PM: Prof. Dr. Eng. Lucian Mihet
  - Prof. Nand Kishor, Assoc. Prof. Manikandan;
  - PhD students: Ibrahim Ahmed
  - Lab assistants: Master students-Amina, Robert, Fayzul

  - Two Lecturers and Researchers: Dorin Let-ICSTM & Valahia University of Targoviste, Dorin Bordeasu-University Politehnica Timisoara

Conclusions and outcomes related to the ongoing projects

- We were granted 8 EEA & Norway Grants with a total budget of more than 4 million Euro and one Horizon Europe (2.4 mill. Euro).
- We organized **2 workshops** in Fredrikstad (June & December) with more than 60 people for dissemination and networking
- We were visited for two weeks by more than ***20 professors from 5 universities*** and research centers with staff mobility for research and training
- I brought 6 students for one semester from 2 universities in Romania, only last year (2023)
- We trained more than **150 people and 150 students**, during **6 training sessions**
- We delivered ***10 interim and financial reports***, ***7 newsletters***, and published more than 10 papers for these projects

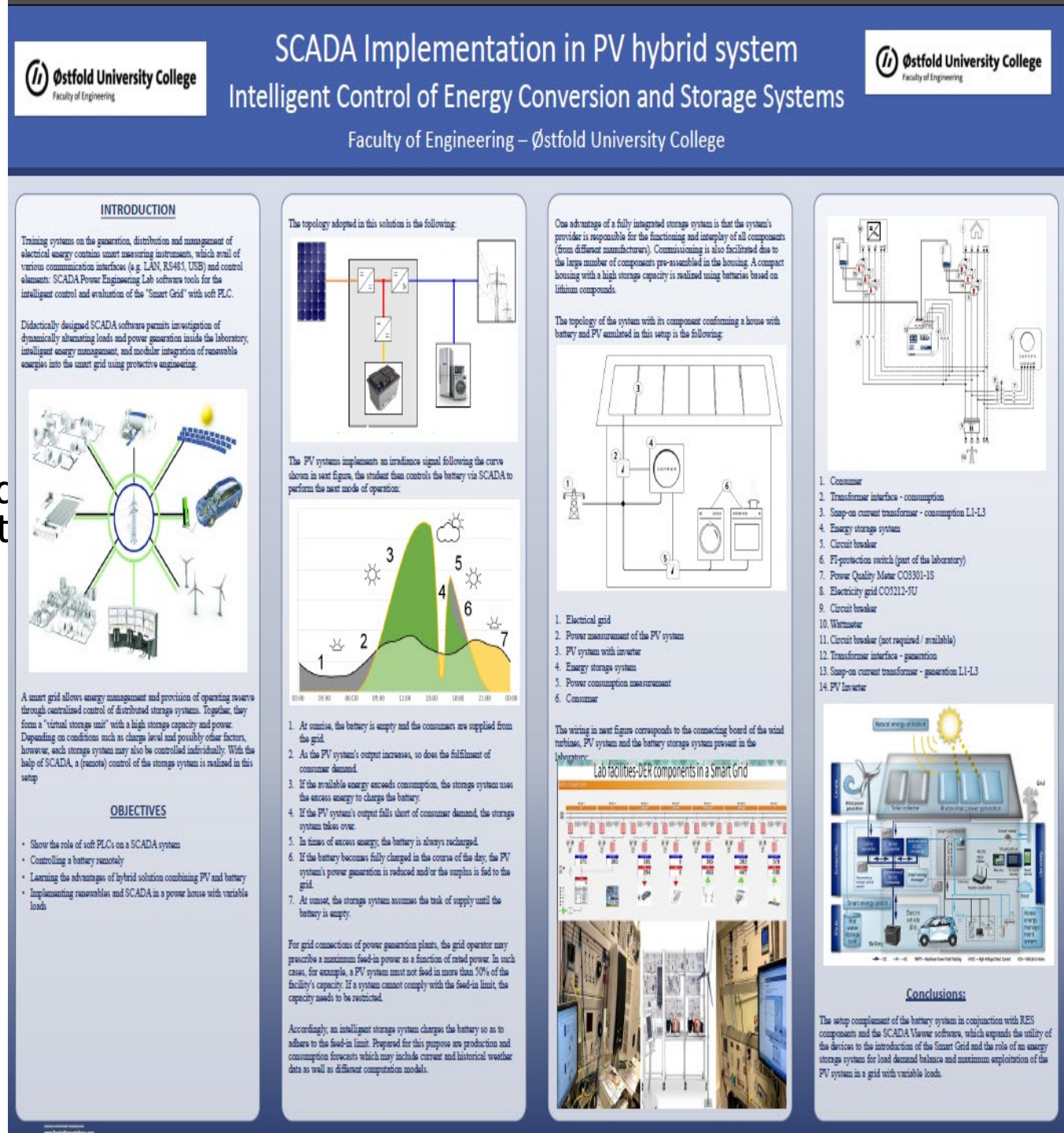
HIOF's main role and contribution

Research and Development conducted by our research group

- Development of simulation models, algorithms and tools/apps-based on AI, ML, SL, RL;
