Dr. Imene Yahyaoui

Department of Applied Mathematics, Materials Science and Engineering and **Electronic Technology**

High School of Experimental Sciences and Technology

University Rey Juan Carlos, Spain

IMENE.YAHYAOUI@URJC.ES

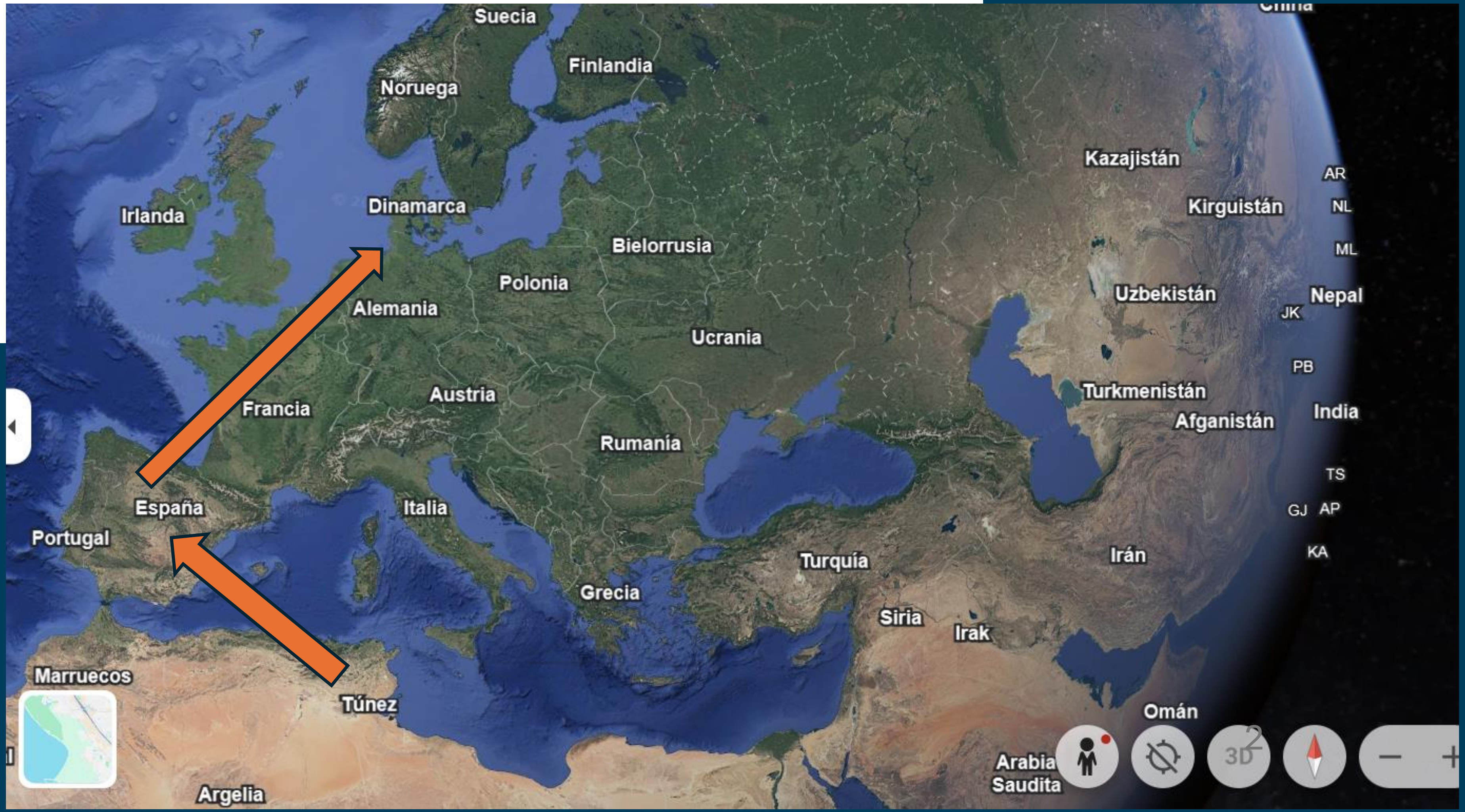
Escuela Superior de Ciencias Experimentales y Tecnología

- **Name**: Imene Yahyaoui

- **Specialty**: PhD in Process and systems engineering from the Department of Systems Engineering and Automation at the University of Valladolid, Spain, 2015.

- **Current professional situation: Pr. Contratado Dr.**

- **Languages skills**: Arab; French; English; Spanish and Portuguese



➢***International PhD*** in **Process and Systems Engineering**, University of Valladolid, Spain, April, 2015 (**Sobre saliente, Cum Laude**)

- ❖ Project: Optimum sizing and energy management of photovoltaic water pumping systems.

➢***Postdoc researcher and volunteer professor*** in **Electric Engineering** Department @ the Federal University of Espirito Santo, Vitoria, Brazil (09/2015-03/2017).

➢***Postdoc researcher*** in **Electric Engineering** Department @ the university Carlos III Madrid. (03/2017-05/2018).

➢***Postdoc researcher*** in **IES , UPM, Madrid. (05/2018-09/2018).**

➢**Profesor in la URJC since 09/2018.**

URJC Escuela Superior de Ciencias Experimentales y Tecnología

❖ Research publications (updated on 21/12/2025)

✓ More than 25 research articles in Q1 and Q2 journals.
✓ Three books published with Elsevier.
✓ More than 40 conference papers.
✓ More than 8 research chapters.
✓ PI of 2 three competetive research projects funded by the Spanish ministry of universities and Madrid State with total of 280 k€ in 2025.

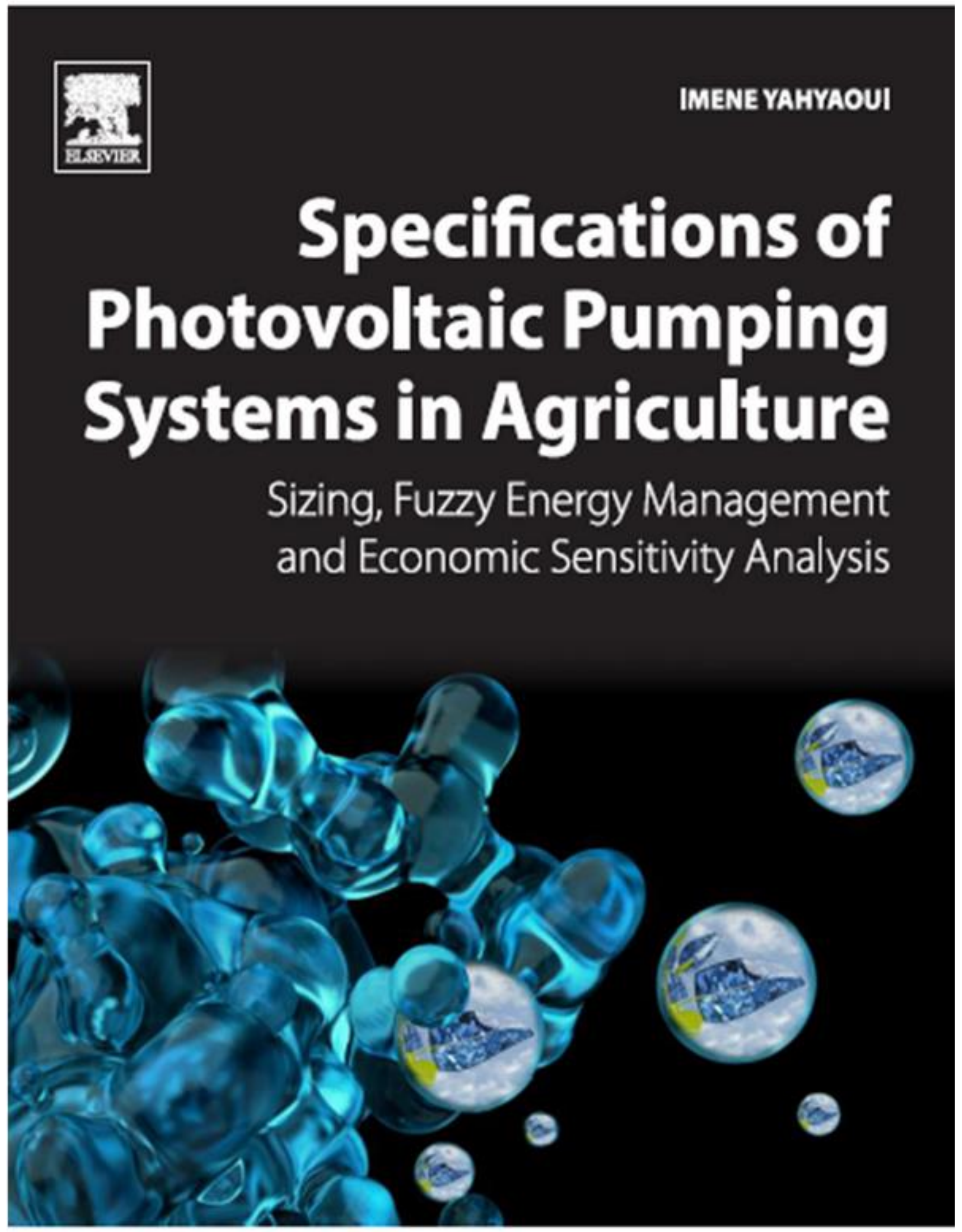
h index: 24.
I10 index: 39.

- ***Books:***

Author: Imene Yahyaoui

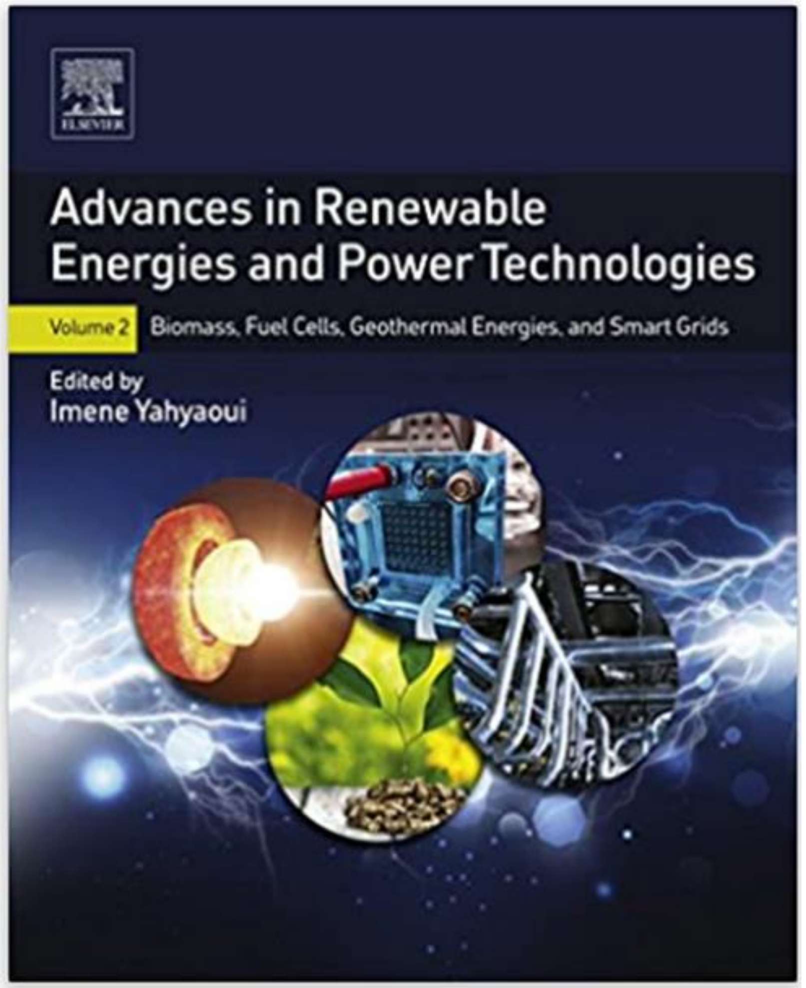
Acceptation: January, 2016

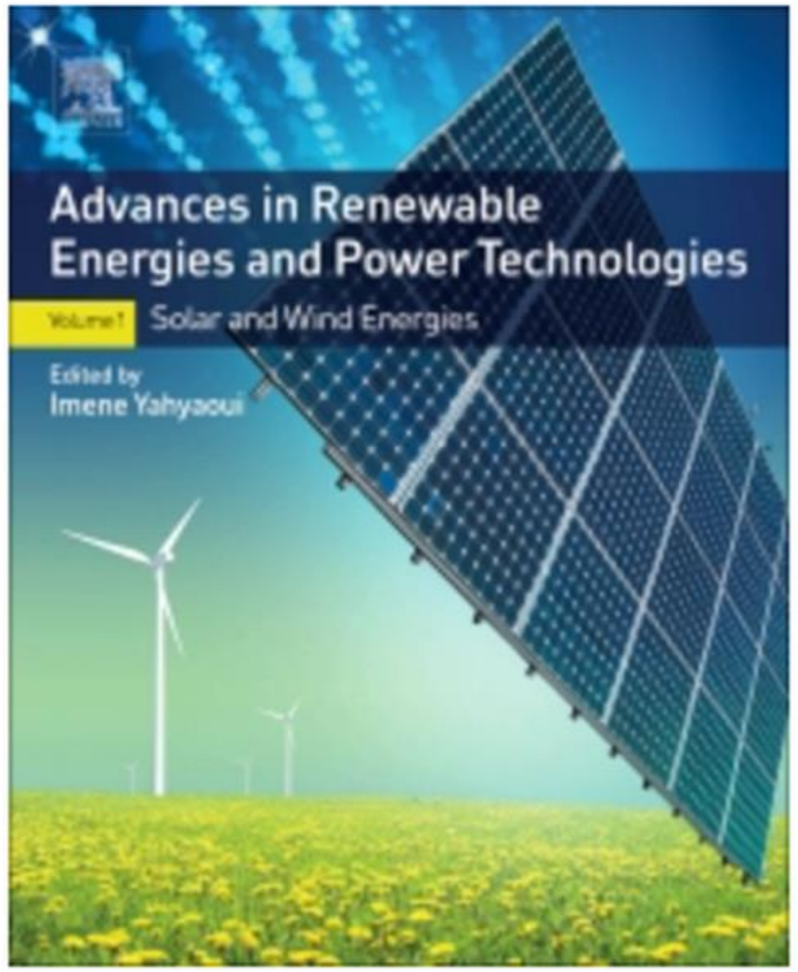
Publication: November, 2016



- ***Books:***

Editor: Imene Yahyaoui. Publication: November, 2017





Research lines:

Energy management and power optimization in renewable plants connected to the electrical grid and isolated plants
Development of models for PV generation forecasting
Renewable energies integration to the electrical grid
Reconfiguration of PV panels connections

The university

URJC Escuela Superior de Ciencias Experimentales y Tecnología

The university

[Bing Vídeos]

- ✓Founded in 19965 university campuses.
- ✓2campus in Madrid
- ✓8 faculties and schools.
- ✓21 departments
- ✓45,700 students
- ✓2,600 professors
- ✓85 bachelor's degrees,
- ✓74 double degrees
- ✓63 master's degrees
- ✓13 doctoral programs

The university

School of Experimental Sciences and Technology

- Founded in 1997
- Headquarters: Móstoles Campus
- 13 bachelor's degrees in science and engineering
- 8 double degrees
- More than 3,400 undergraduate students
- Organized into 4 departments

Dpo. Matemática Aplicada, Ciencia e Ingeniería de Materiales y Tecnología Electrónica

Electronic Tecnologies

Universidad Rey Juan Carlos | Campus de Móstoles

Universidad Rey Juan Carlos | Escuela Superior Ciencias Experimentales y Tecnología

TECNOLOGÍA ELECTRÓNICA

- Founded in 2003
- 25 professors
- Teaches 43 subjects in 11 degrees
- Coordinates the Degree in Industrial Electronics and Automation Engineering
- 4 teaching laboratories
- 4 research groups in Electronic Technology
- 1 teaching innovation group

BeST BIOENGINEERING SYSTEMS AND TECHNOLOGIES RESEARCH GROUP

PROMISE

DELFO Grupo de Dispositivos Electrónicos y Fotónicos Orgánicos

Aera

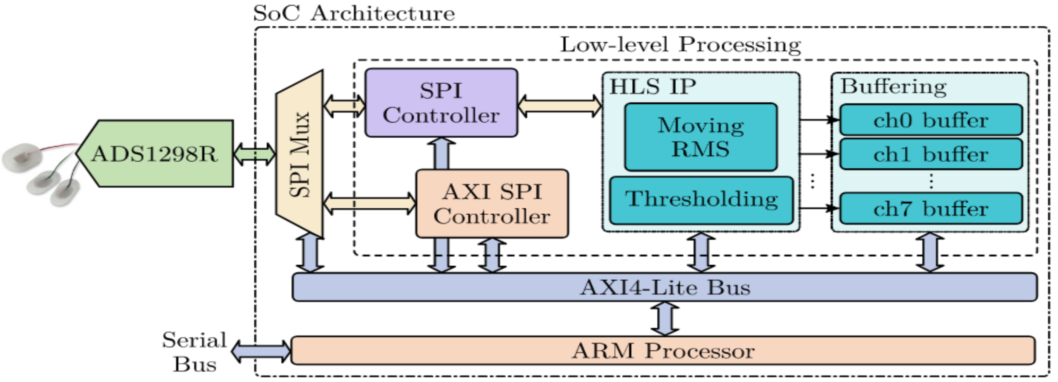
Research groups in TE area

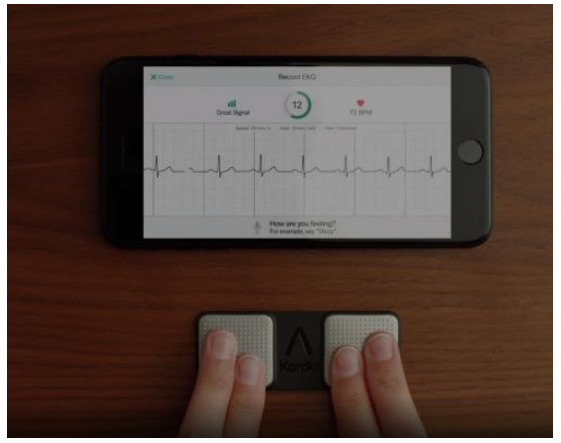
RESEARCH GROUP ON SYSTEMS AND TECHNOLOGIES FOR BIOENGINEERING

BIOENGINEERING SYSTEMS AND TECHNOLOGIES RESEARCH GROUP

Development of motion assistance robots for industrial and rehabilitation applications, including the development of hybrid actuation and control systems.