- Design, development and testing of IoT communication platforms for BEMS;
- Validation of low-cost and effective solutions and tools for BEMS in a real environment/Demo Pilot for control and monitoring;

Dissemination and exploitation of the research results

- Organization of **workshops** in Norway to promote the project objectives, solutions and measures which must be consider for energy efficiency increasing;
- **Conference and networking, exhibition, trainings** for target groups.



Intelligent control of energy conversion and storage systems research group. Teaching and research lab

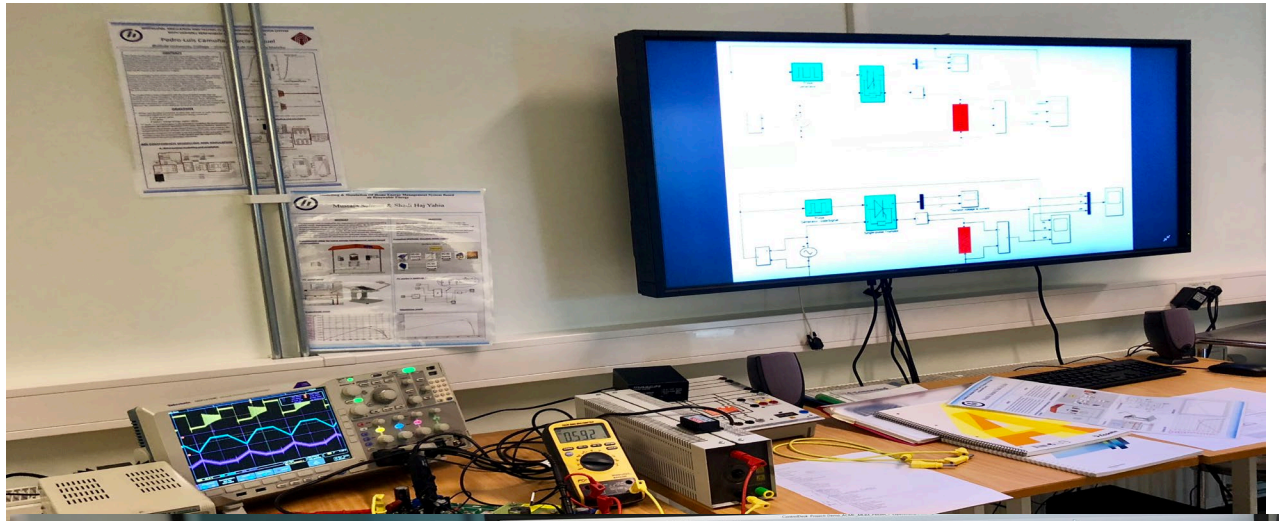
- Research group members: Norway, Denmark, Sweden, Finland, Germany, Italy, Spain, Greece, Romania
- https://www.hiof.no/iio/ing/english/research/groups/intelligent-control-of-energy-conversion-and-stora/index.html
- Research and teaching labs: The lab is dedicated for teaching and research in connection with Master Program "Green Energy Technology", but can also be use by Researchers and PhD students
- The lab is equipped with state-of-the-art and new technology (software and hardware) regarding electric power engineering, power electronics, renewable power generation and Smart MicroGrids;
- https://www.hiof.no/iio/ing/english/research/groups/intelligent-control-of-energy-conversion-and-stora/research_lab_presentation.pdf

- Master Program "Green Energy Technology", Admission deadline-1 March
- I was visited by 16 students from Romania, Italy and Spain (with an Erasmus scholarships for 3/6 months) + 20 Professors and Researchers

Setups and trainers

- It contains >10 setups/trainers with Renewable Energy Sources (PV, WT), Energy Storage Systems and Power Electronics Converters for Electric Drives applications, Energy Efficiency in Smart Buildings and Smart Grids, as it is shown in Figs below.







Smart Grid and Micro Grid Setups

Smart Grid

Smart Grid – Control Centre – Energy Management

This equipment set forms the core for a smart grid in a power generation lab. In addition to generation, transmission and distribution of energy, the SCADA software records all relevant values and handles the requisite switching operations. This can be done manually or automatically by means of SoftPLC software. Energy feeds from generating sources and changes in load are recorded by the smart grid control centre and the requisite actions taken to keep the power grid balanced.



Optional supplementary sets are also available for the smart grid:
- Professional photovoltaics (EPH3)
- Wind power plants (EWG1)
- Pumped-storage power plant (EUG3)
- Transformers (EUT)
- Power transmission (EUL)
- Power protection (ELP)
- HVDC direct current transmission (EDC1)
- Power generation (EUG)

Example experiment "Smart grid: Generation, distribution, transmission and management of electrical power, ESG1"

Training contents
- Three-phase busbar systems
- Investigation of three-phase transmission lines
- Overcurrent-time protection for transmission lines
- Complex consumers, measurement of power consumption and monitoring of peak load
- Manual and automatic reactive power compensation
- Load management – demand side management
- Intelligent control of generators and consumers

Microgrid

Parallel Operation of Stand-alone Networks/Microgrids

When an off-grid network is coupled to a smart grid it is referred to as a microgrid. Such a grid has three different operating modes: on-grid, off-grid and dual mode. A microgrid features the following benefits:

- Reduction of transmission and transformer losses
- Independence from large power suppliers (utilities)
- Smart grid as back-up system
- Intelligently controlled power supply and consumption thanks to SCADA
- Power generation with renewable energy sources
- Optimum electrical power quality, reliability and sustainability

Microgrids are playing an ever more prominent role in the smart grids of tomorrow.



Optional supplementary sets are also available for the stand-alone Microgrid:
- Professional photovoltaics (EPH3)
- Wind power plants (EWG1)
- Pumped-storage power plant (EUG3)
- Dynamic consumers (EUC2)

Example experiment "Parallel operation of stand-alone networks with two generators" EMG2

Training contents
- Control of multiple generators in a stand-alone network
- Control of multiple generators in parallel generation mode
- Coordination of energy needs and generating capacity in stand-alone networks.
- Use of modern information technology such as networked sensors/actuators, PLC control and the SCADA operating environment
- Smart metering of a "slack bus" to make a sub-network autonomous.
- Manual control
- Voltage control
- Frequency control
- Torque control
- Power factor (cos phi) control
- Droop control

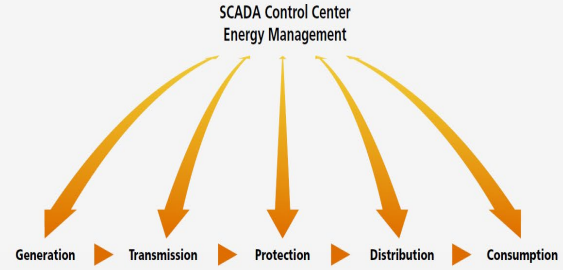
Smart Grids

The Networked Power Engineering Laboratory

These equipment sets allow training systems covering the generation, transmission and management of electrical energy as well as the protective equipment required to be combined, both electrically and by means of computer networks. All relevant values can be measured via the smart grid control centre and the necessary switching operations undertaken. This makes it possible to study the influence of renewable energy generation in laboratories. A host of scenarios can be emulated, such as the following:

- Charging of electric cars when there is a surplus of wind energy
- Storage of excess energy in pumped-storage hydroelectric plants
- Disconnection of consumers to reduce peak load
- Compensating for energy deficits by means of pumped-storage hydroelectric power

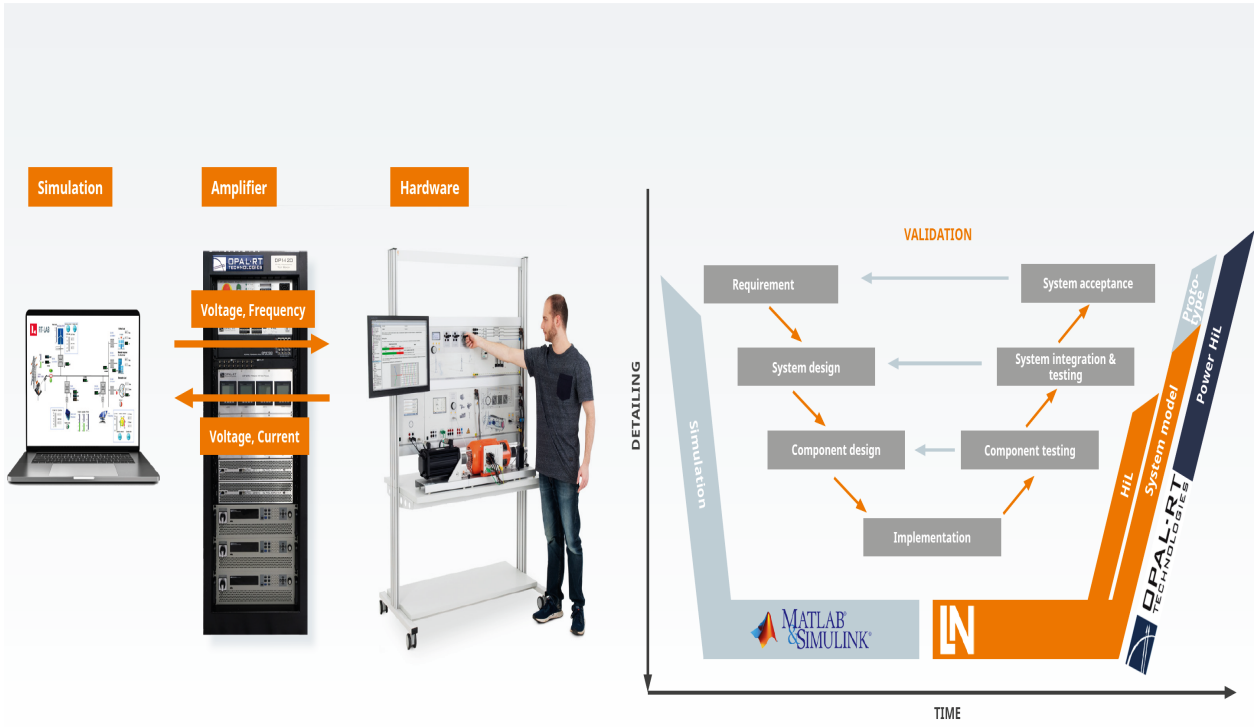
The SCADA software allows the whole system to be observed or controlled from any work station





Next steps and setups for Smart Grids

POWER-HARDWARE-IN-THE-LOOP (PHIL)



Note: This image has been significantly simplified

Power-Hardware-in-the-Loop (PHIL)
PHIL is an expansion of the Hardware-in-the-Loop (HIL) tests, in which the real-time simulation environment is able to exchange power with the DUT (device under test). The DUTs are connected to the simulator via a power amplifier which is controlled by the simulation.