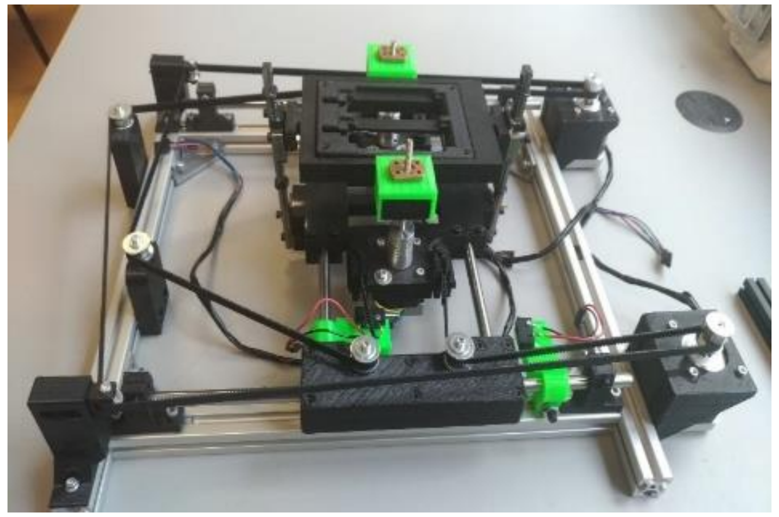
Design and implementation of advanced embedded electronic systems (SoCs, FPGAs) and co-design





Design and development of electronic instrumentation systems for acquiring and processing physiological signals such as ECG, EEG, EMG, or evoked potentials, among others.

Development of open source hardware and software for the development of scientific equipment in bioengineering applications.



Research groups in TE area

GRUPO DE INVESTIGACIÓN EN SISTENAS Y TECNOLOGÍAS PARA LA BIOINGENIERÍA

BIOENGINEERING SYSTEMS AND TECHNOLOGIES RESEARCH GROUP

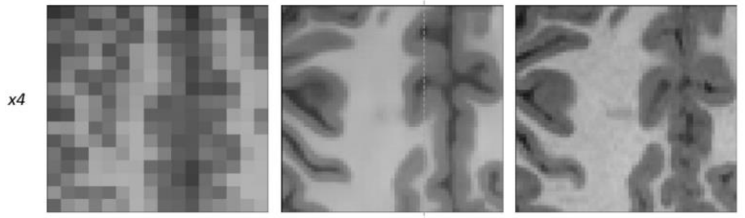
Main features:
Modular system (ROS2): exoskeleton + robotic structure + cable-driven robot
User weight offloading
Assistance with weight transfer between legs during walking
Projection of targets during walking
Control of user-exoskeleton interaction
Exoskeleton kinematic patterns optimized in TR to stride length and height.

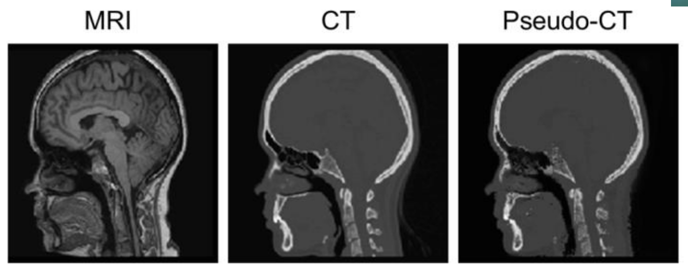
Research groups in TE area

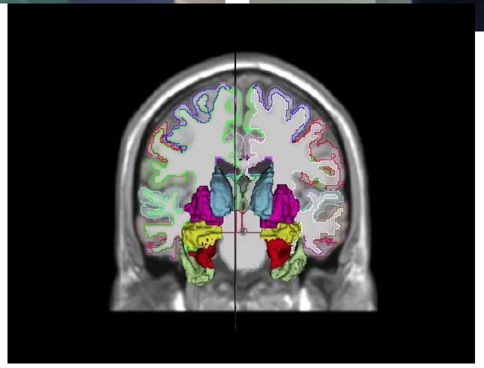
PROMISE MEDICAL IMAGING SCIENCE AND ENGINEERING

Computer Vision and AI for medical image analysis

- Image superresolution and image synthesis
- Multimodal imaging / Radiomics
- Biomarkers from images and video
- Image guided surgery / Augmented Reality
- Neuroimaging / oncological diagnosis and therapy







Research groups in TE area

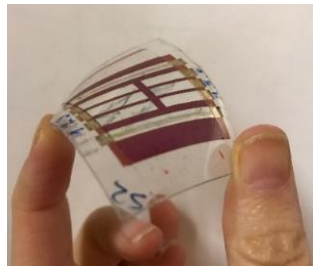
DELFO
Grupo de Dispositivos Electrónicos y Fotónicos Orgánicos

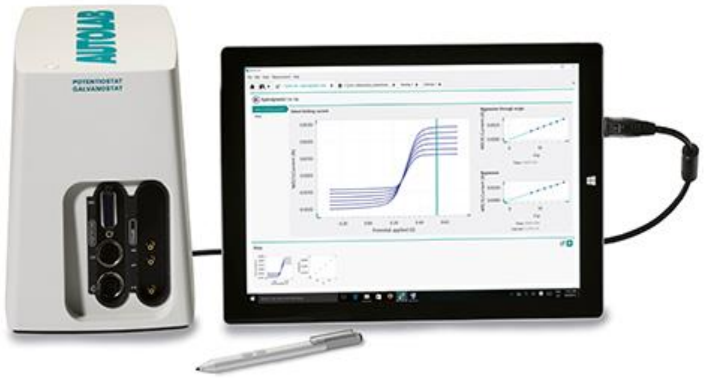
GROUP OF ORGANIC ELECTRONIC AND PHOTONIC DEVICES

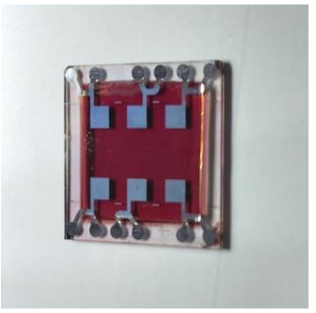
- Organic and perovskite-based electronic devices.
- Photovoltaic solar cells and photodetectors.

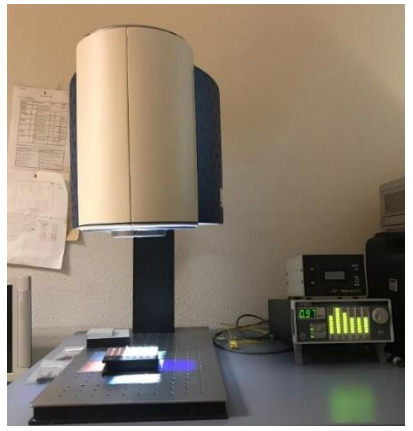
UNIDAD DE FABRICACIÓN

UNIDAD DE CARACTERIZACIÓN









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Research groups in TE area

Aera

APPLICATIONS IN RENEWABLE ENERGIES AND ADVANCED MONITORING OF ENVIRONMENTS

Operation, energy management and production forecasting in photovoltaic plants and their integration into the power grid.

Simulation, design and prototyping of power electronic converters and controls for application to renewable energies. Integration of power electronics into electrical grids.

Microgrids and Smartgrids.

Design and development of control and monitoring data analysis systems for the study of energy efficiency in buildings.

Digital modeling of buildings based on BMS (Building Management Systems) digital of buildings and development of applications based on these models.

URJC Escuela Superior de Ciencias Experimentales y Tecnología

Aera

Universidad de Alcalá

uc3m Universidad Carlos III de Madrid

UFES

TECNOLÓGICO NACIONAL DE MÉXICO

ISEP

instituto imdea energía

UAM Universidad Autónoma de Madrid

ITCelaya

Università degli Studi di Palermo

UBC

COMILLAS UNIVERSIDAD PONTIFICIA ICAI ICADE CIHS

AALBORG UNIVERSITET

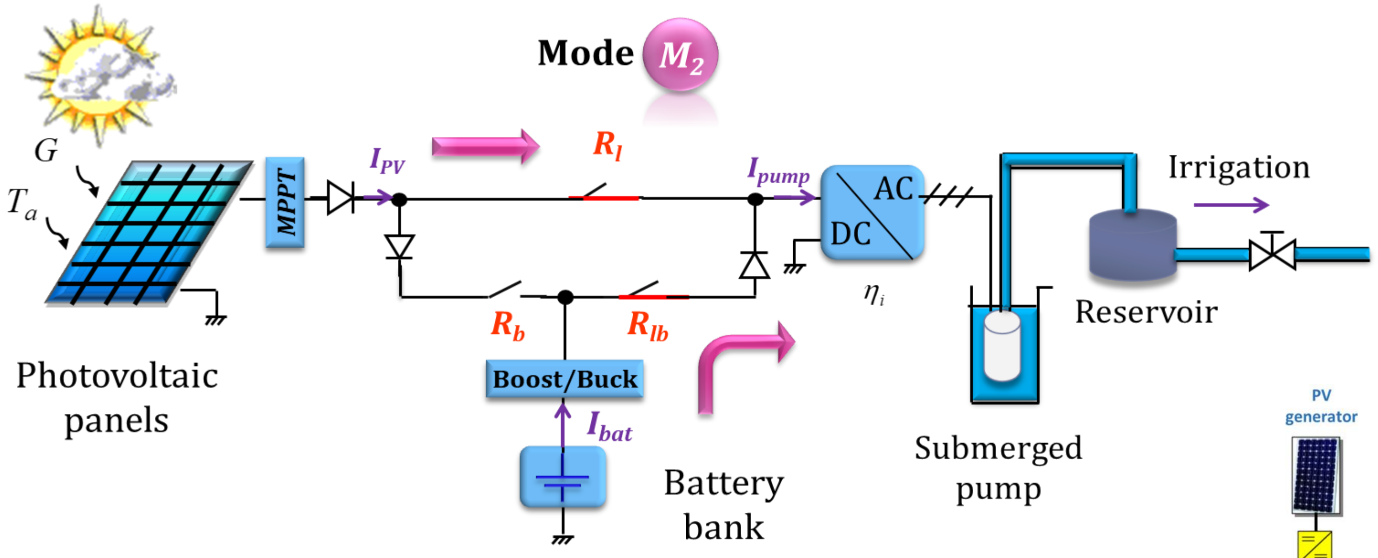
Université de Montréal

TU Delft Delft University of Technology

Aera

Dra. Imene Yahyaoui

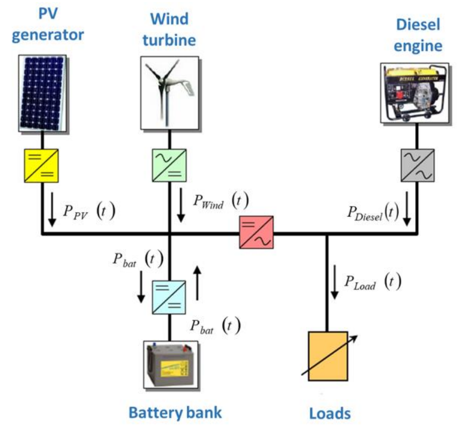
- ✓ Optimization, operation, and energy management of isolated renewable energy plants.
- ✓ ANN for predicting generation in photovoltaic plants.
- ✓ Optimization algorithms for the placement of distributed generation, battery banks, and short-circuit current limiters
- ✓ Control of asynchronous motors

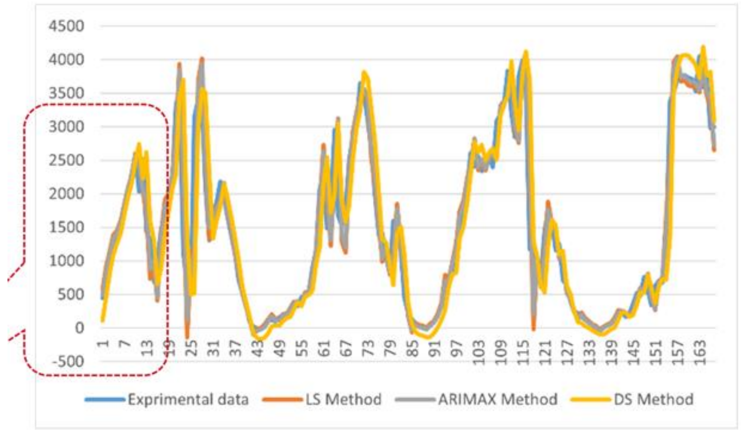


Function mode

Mode 2 (M_2): R_l and R_{lb} are ON

$$P_{pump} = P_{bat} + P_{PV}$$





My research activities

01/ Energy management in renewable plants: grid connected and isolated plants

A. Diffuse logic (Fuzzy Logic) for photovoltaic water pump

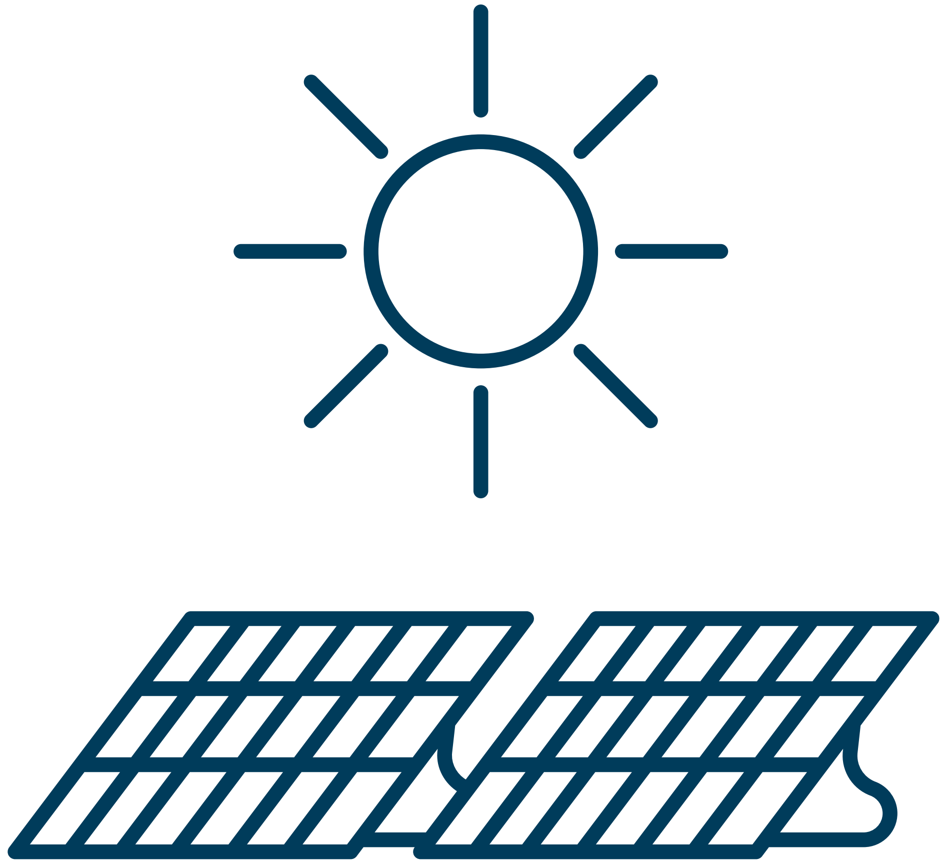
B. Genetic algorithm in wind and photovoltaic power plants

02/ Development of models for PV generation forecasting

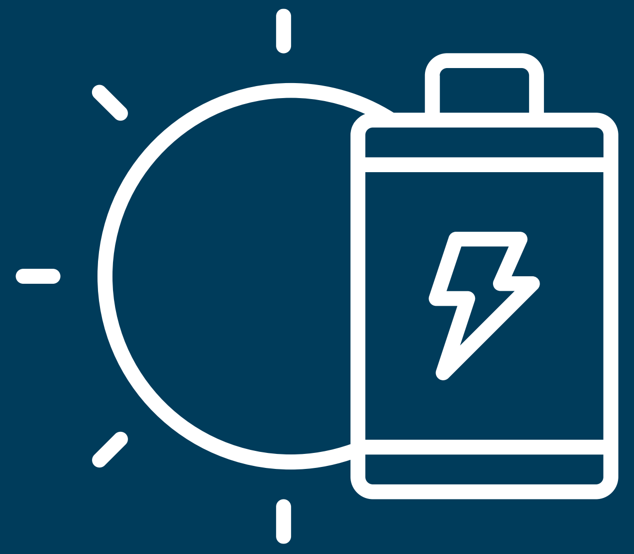
03/ Renewable energies integration to the electrical grid (Project PREDFLEX)

04/ Reconfiguration of PV panels connections (PROJECT PVCAD)

05/ Demand planification in NZEBs



A. Diffuse logic (Fuzzy Logic) for photovoltaic water pump



It is possible to have the PV plant close to the consumption.