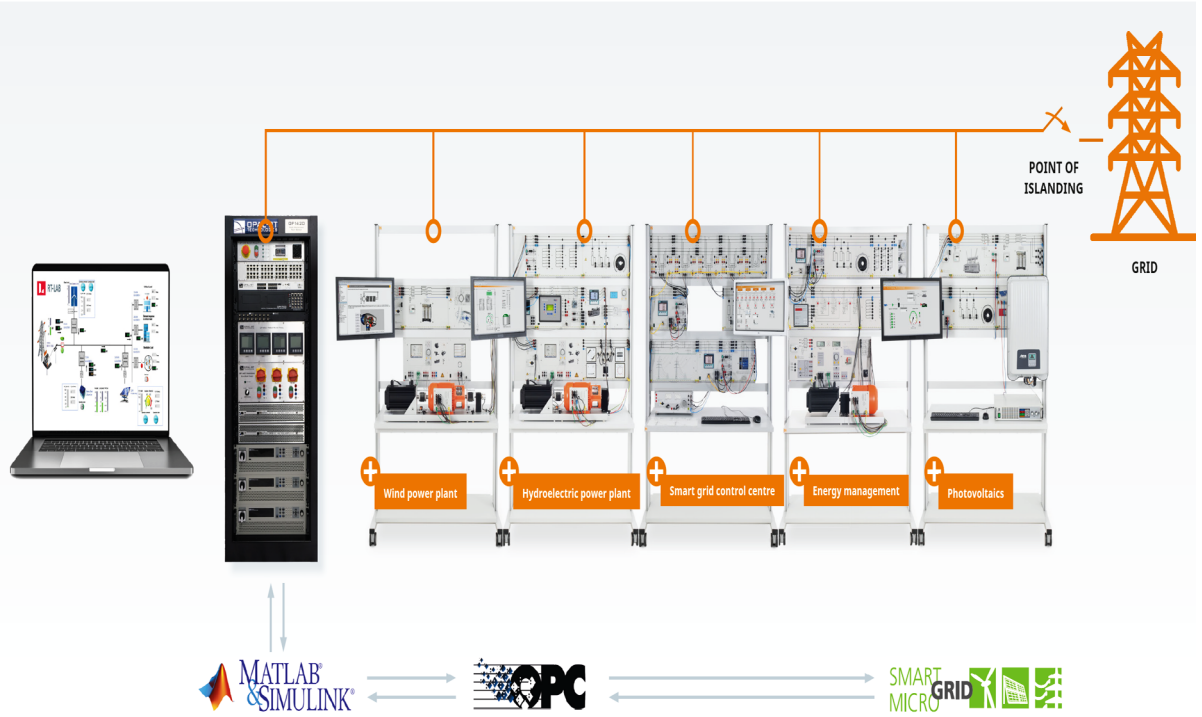
- Fast simulation of power grids, energy sources and distributed energy sources (DER)
- Development of energy systems, power electronics and process control software
- System validation prior to installation into productive systems

Using training systems in the research and development process
Using simulations, many design choices can be made at the very beginning of the development phase. During implementation, these decisions have to be validated for quality assurance purposes.

Benefits with Lucas-Nülle training systems
- Modular system
- Simple configuration
- Rapid prototyping systems / Hardware-in-the-Loop (HIL) with Matlab Simulink
- Smart Grid/Microgrid system models

In conjunction with OPAL-RT
- Power Hardware-in-the-Loop (PHIL)

SMART GRID AND PHIL WITH OPAL-RT



OPAL-RT RT-LAB

Easy to commission and configure parameters in 4 steps



OPAL-RTOP1420 – Power amplifier
- 4Q Power amplifier up to 15 kW
- Innovative soft-switching cell based on SiC transistor technology
- 100% energy recovery, no power losses
- Very high efficiency >96%
- Voltage and current mode
- Up to 10 kHz (-3dB), THD
- Microgrid Simulink Model
- FPGA real-time simulation possible
- Microgrid-grid emulator with busbar and measuring devices
- Safety measurement connections
- Protection against overloading, short-circuit and with temperature monitoring