Installation is simple.

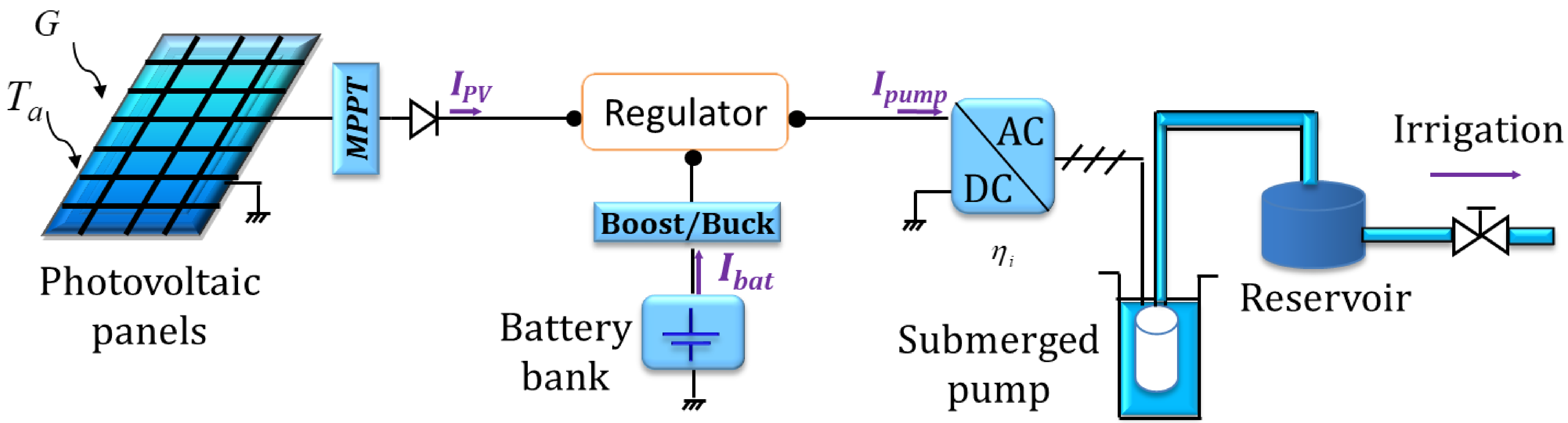
No pollution once the plant is installed.

A. Fuzzy Logic for water pumping plants

- **Photovoltaic Installation for Water Pumping**

Components:

- Photovoltaic panels (PVP)
- MPPT: Perturb and Observe (P&O)
- Regulator: Includes the Energy Management Algorithm
- Battery bank: lead-acid batteries
- DC/AC converter
- Submerged pump: centrifuge
- Reservoir



Yahyaoui, I., Sallem, S., Kamoun, M. B. A., & Tadeo, F. (2014). A proposal for off-grid photovoltaic systems with non-controllable loads using fuzzy logic. *Energy conversion and management*, *78*, 835-842.

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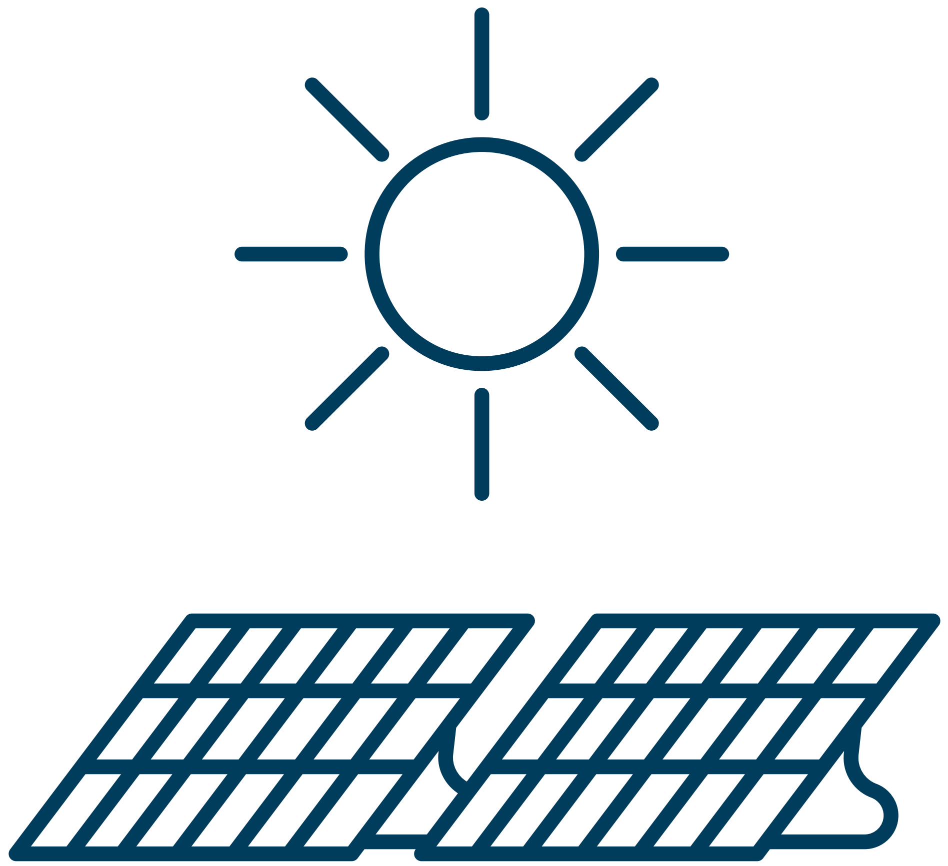
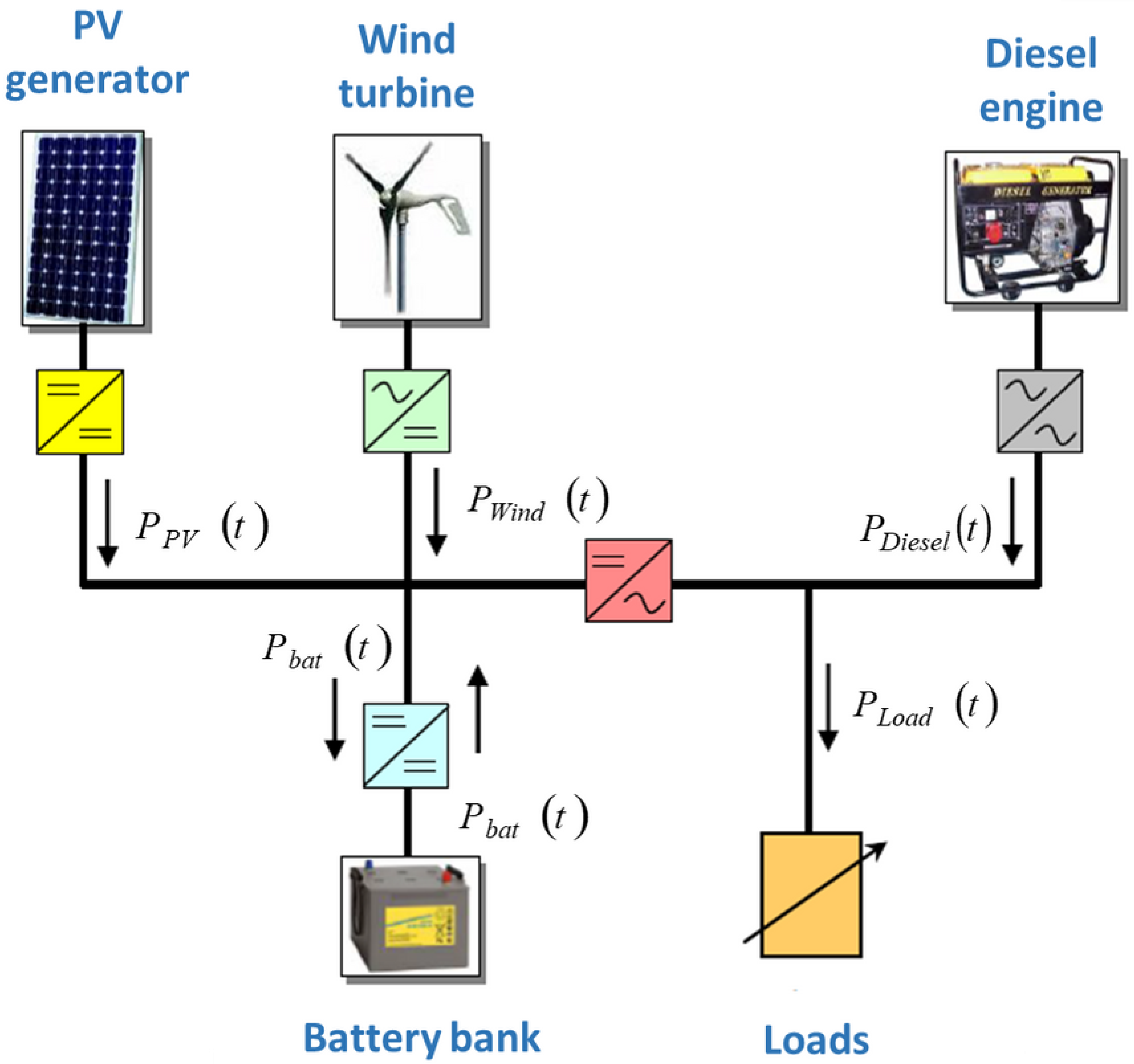


B. Genetic algorithm in wind and photovoltaic power plants

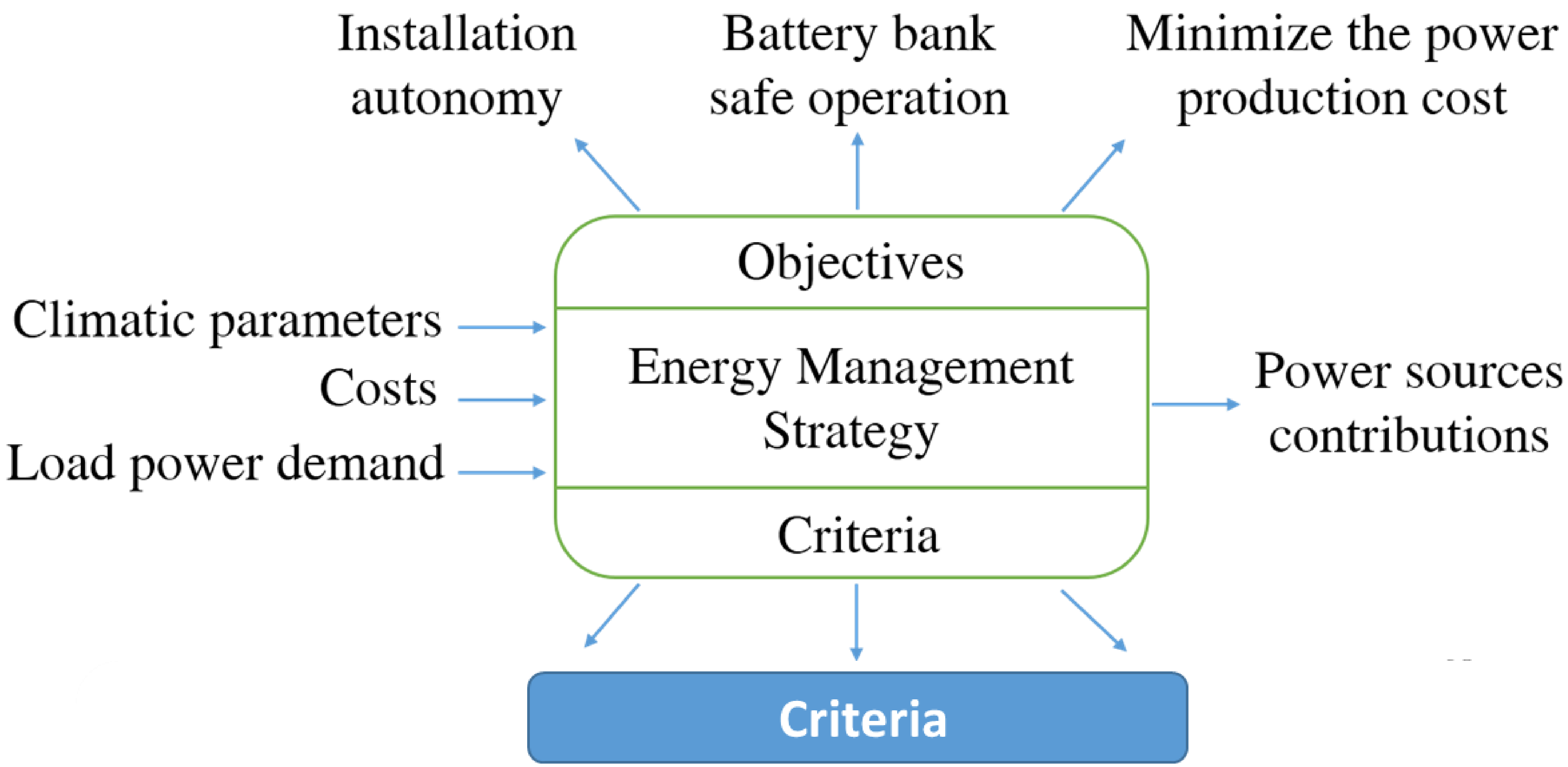
- Photovoltaic panels (PVP)
- Wind turbine
- Diesel engine
- Battery bank: lead-acid batteries
- DC/DC; AC/DC; AC/AC; DC/AC converters
- AC loads

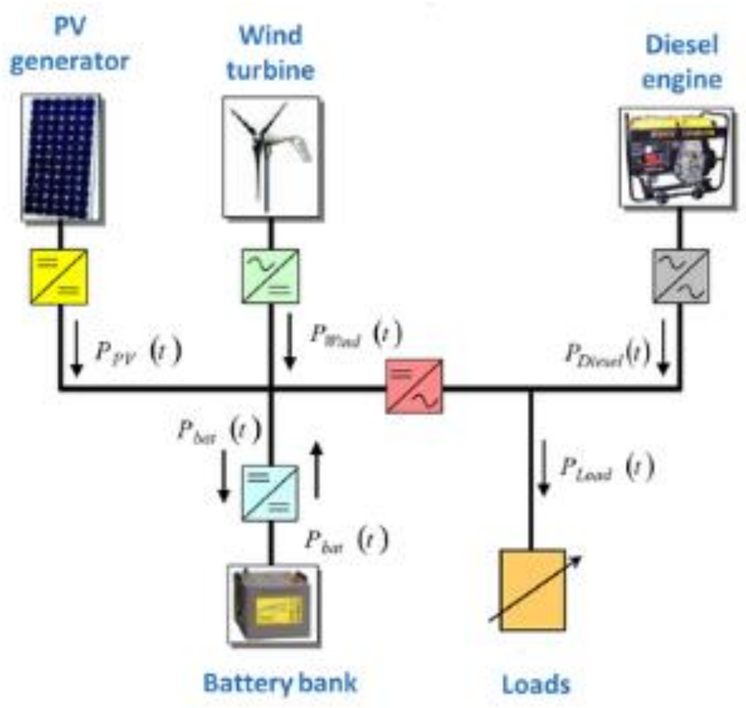


Yahyaoui, I., Ghraizi, R., Tadeo, F., & Segatto, M. E. V. (2017). Smart Energy and Cost Optimization for Hybrid Micro-Grids: PV/Wind/Battery/Diesel Generator Control. In *Security Solutions and Applied Cryptography in Smart Grid Communications* (pp. 287-312). IGI Global Scientific Publishing.

B. Genetic algorithm in wind and photovoltaic power plants

✓ Manage the power generated by the system sources following the loads' demand in power.





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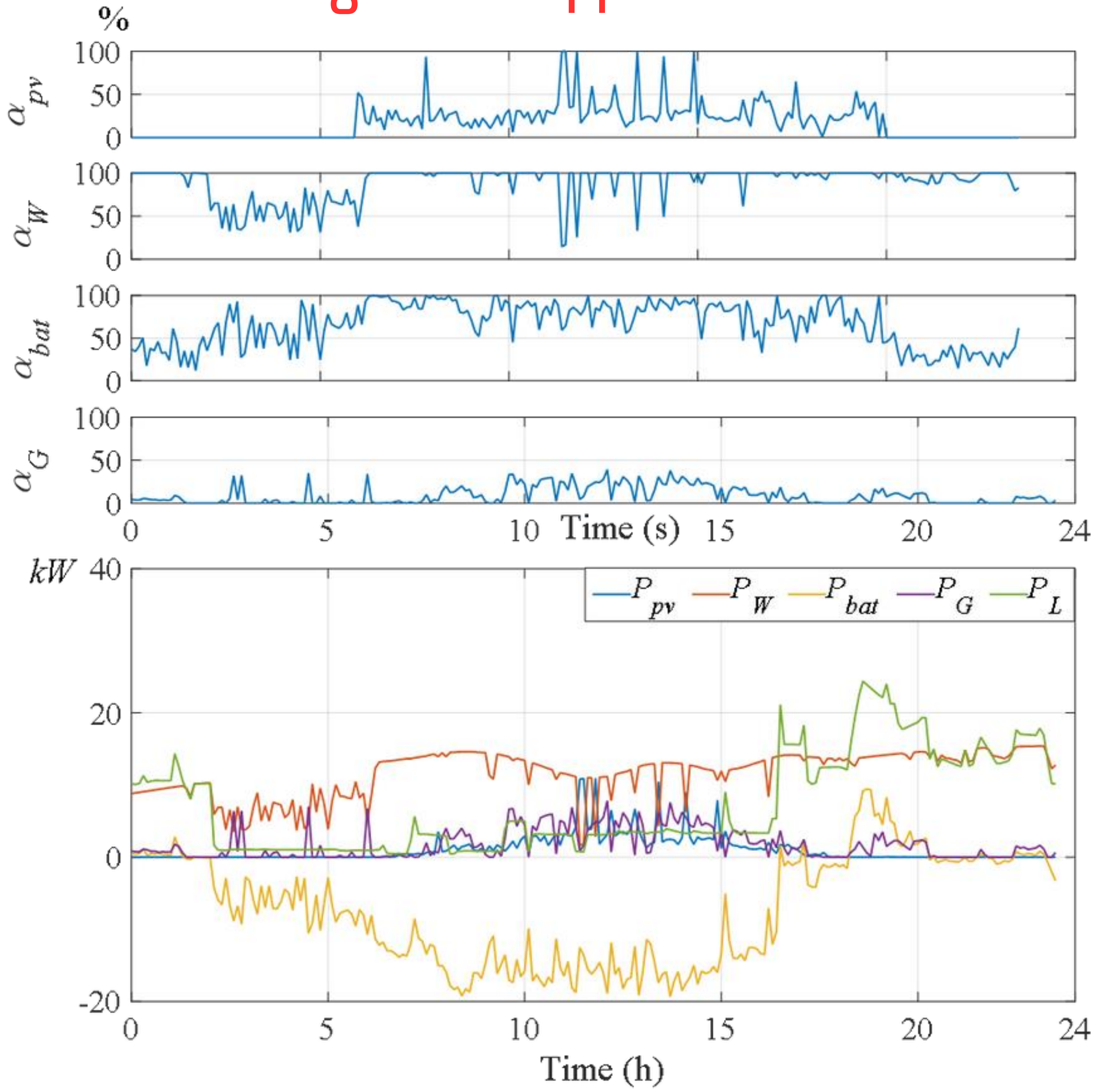
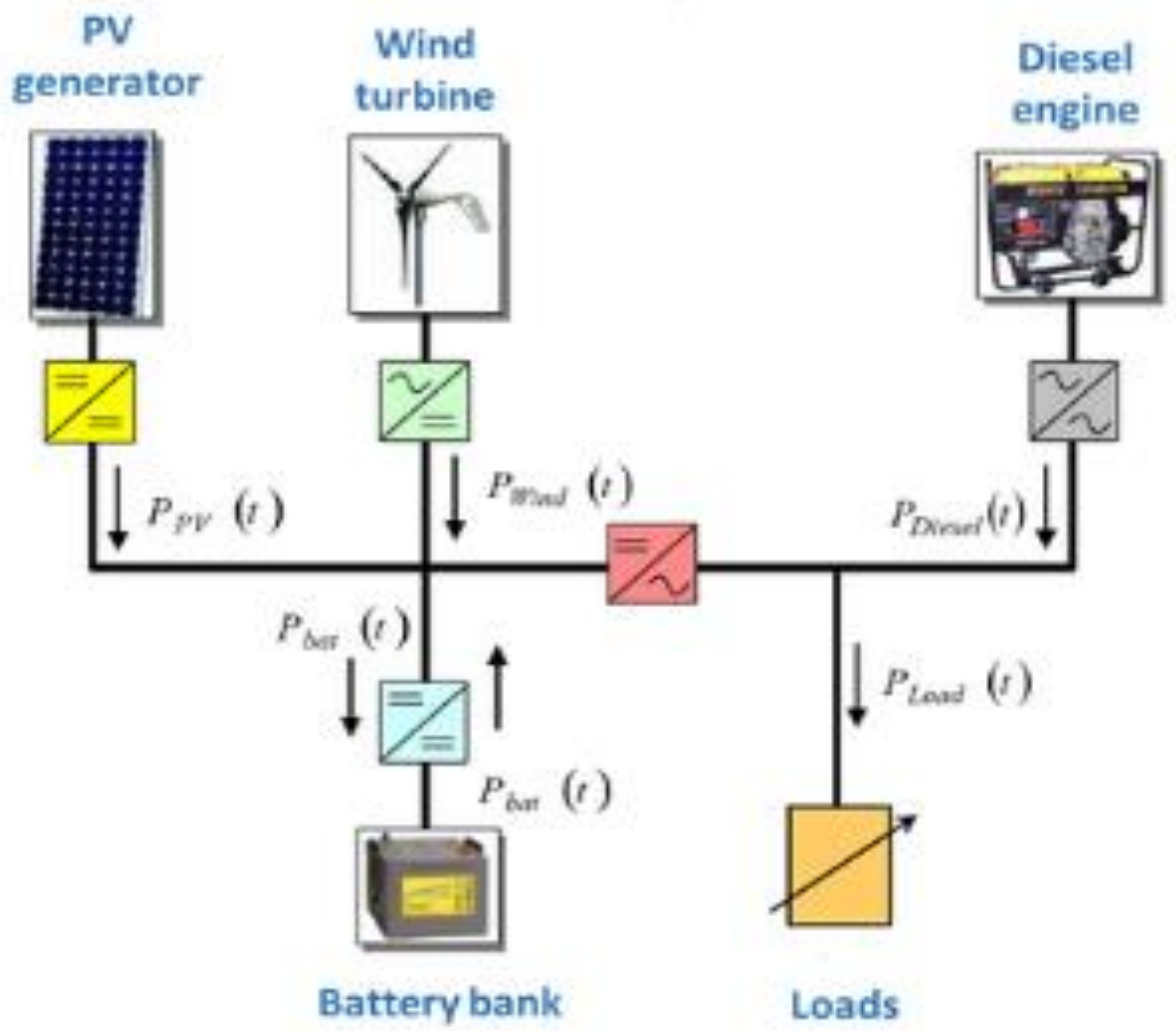
B. Genetic algorithm in wind and photovoltaic power plants

Genetic algorithm application results





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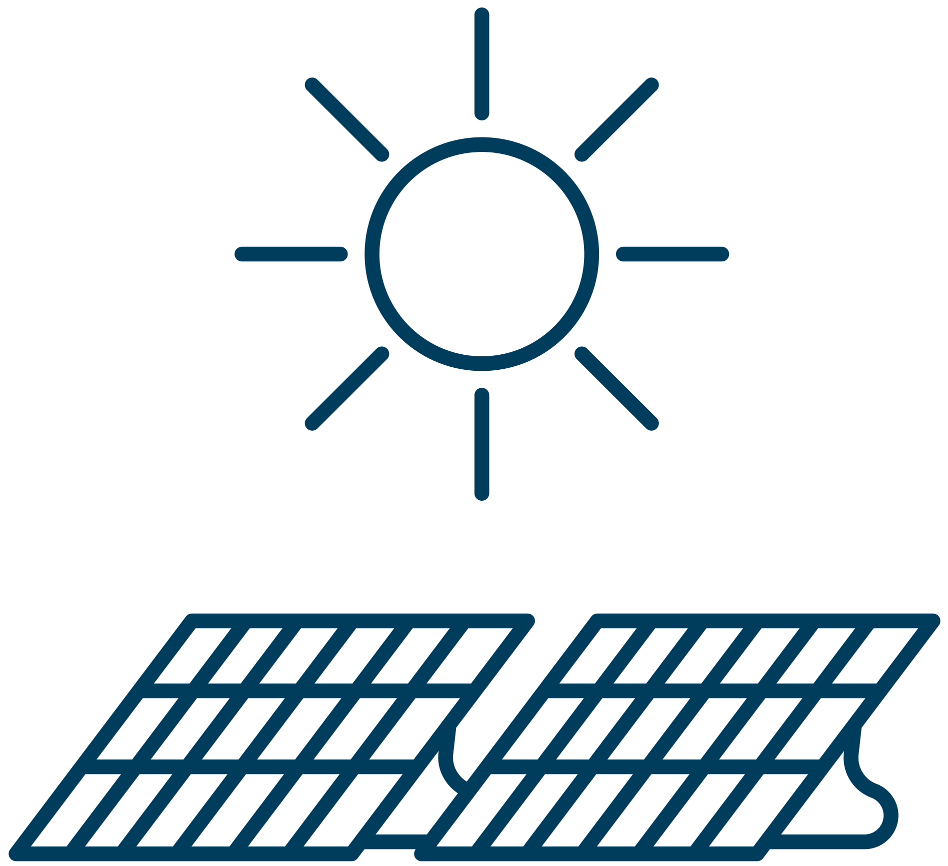


02/ Development of models for PV generation forecasting

Results of applying ARIMAX model for the PV power.

Variable	Coefficient	Std. Error	t-Statistic	Prob.height
Constant	-56.92598	22.60811	-2.517945	0.0118
Radiation	3.467604	0.007784	445.4613	0.0000
Temperature	9.989352	0.260673	38.32146	0.0000
AR (1)	0.843146	0.002681	314.4818	0.0000
AR (2)	0.045838	0.003656	12.53632	0.0000
AR (3)	0.033206	0.003668	9.053120	0.0000
AR (4)	0.020941	0.003621	5.783711	0.0000
SIGMASQ	19782.15	70.03618	282.4562	0.0000

$$P_t = -56.92+3,46G_t+9.98T_t+0.84P_{t-1}+0.04P_{t-2}+0.03P_{t-3}+0.02P_{t-4}+\varepsilon_t$$

ARIMAX applied for the PV voltage.

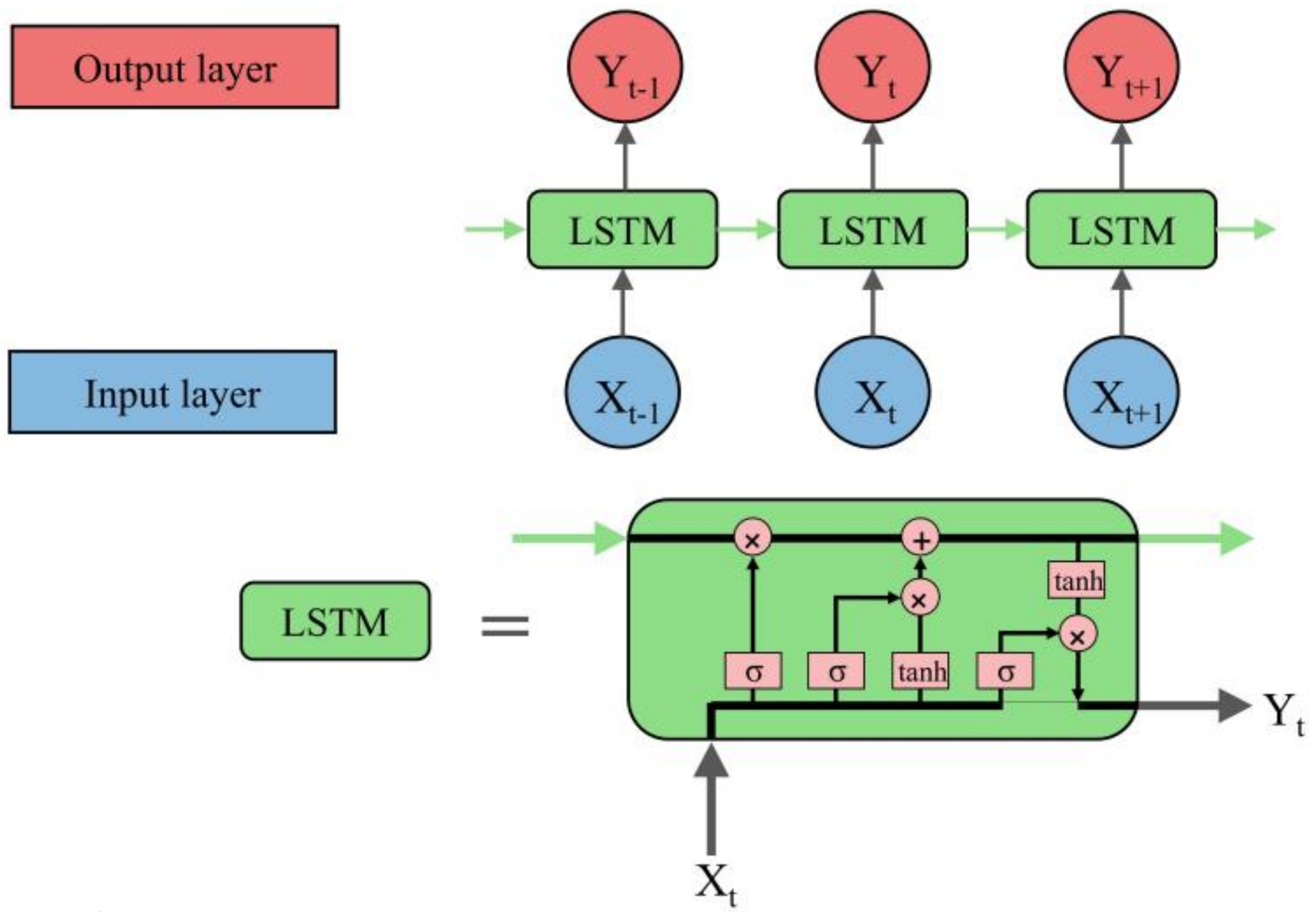
Variable	Coefficient	Std. Error	t-Statistic	Prob.height
Radiation	0.022985	0.002909	7.900155	0.0000
Temperature	-0.115388	0.048417	-2.383210	0.0172
AR (1)	0.503176	0.002420	207.8903	0.0000
AR (2)	0.179692	0.003237	55.50917	0.0000
AR (3)	0.168847	0.004252	39.70739	0.0000
AR (4)	0.145702	0.003619	40.26017	0.0000
SIGMASQ	446.6533	1.410666	316.6258	0.0000

$$Vpv_t = 0.02G_t-0.11T_t+0.5Vpv_{t-1}+0.17Vpv_{t-2}+0.16Vpv_{t-3}+0.14Vpv_{t-4}+\varepsilon_t$$

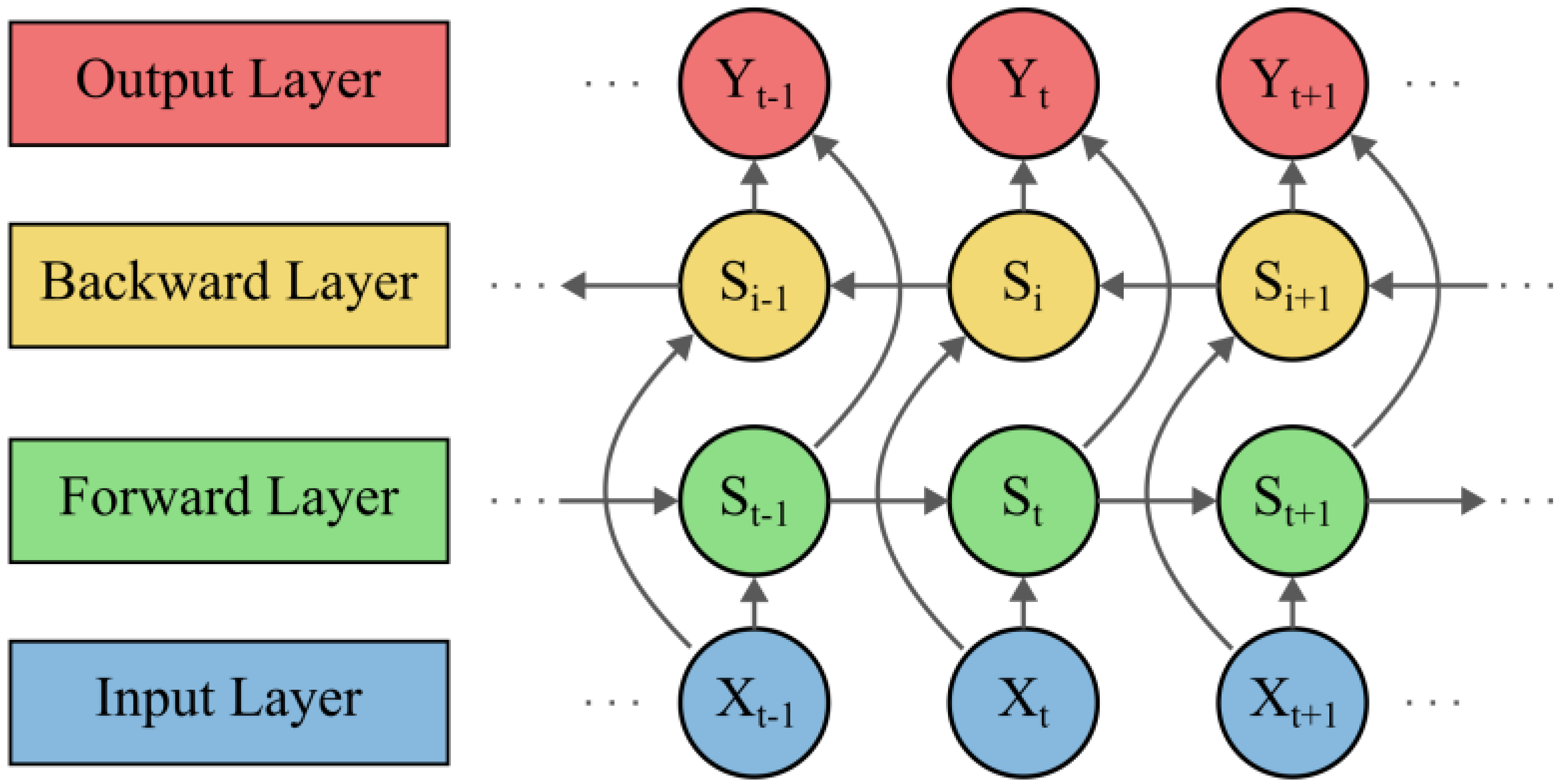
Yahyaoui, I., Mariñas-Collado, I., Sipols, A. E. G., de Blas, C. S., & Sánche, C. R. (2022, October). Application of the double smoothing and arimax methods for the prediction of polycristalline photovoltaic generation. In *IECON 2022–48th Annual Conference of the IEEE Industrial Electronics Society* (pp. 1-4). IEEE.