Lucas-Nuelle Smart Grid – Networked Systems in the Power Engineering Laboratory

Simulation of an entire power supply grid from energy generation all the way to end consumer

- Renewable energies with fluctuating power generation
- Power distribution with transmission lines, transformers and double busbars
- Systems, measurement and protective devices integrated in SCADA
- Centralized evaluation and control using SCADA
- Unlimited potential for design and investigation of smart grids and power systems in the lab

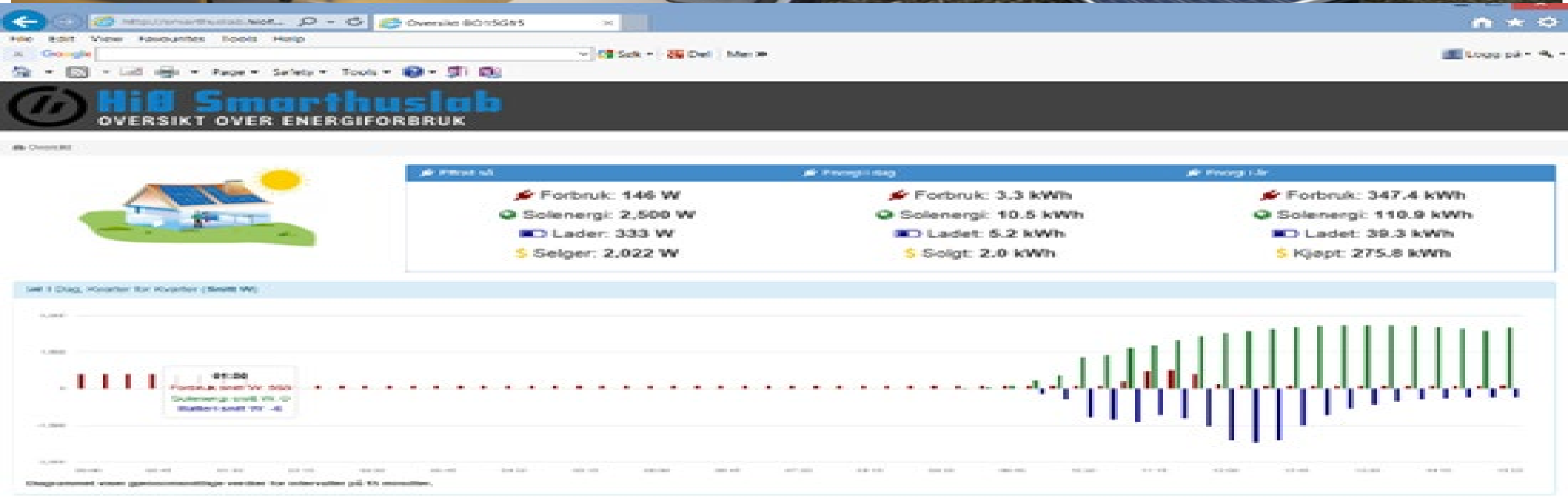
Smart grid and power amplifier

Benefits:
- Realistic training systems for training fundamental principles and applications
- Combination of simulation, real and industrial hardware
- Modular design means rapid configuration and adaptation
- Fast and easy PHIL implementation
- Fault-protected hardware
- Pre-assembled models for fast immersion into PHIL