02/ Development of models for PV generation forecasting

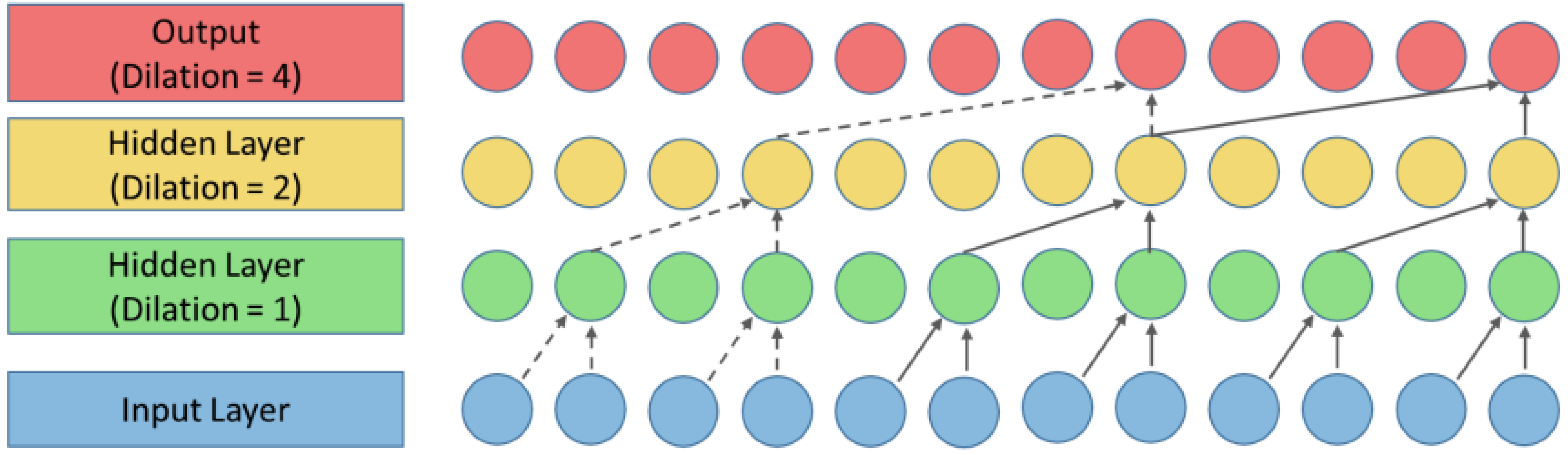
LSTM

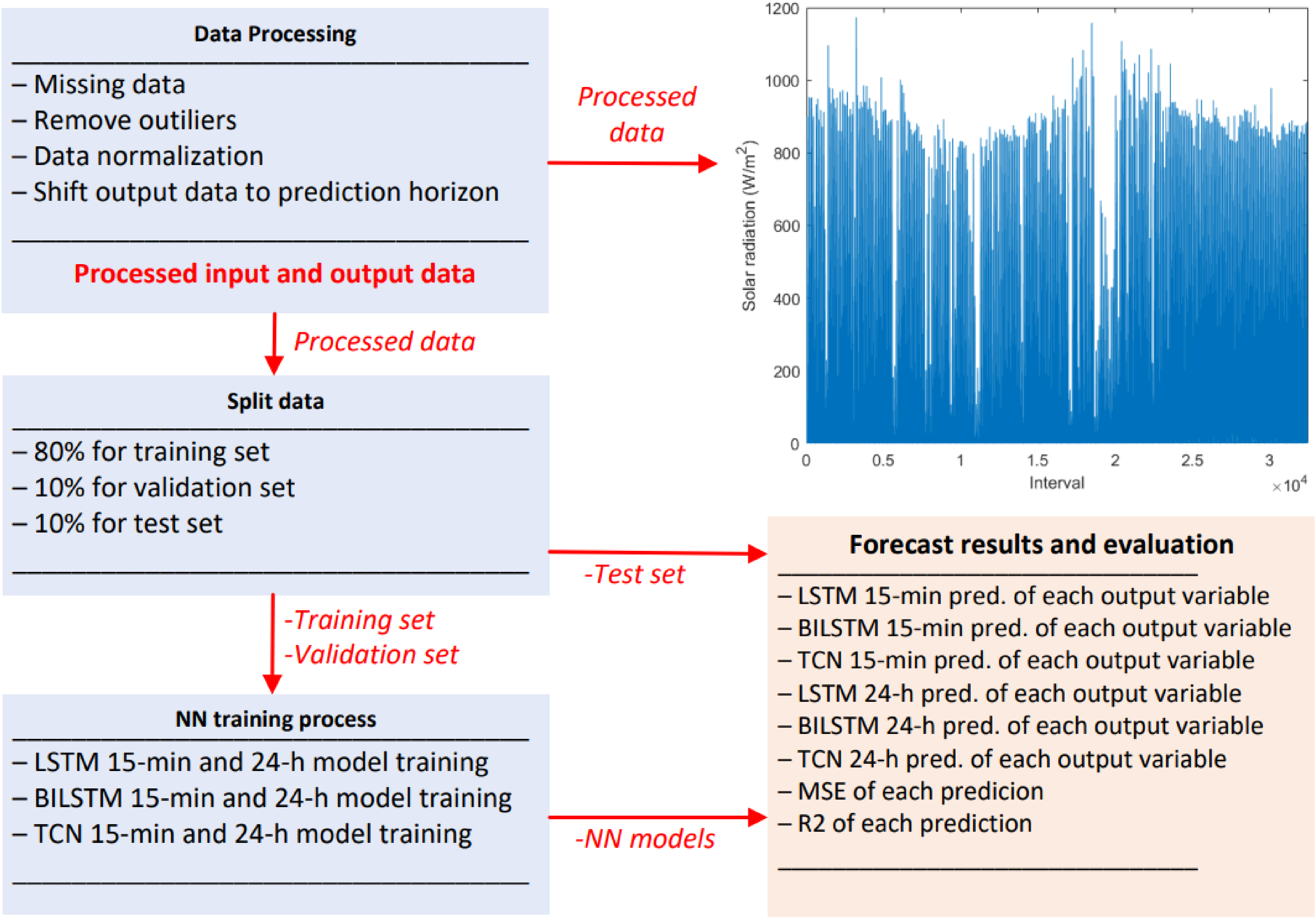


BiLSTM



TCN





MSE, R^2 and execution times of different models in 15 min forecasts.

Algorithm	LSTM	BiLSTM	TCN	T in $T+1$
Training MSE (-)	0.0040	0.0038	0.0024	–
Validation MSE (-)	0.0051	0.0049	0.0039	–
Testing MSE (-)	0.0031	0.0032	0.0024	0.0053
Testing R^2 (-)	0.97	0.96	0.98	0.94
Test execution time (ms)	9	10	6	28

Rocha, H. R., Fiorotti, R., Fardin, J. F., Garcia-Pereira, H., Bouvier, Y. E., Rodríguez-Lorente, A., & Yahyaoui, I. (2023). Application of AI for short-term pv generation forecast. *Sensors*, *24*(1), 85.

My research activities

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Multi objective Gray Wolf algorithm optimization for losses, short-circuit currents and harmonics reduction by allocation of distributed generation, capacitor banks and fault current limiters in distribution grids

✓Inspired by the hierarchy and the hunting strategy of gray wolves: the pack of wolves represents the optimizer, and the prey is considered the solution;

✓Alpha wolf (α) is the leader of the group while the second and third leaders are beta (β) and delta (δ) respectively, asked to assist the other wolves and help during decision making of wolf (α).

Group hunting is an interesting social behavior of gray wolves, which mainly includes the following stages:

- Tracking, chasing and approaching prey;
- Hunt, surround and harass prey until it stops moving;
- Attack the prey.

03/ Renewable energies integration to the electrical grid

$$Min\ f_1 = \sum_{i=1}^{24} Loss_i$$

$$Min\ f_2 = mean(\sum_{j=1}^{n} THD_j)$$

$$Min\ f_3 = mean(\sum_{k=1}^{n} TriFault_k + \sum_{k=1}^{n} SingFault_k)$$

Objective

$$n_{CB13} \leq 6, n_{FCL13} \leq 6, n_{DG13} \leq 6$$

$$\sum_{i=1}^{n} P_i^{sp} - \sum_{i=1}^{n} P_i^{calc} = 0$$

$$\sum_{i=1}^{n} Q_i^{sp} - \sum_{i=1}^{n} Q_i^{calc} = 0$$

$$V_i^{min} \leq V_i \leq V_i^{max}, \forall\ i \in \Omega_n$$

Constraints

03/ Renewable energies integration to the electrical grid

It is important to define the population size, the maximum number of iterations and the decision vectors

➔**A population of 100 wolves has been used with a maximum number of 400 iterations for a grid of 13 nodes.**

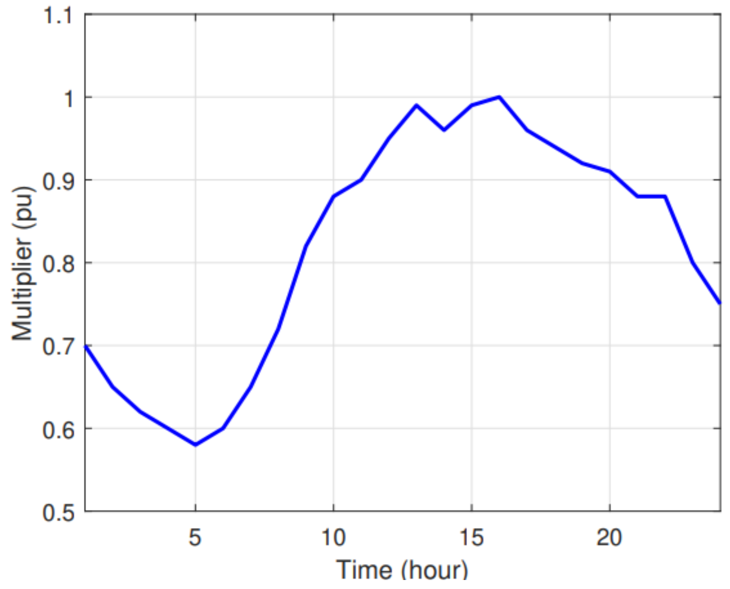
➔**Definition of Decision Variable Vectors:**

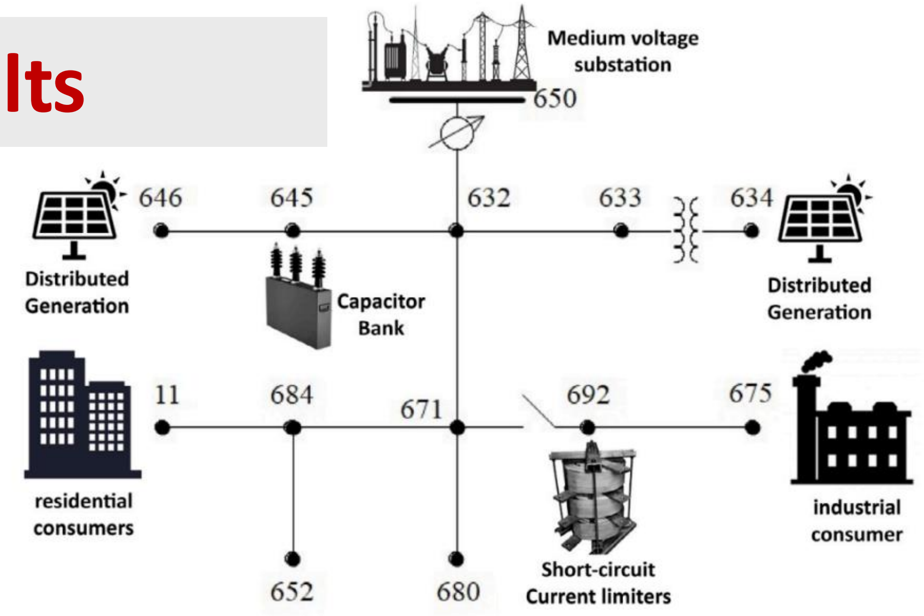
1. **DGs generation:** During the simulation process, the optimizer checks which panels should be activated according to the DGs vector to obtain the best result to minimize losses, short-circuit current and harmonic distortion rate;
2. **CBs:** a power value of the CBs among 50, 100, 150, 200, 300, 400, 500, 600, 700 and 800 kVAr is chosen;
3. **FCL choice: the optimizer choose one of the following values for the** the reactor impedance: 5, 10, 12, 15, 18, 20, 25 and 30 ohms, to obtain the best result to minimize losses, short-circuit current and harmonic distortion rate;
4. **Network Nodes Vector:** three-phase.

Differences in Voltage and current: comparison of OpenDSS and IEEE results

Table 1: Difference in Voltage values between the simulated network and the report provided by the IEEE.

Node	Phase A		Phase B		Phase C	
	Mag	Ang	Mag	Ang	Mag	Ang
650	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
632	-1.99%	0.00%	1.26%	-0.07%	1.30%	0.03%
633	0.66%	-1.56%	1.26%	-0.02%	1.31%	0.02%
634	0.69%	-2.17%	-0.51%	0.34%	-0.55%	-0.39%
645	-	-	1.28%	0.00%	1.30%	0.05%
646	-	-	1.27%	-0.02%	1.30%	0.08%
671	0.73%	-1.89%	1.20%	-0.05%	1.32%	0.02%
680	0.73%	-1.89%	1.20%	-0.05%	1.32%	0.02%
684	0.73%	-1.50%	-	-	1.33%	0.02%
611	-	-	-	-	0.56%	0.07%
652	0.73%	-0.95%	-	-	-	-
692	0.73%	-1.69%	1.20%	-0.05%	1.31%	0.02%
675	0.74%	-0.72%	1.20%	-0.07%	1.32%	0.03%





+ OpenDSS and IEEE reports uses different power flow calculation methods;
+ Each type of simulation admits a specific error for convergence.

Table 2: Difference in Current values between the simulated network and the report provided by the IEEE.

2*Node	Phase A		Phase B		Phase C	
	Mag	Ang	Mag	Ang	Mag	Ang
RG-632	0,00%	0,00%	0.00%	0.00%	0.00%	0.00%
632-633	-0.70%	0.00%	-1.33%	-0.01%	-1.40%	0.10%
632-645	-	-	-0.20%	-0.17%	1.28%	-1.35%
632-671	-0.76%	-0.63%	-1..36%	-0.40%	-1.01%	0.30%
633-Transf	-	-	-1.33%	-0.01%	-1.38%	0.09%
Transf-634	-	-	-1.32%	-0.01%	-1.39%	0.09%
645-646	-	-	1.28%	-0.02%	1.28%	0.05%
671-680	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
671-684	0.59%	-0.20%	-	-	-0.01%	0.35%
671-692	-	-	-	-	-1.30%	0.63%
684-611	-	-	-	-	-	-
684-652	0.59%	-0.20%	-	-	-	-
692-675	-0.74%	-6.80%	1.58%	-1.29%	-1.50%	0.89%

Differences in Voltage and current: comparison of OpenDSS and IEEE results

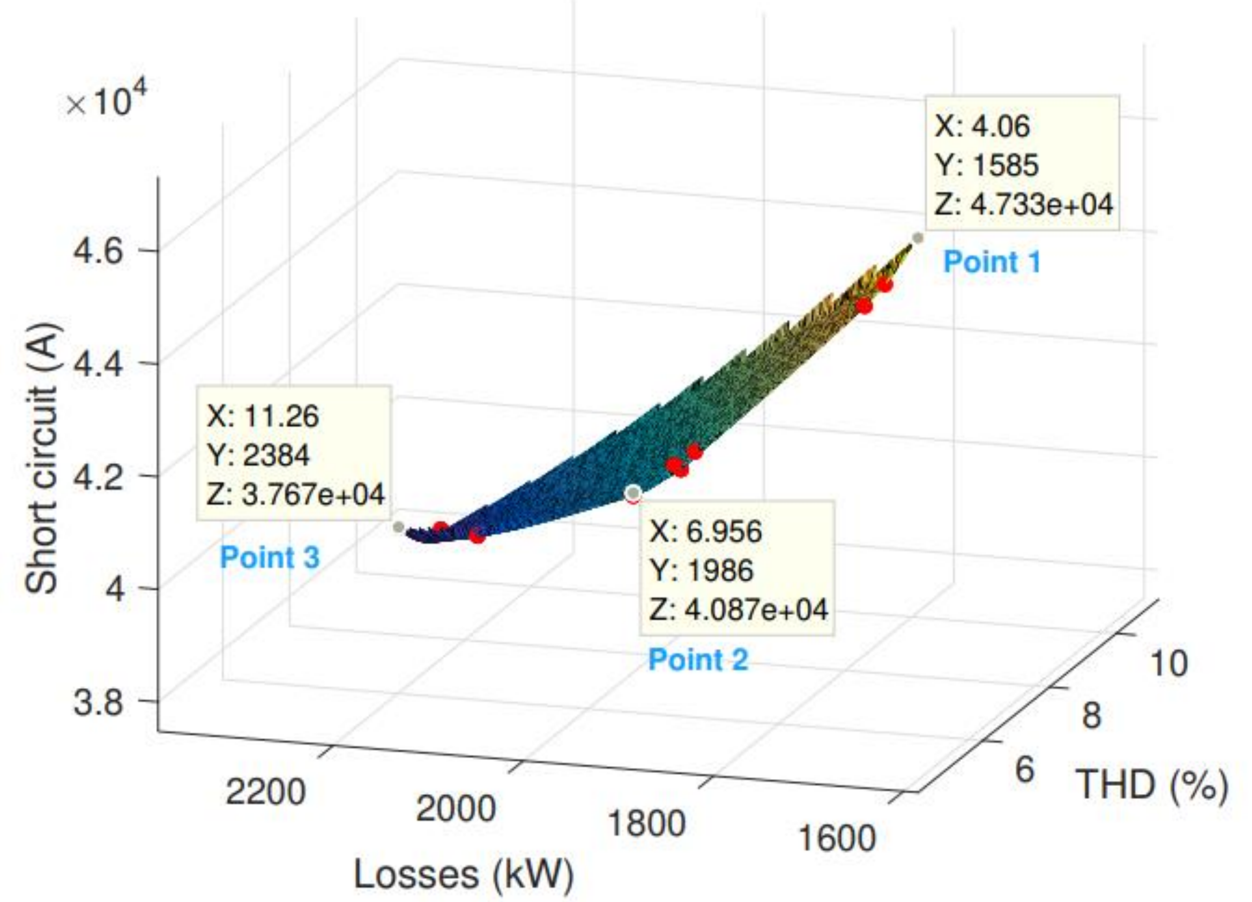
1. The first point is at the knee of Pareto curve and the two other points are situated at the end of the curve;
2. A comparison of these values with those obtained without performing any optimization.

Table 3: Comparison of values with and without optimization in the 13-node network

Parameters	Without Optimization (Case Base 1)	MOGWO					
		Point 1	Reduction	Point 2	Reduction	Point 3	Reduction
THD(%)	11.86	4.06	65.77%	6.95	41.40%	11.26	5.06%
Loss(kW)	2199.7	1584.76	27.96%	1986.49	9.69%	2384.19	**-8.39%**
S. circuit(A)	45262	47326.5	**-4.56%**	40865.88	9.71%	37668.5	16.78%

Table 4: Devices number distributed at each selected point of Pareto curve in the 13-node network

Devices	Point 1	Point 2	Point 3
DGs	4	2	1
CBs	2	2	2
FCLs	1	1	2



→ Although the number of elements is similar, the places of their allocation have different consequences.

Pereira, L. D., Yahyaoui, I., Fiorotti, R., de Menezes, L. S., Fardin, J. F., Rocha, H. R., & Tadeo, F. (2022). Optimal allocation of distributed generation and capacitor banks using probabilistic generation models with correlations. *Applied Energy*, *307*, 118097.

Azeredo, L. F., Yahyaoui, I., Fiorotti, R., Fardin, J. F., Garcia-Pereira, H., & Rocha, H. R. (2023). Study of reducing losses, short-circuit currents and harmonics by allocation of distributed generation, capacitor banks and fault current limiters in distribution grids. *Applied Energy*, *350*, 121760.

Silva, W. P., Fiorotti, R., Rocha, H. R. O., & Yahyaoui, I. (2025, February). Minimization of Energy Expenditure and Charging Cycles in Distribution Systems With Electric Vehicles Using MOGWO. In 2025 15th International Renewable Energy Congress (IREC) (pp. 1-6). IEEE.

03/ Renewable energies integration to the electrical grid (PREDFLEX-CM project)

PREDFLEX-CM: Stable and flexible digital power grid program
TEC-2024/ECO-287
Funded by Madrid State (CAM): 1026k€.
Participation: 6 research groups from CAM.
AERA funds: 165k€.
PI: Imene Yahyaoui

Comunidad de Madrid

[Bienvenidos - PREDFLEX-CM]()

Annual meeting of the consortium, December 16th, 2025

03/ Renewable energies integration to the electrical grid (PREDFLEX-CM project)

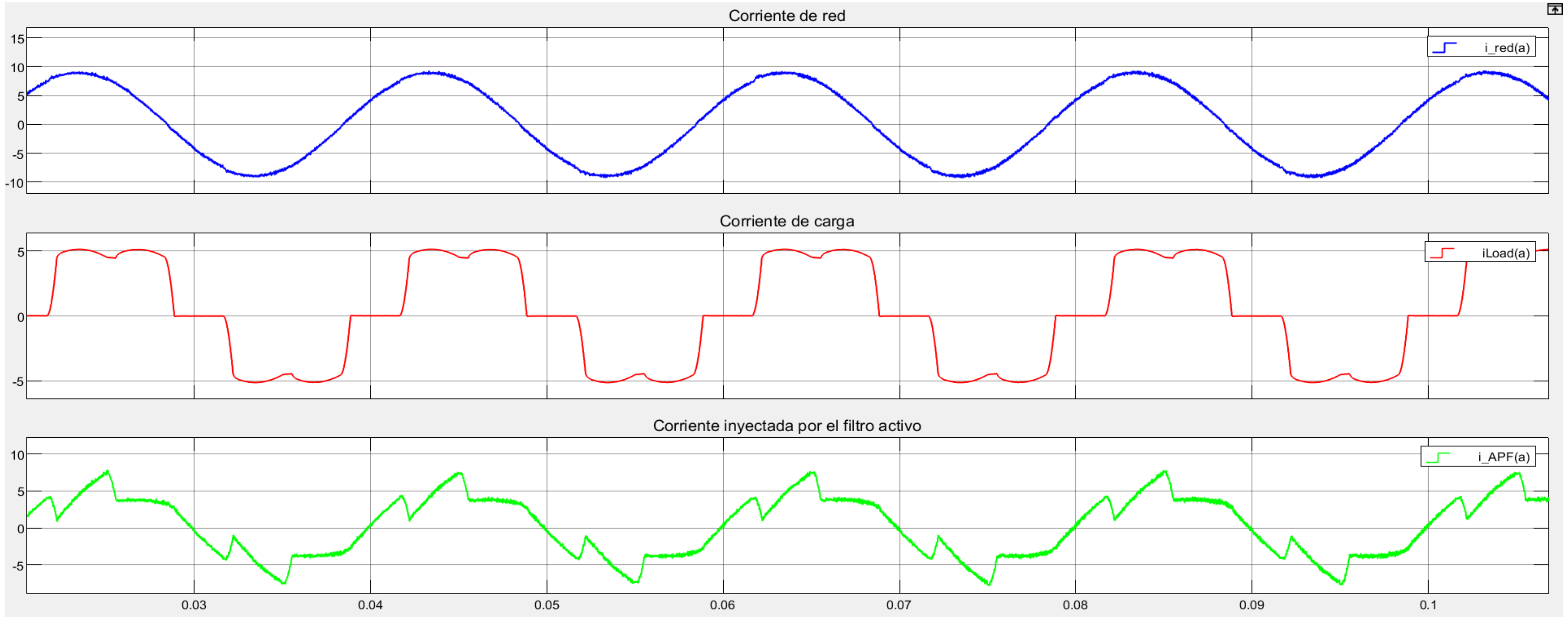
Objective 1 (O1). Integration, control and operation of renewable generation sources, storage and consumption systems in the context of a VPP.
Objective 2 (O2). Modeling and dynamic control of VPPs within a Distribution Network, taking into account aspects of voltage stability, frequency and dynamic interactions.
Objective 3 (O3). Design, modeling, emulation and evaluation of participation in local electricity markets and flexibility for energy communities based on VPPs.
Objective 4 (O4). New players in flexible and smart local grids: Digital twin and VPPs.
Objective 5 (O5). Application of artificial intelligence to VPPs in the distribution grid environment.
Objective 6 (O6). Study of distribution grid replanning solutions, future scenarios of electrification and potential of VPPs.
Objective 7 (O7). Demonstrator. Emulation of a VPP in a hardware-in-the-loop (HIL) system, with the elements of the VPP in each of the partners' facilities.

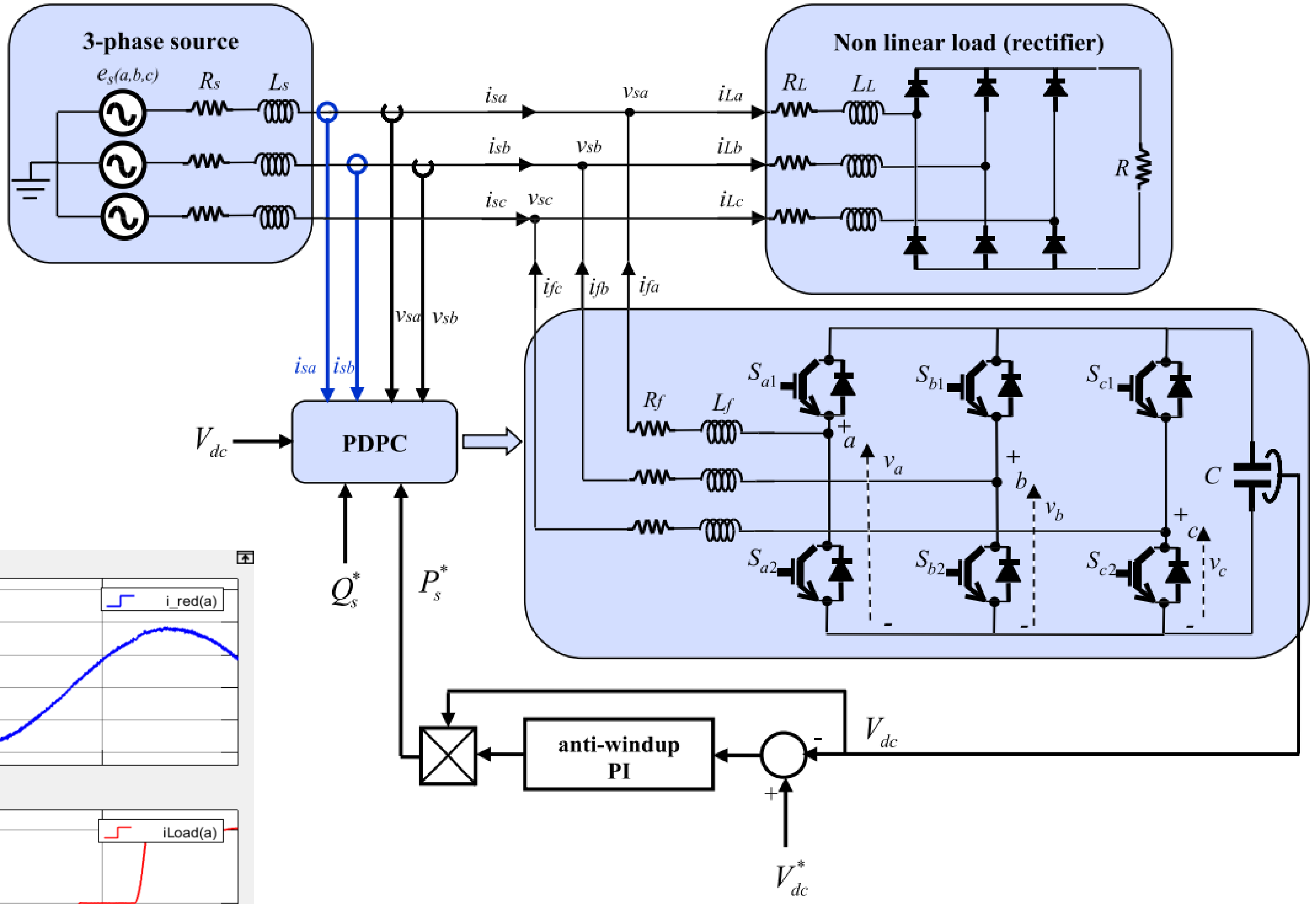
1. Review of the state of the art of APFs
    a. Study of different types of APFs
    b. Simulation in Matlab- Simulink
        i. Hysteresis-controlled parallel active filter (shunt-APF)
        ii. Shunt-APF controlled by direct predictive control (DPC)
        iii. Shunt-APF controlled by direct predictive control optimized with the Grey Wolf Optimizer (GWO) algorithm
        iv. Shunt-APF controlled by direct predictive control (DPC) for a 6-node IEEE network
2. Review of the state of the art of SCLs

03/ Renewable energies integration to the electrical grid (PREDFLEX-CM project)

Shunt-APF controlled by direct predictive control (DPC)

Casse	THD (%)
Without PI	30
PI	9,06%

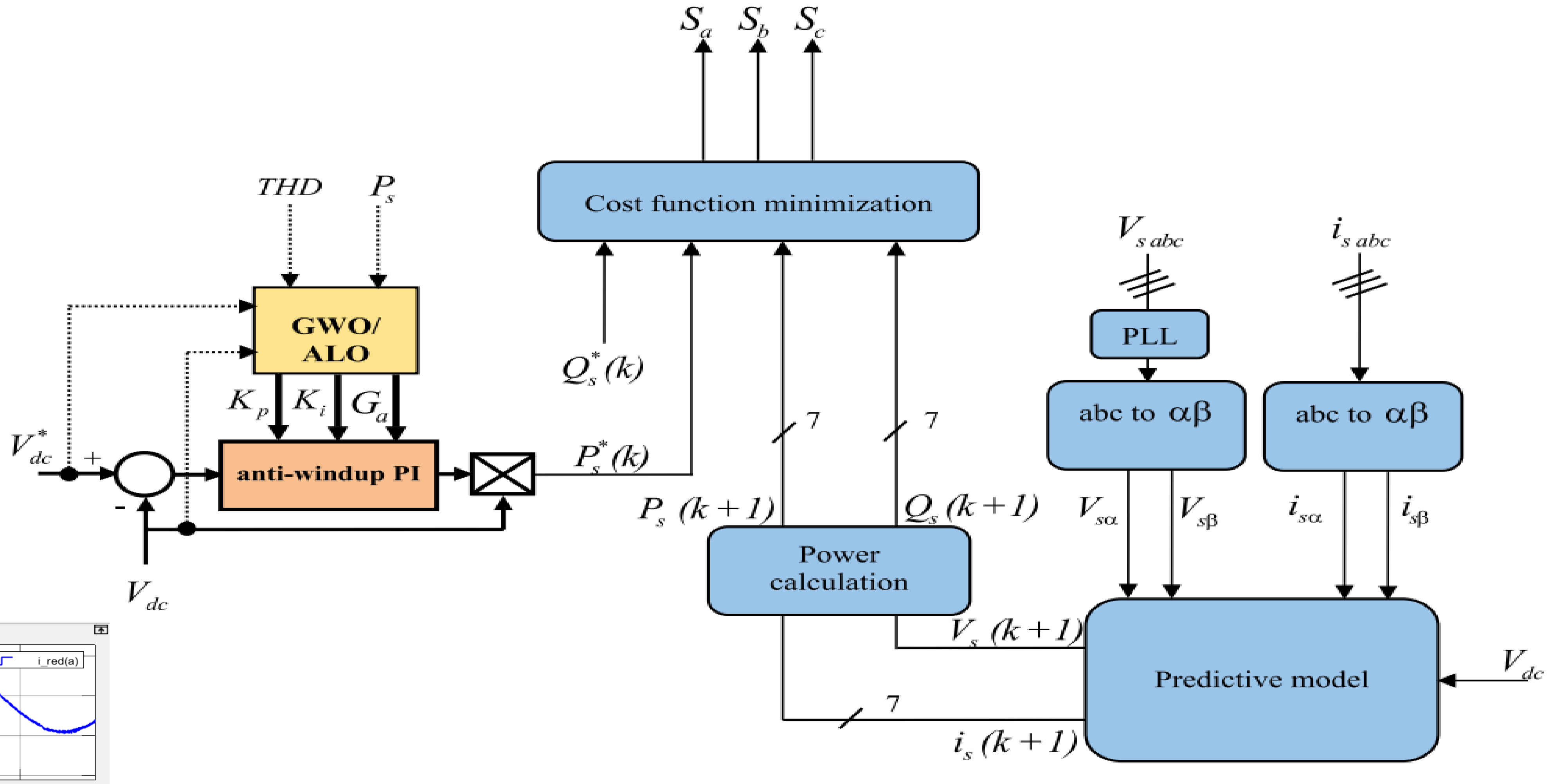


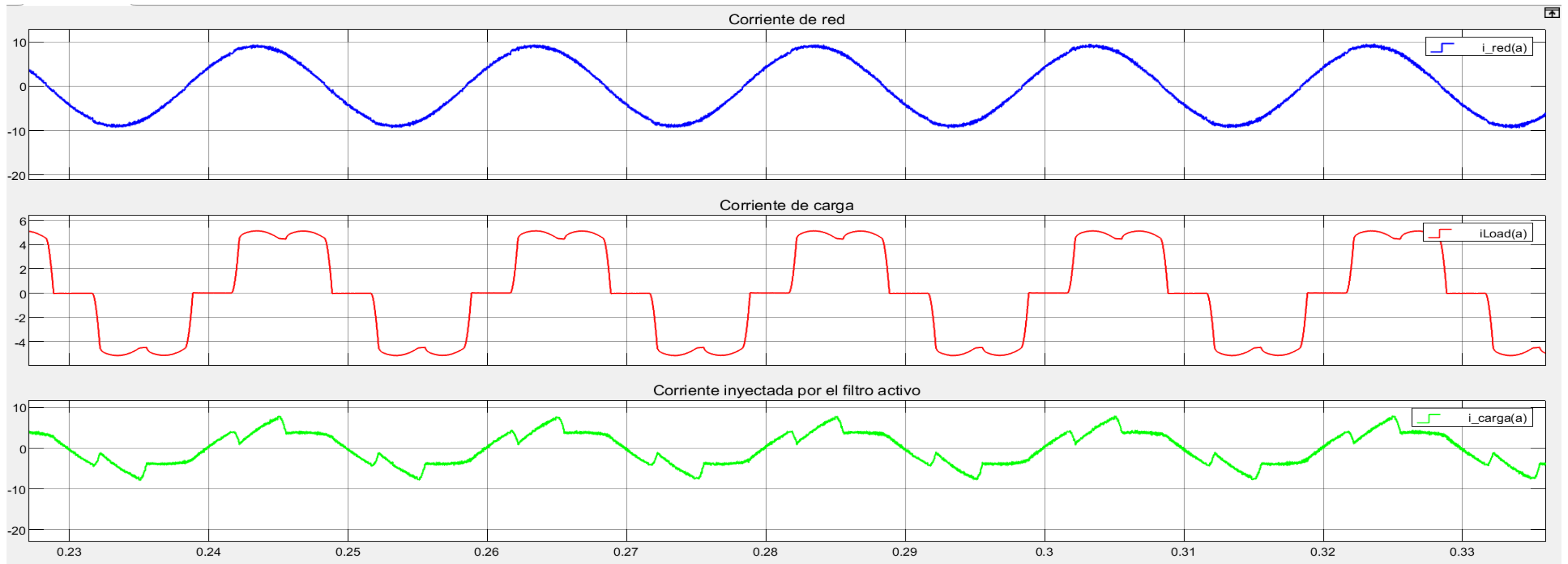


03/ Renewable energies integration to the electrical grid (PREDFLEX-CM project)