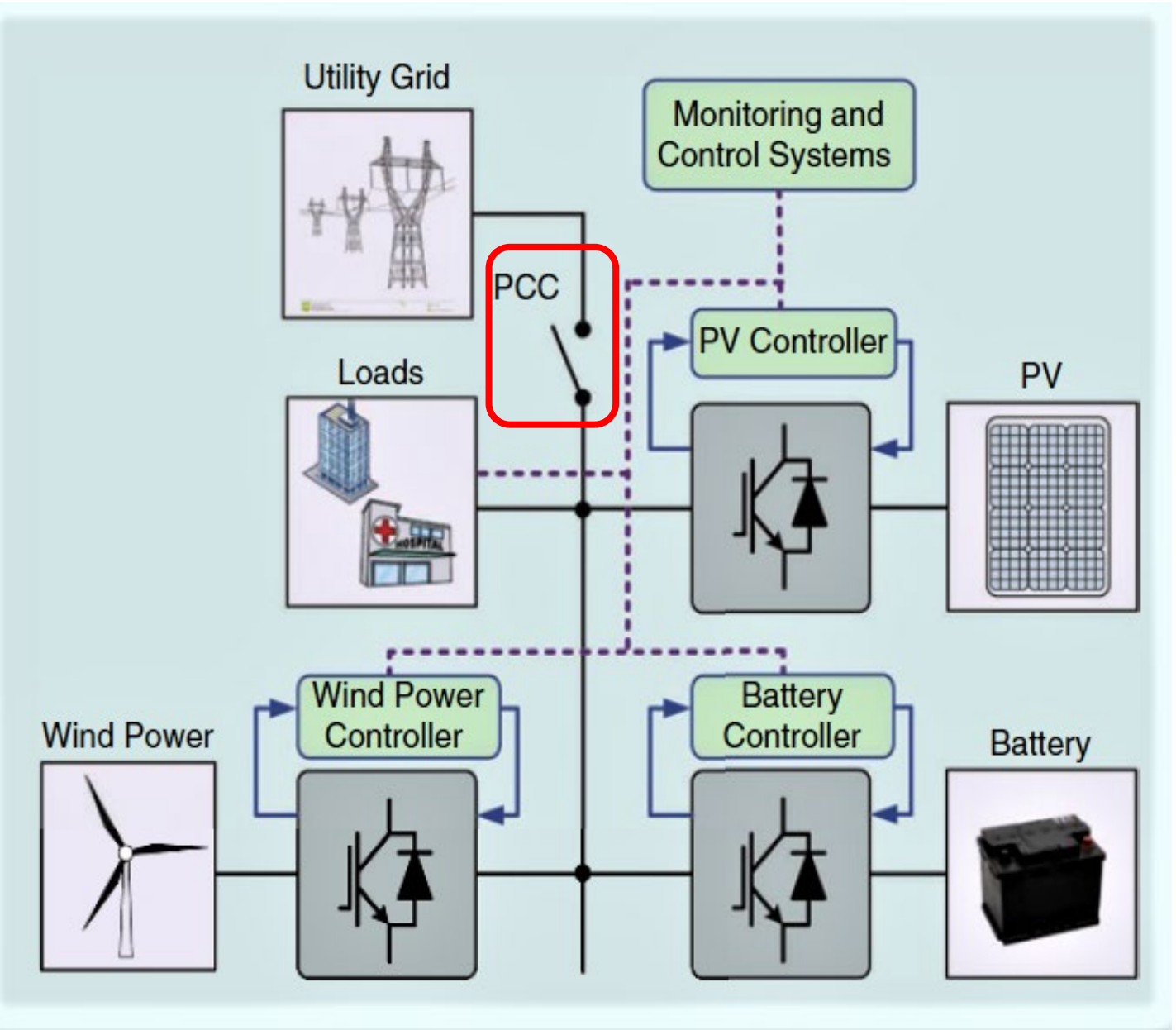
Research center in HALDEN-Residential house-based renewables

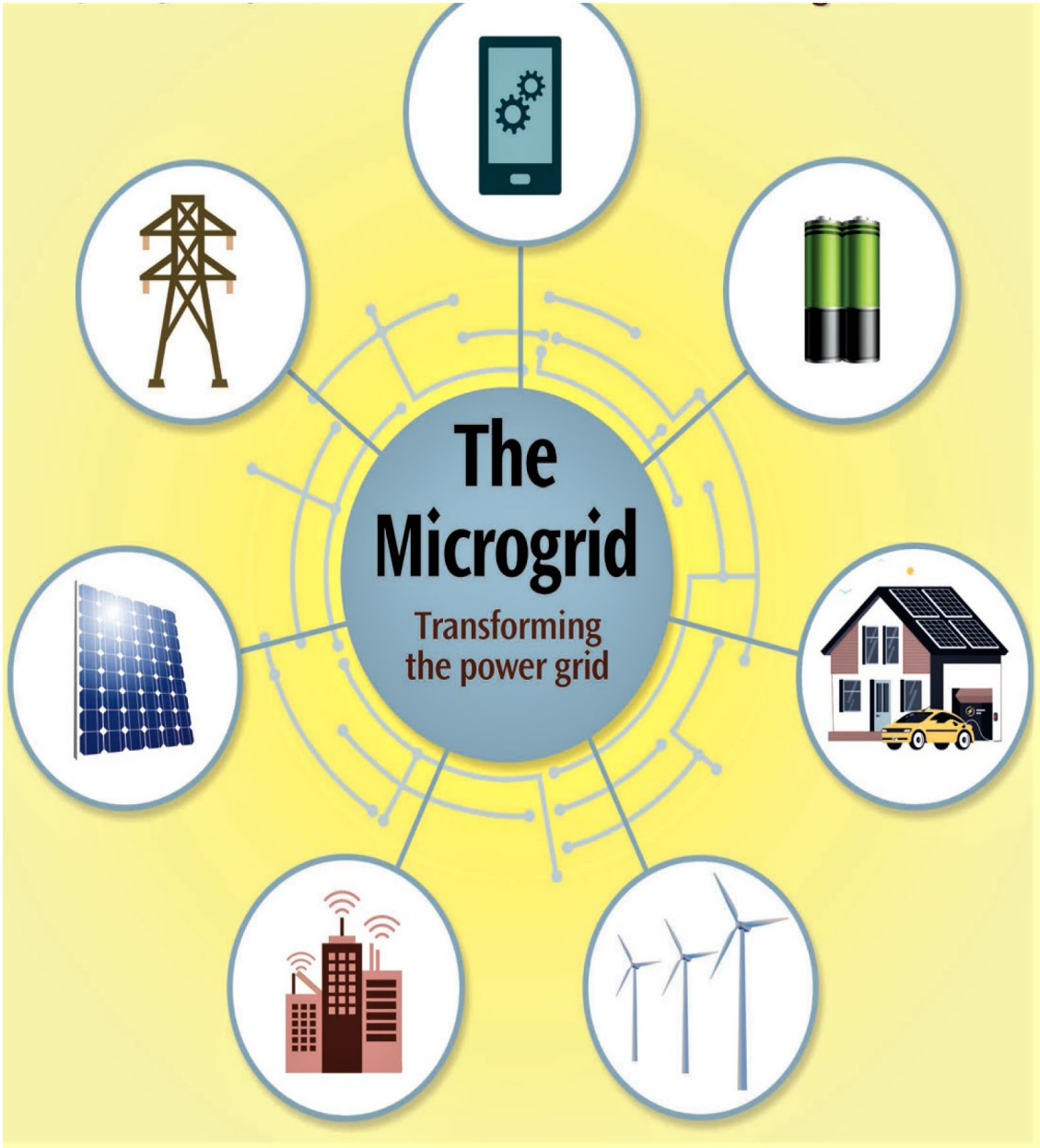






Microgrids-An overview





Master Programme-Green Energy Technology. Courses connected with our research projects/group

1) IRMGR40218 Renewable Energy (Autumn-First year)

2) IRMGR41118-Dynamic Modeling and Simulation of MicroGrids (Spring-1 year)

3) IRMGR42118-Smart Grids Technology and Applications (3rd semester-autumn)

4) IRMGR42018 Power System Dynamics and Control (Autumn-Second year)

5) IRMGR41018 Wind, Solar and Hydro Power Integration in Power Systems (Spring)

6) One more elective course about Intelligent Control of Electric Drives

New project proposals and challenges

- RCN project proposal: Collaborative Project to meet Societal and Industry-related Challenges
- Project title: A Novel Framework to Decentralized Electric Mobility Sharing and Accelerate Sustainable Energy Sharing and Tracking Towards Carbon Neutrality (EaaS4NOR)
- HIOF Budget: 4.7 mill NOK for a PhD student and other costs