Shunt-APF controlled by direct predictive control optimized with the Grey Wolf Optimizer (GWO) algorithm

Case	Kp	Ki	G	THD (%)
PI	229,04	12 499.46	1000	9,06
PI-GWO	400	3 934,77	1 136,41	7,56





My research activities

01/ Energy management in renewable plants: grid connected and isolated plants

A. Diffuse logic (Fuzzy Logic) for photovoltaic water pump

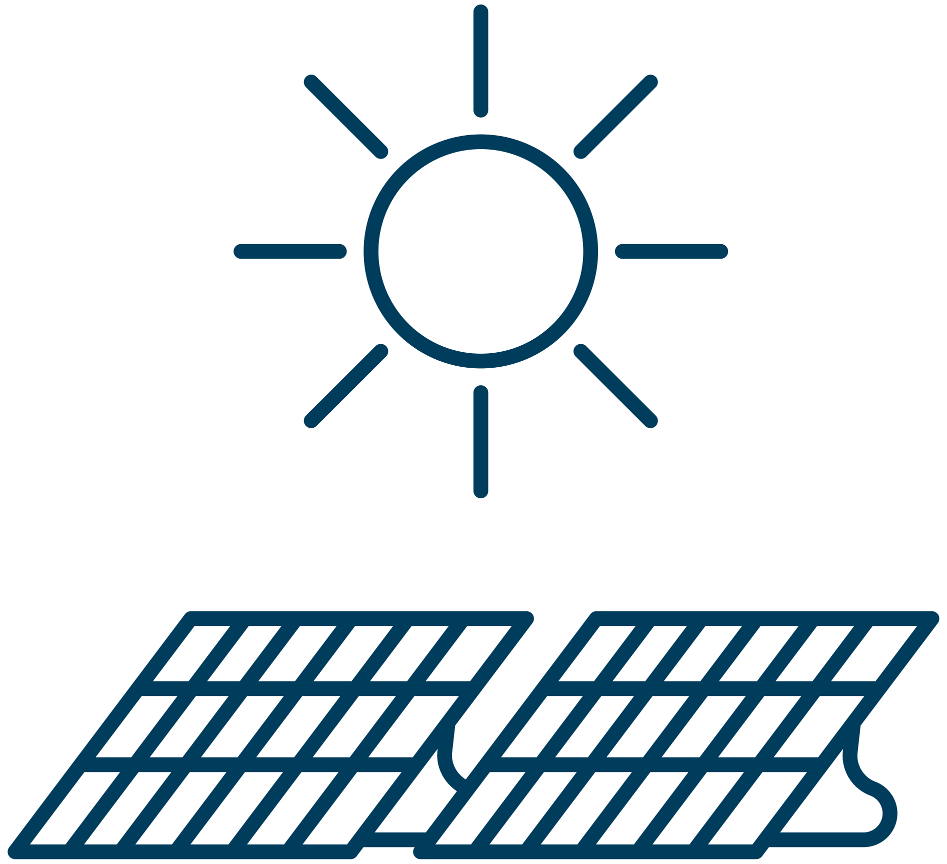
B. Genetic algorithm in wind and photovoltaic power plants

02/ Development of models for PV generation forecasting

03/ Renewable energies integration to the electrical grid (Project PREDFLEX)

04/ Reconfiguration of PV panels connections (PROJECT PVCAD)

05/ Demand planification in NZEBs



04/ Reconfiguration of PV panels connections (PROJECT PVCAD)

PROJECT PVCAD: Control of PhotoVoltaic panels generation by Advanced Deep learning algorithms implemented in FPGA

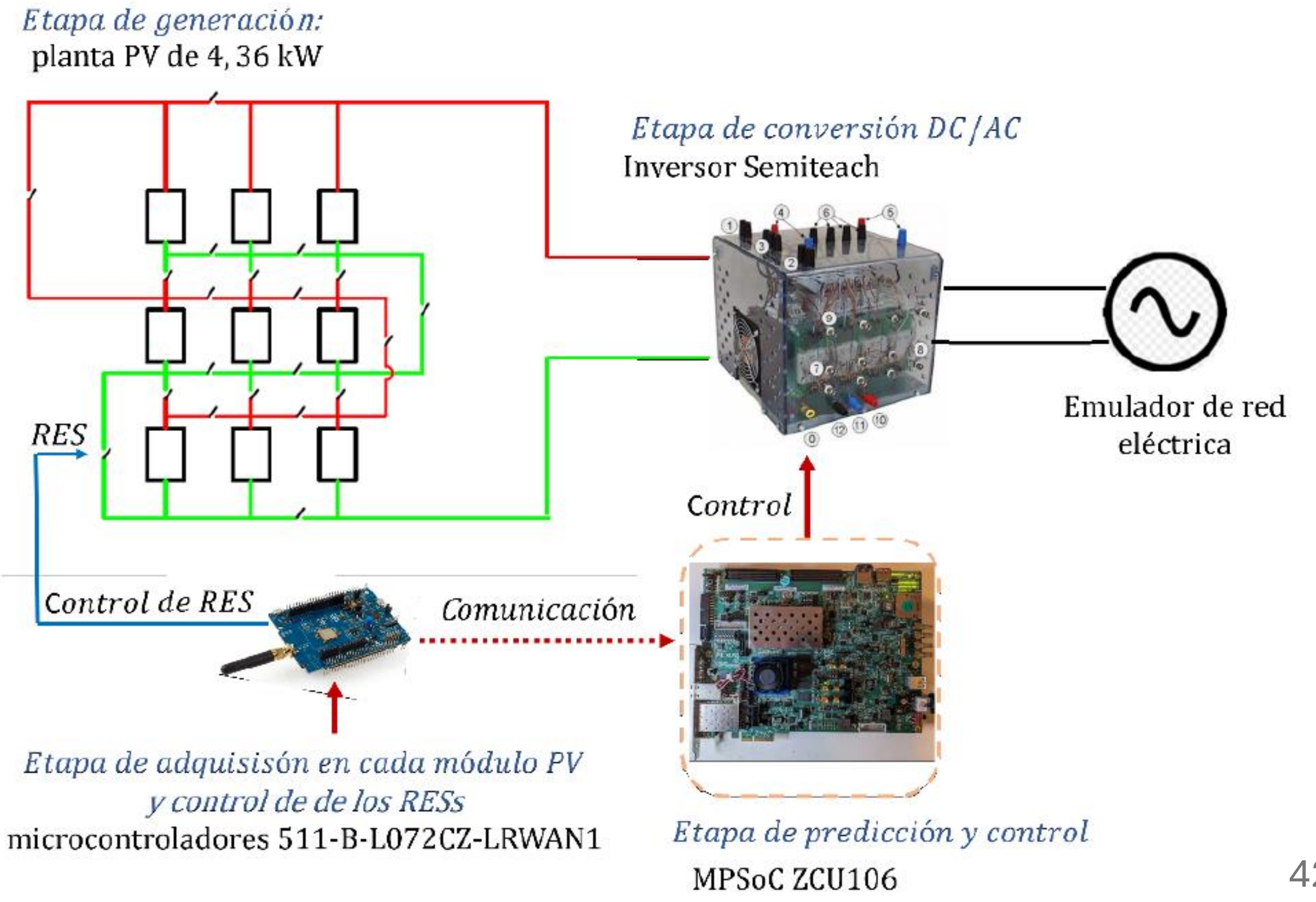
Funded by the State Agency for research (Spain ministry of): 56 k€.

PI: Imene Yahyaoui

O1. Detection and classification of PV plant operation failures and application of TCN in failure prediction.

O2. Solid state relay control for connection of PV modules to maximize power output.

O3. Aplication of TCN for the control of the inverter using FPGA.



04/ Reconfiguration of PV panels connections (PROJECT PVCAD)

This study evaluates the performance of 4 PV panels under varying irradiance conditions by reconfiguring their connections using a custom-designed switching matrix. Simulations were performed to identify the optimal configuration for maximizing power output.

- Operational constraints: The inverter requires at least two panels in series to meet the minimum starting voltage.
- Irradiance conditions:
  - Panels A and C: 1000 W/m^2 irradiance.
  - Panels B and D: 500 W/m^2 irradiance.
- Power generation analysis:
  - A switching matrix with **37 switches** was designed to enable **76 possible configurations** of the PV panels (Fig. 2).
  - Optimum configurations obtained (Fig. 3).
  - PV power output for each of the 76 configurations (Fig. 4).

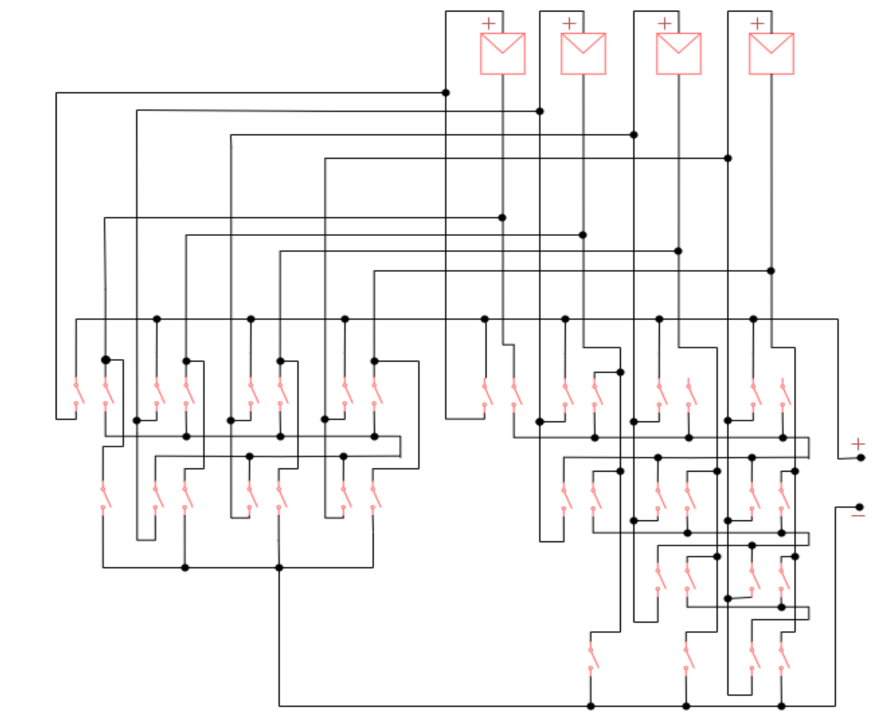


Figure 2. PV panel switching matrix.

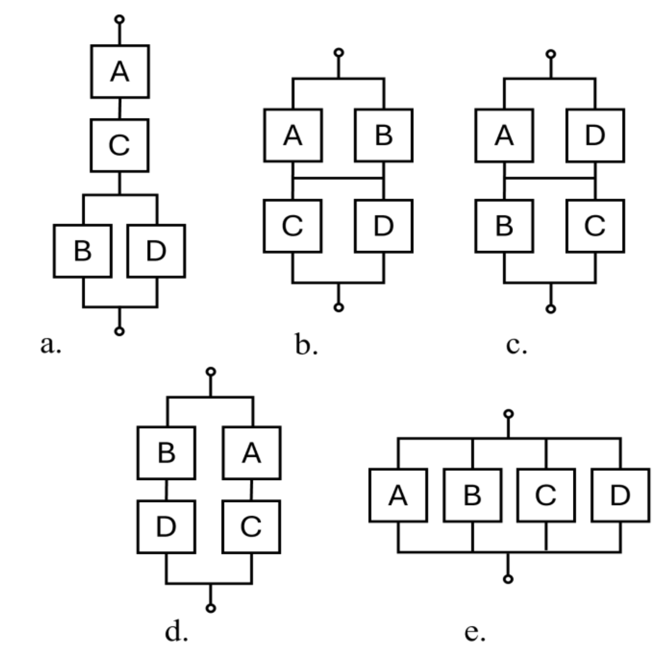


Figure 3. Optimum configurations.

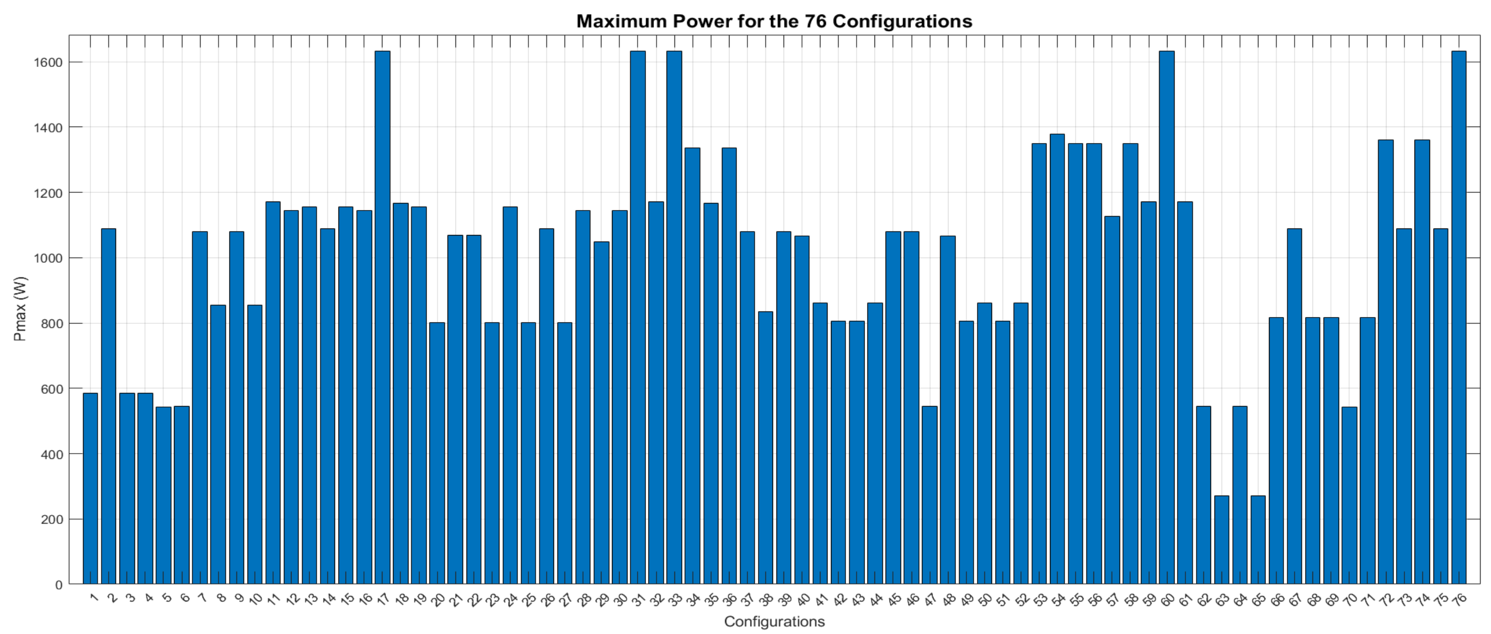
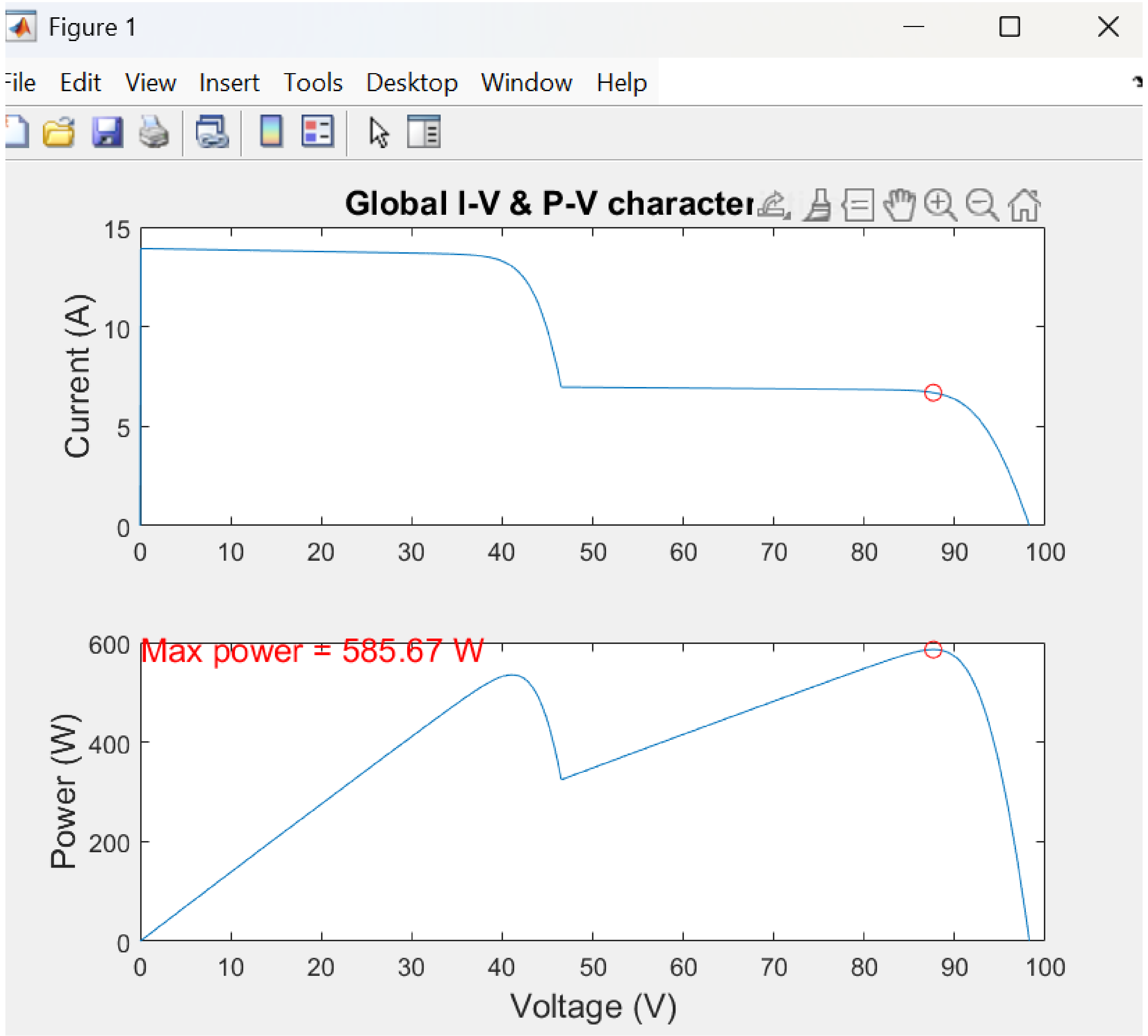
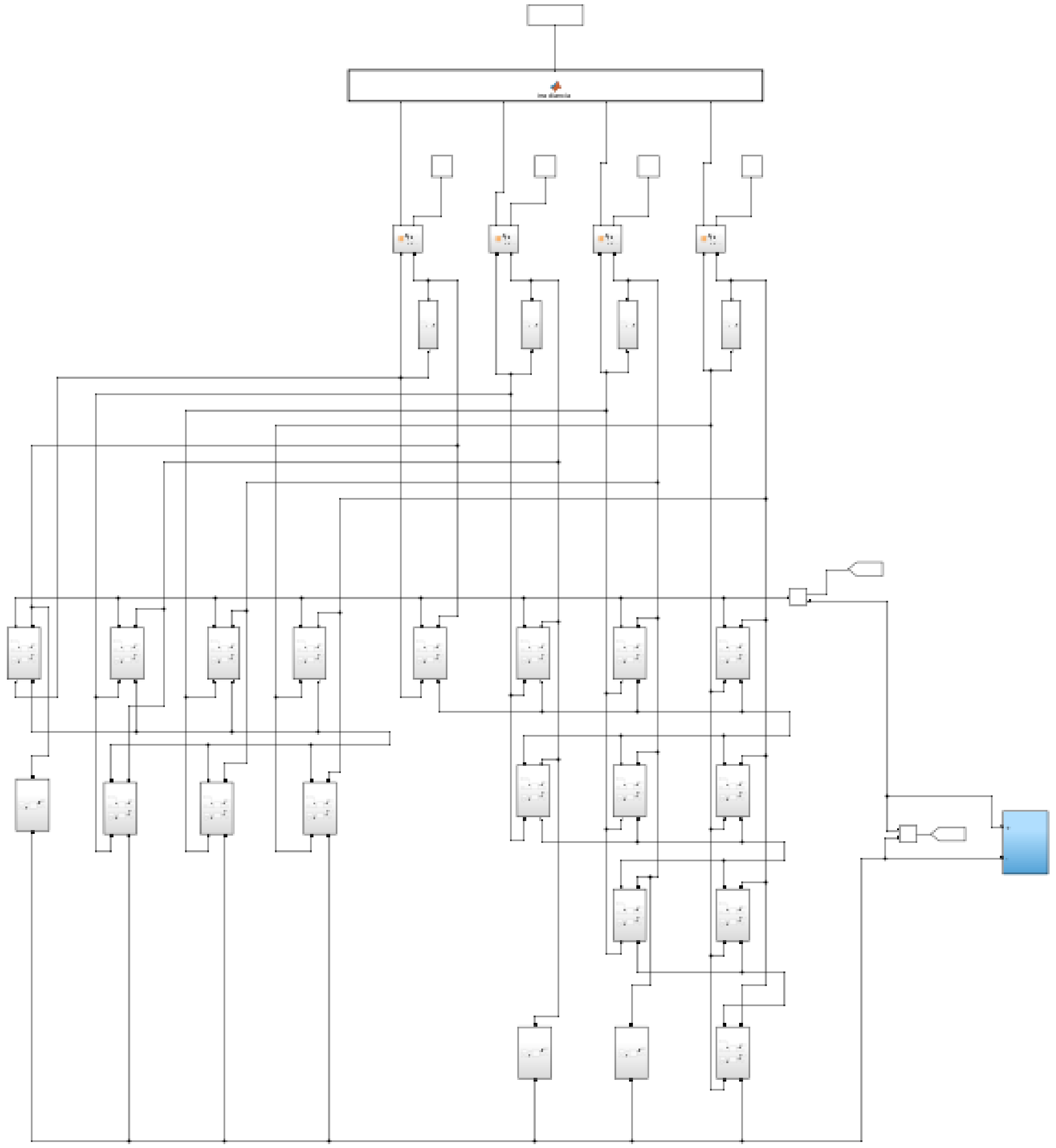


Figure 4. PV power output generated.

04/ Reconfiguration of PV panels connections (PROJECT PVCAD)





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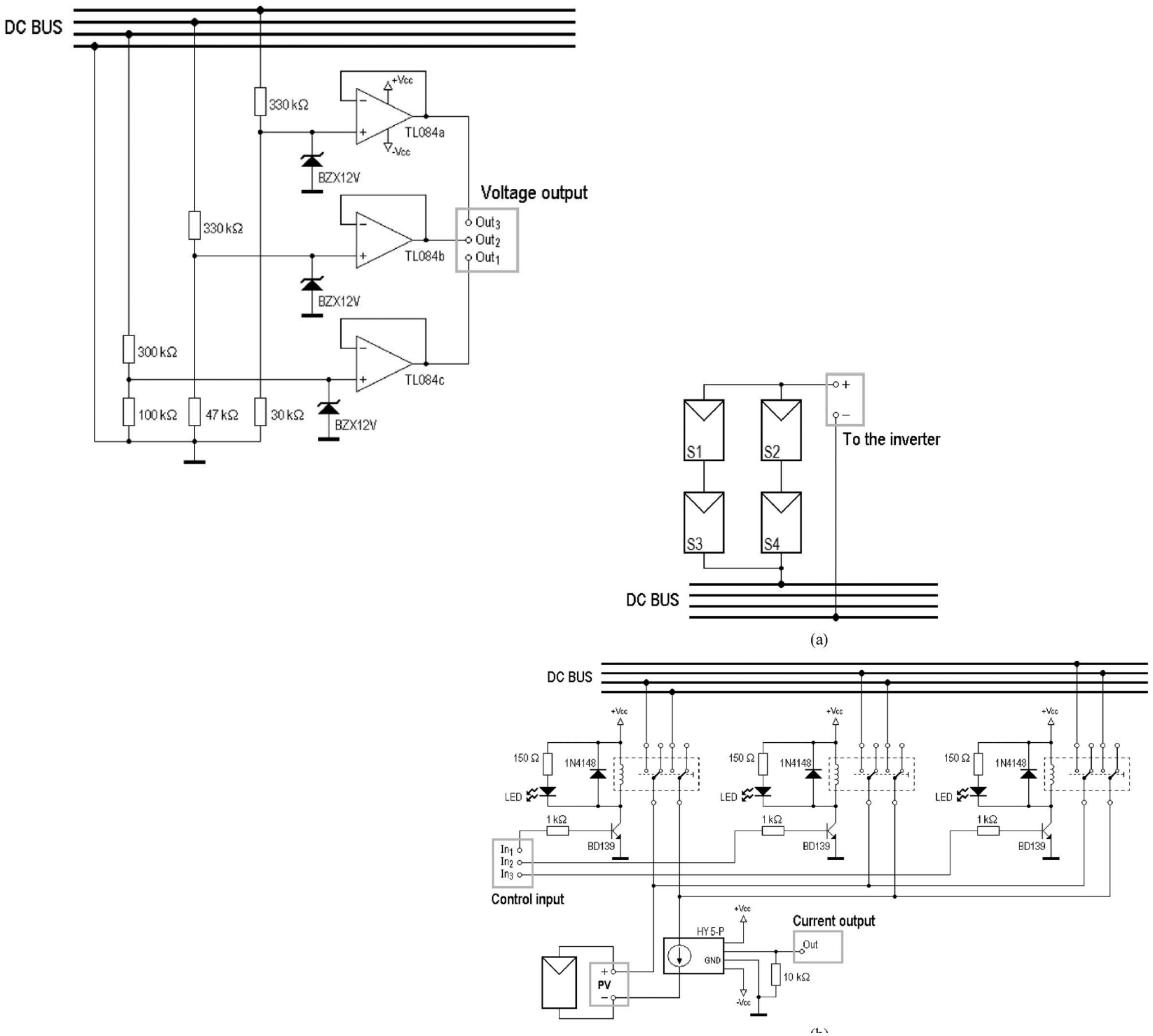
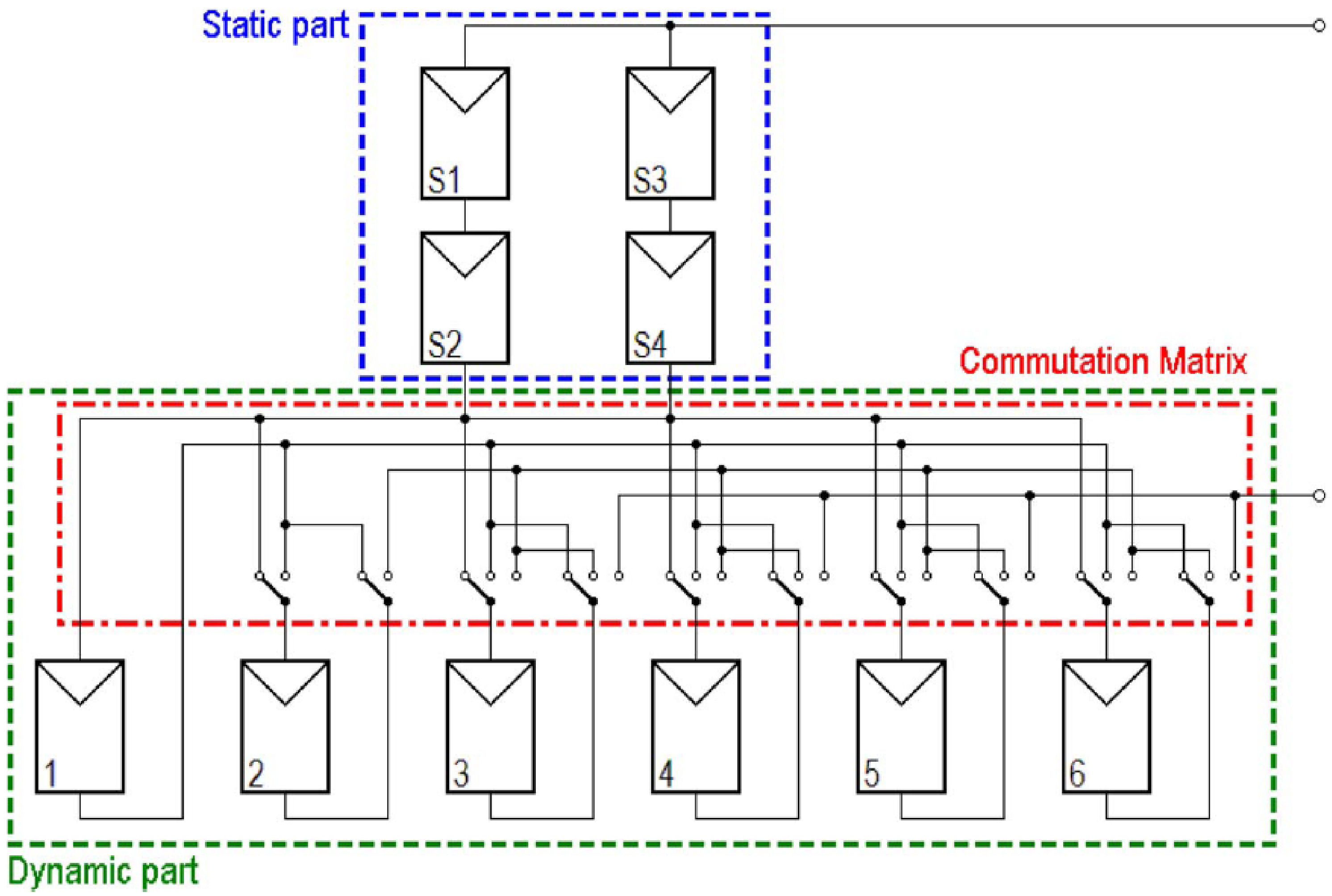
GOBIERNO DE ESPAÑA · MINISTERIO DE CIENCIA, INNOVACIÓN Y UNIVERSIDADES · AGENCIA ESTATAL DE INVESTIGACIÓN





Paper: Velasco-Quesada, G., Guinjoan-Gispert, F., Piqué-López, R., Román-Lumbreras, M., & Conesa-Roca, A. (2009). Electrical PV array reconfiguration strategy for energy extraction improvement in grid-connected PV systems. *IEEE transactions on industrial electronics*, *56*(11), 4319-4331.

04/ Reconfiguration of PV panels connections (PROJECT PVCAD)

Novak, R., Álvaro, M. D., Sánchez, F. R., Sánchez, G. M., de Souza, E. M., Encarnaçao, L., ... & Yahyaoui, I. (2025, February). Study of PV Panels Dynamic Reconfiguration for Maximizing Power Generation. In *2025 15th International Renewable Energy Congress (IREC)* (pp. 1-6). IEEE.

Coutinho, C. R., Fiorotti, R., Segatto, M. E. V., Fardin, J. F., de Oliveira Rocha, H. R., & Yahyaoui, I. (2025). Data collection in solar systems for efficiency enhancement. *Data in Brief*, 112341.

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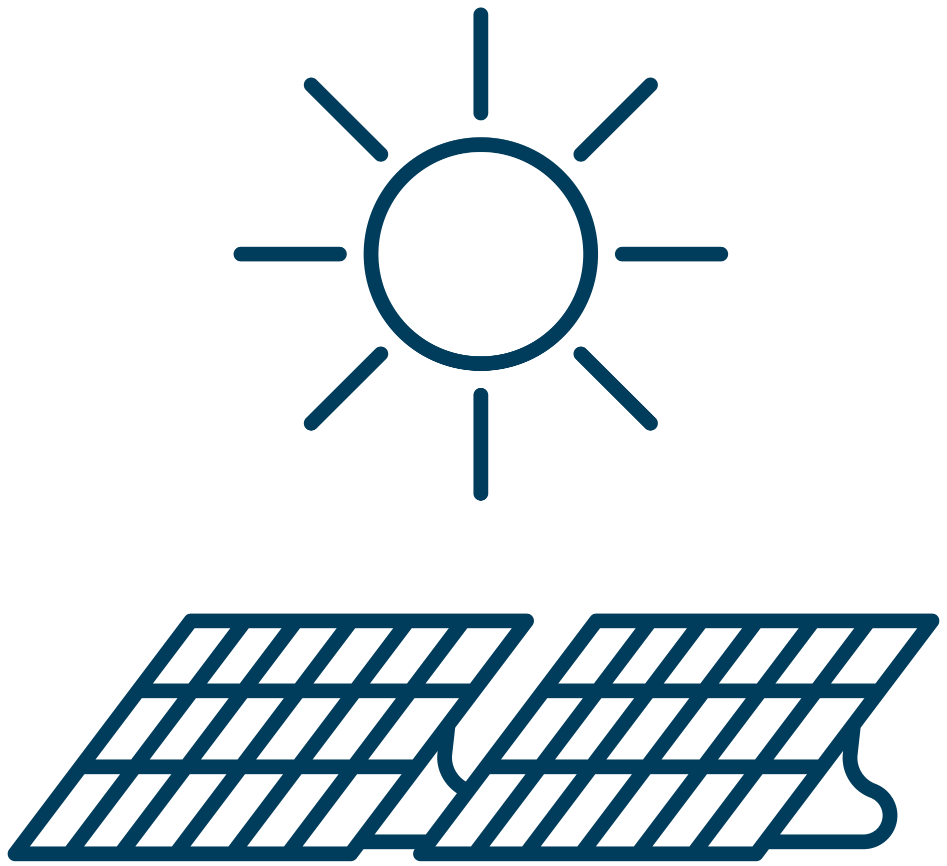
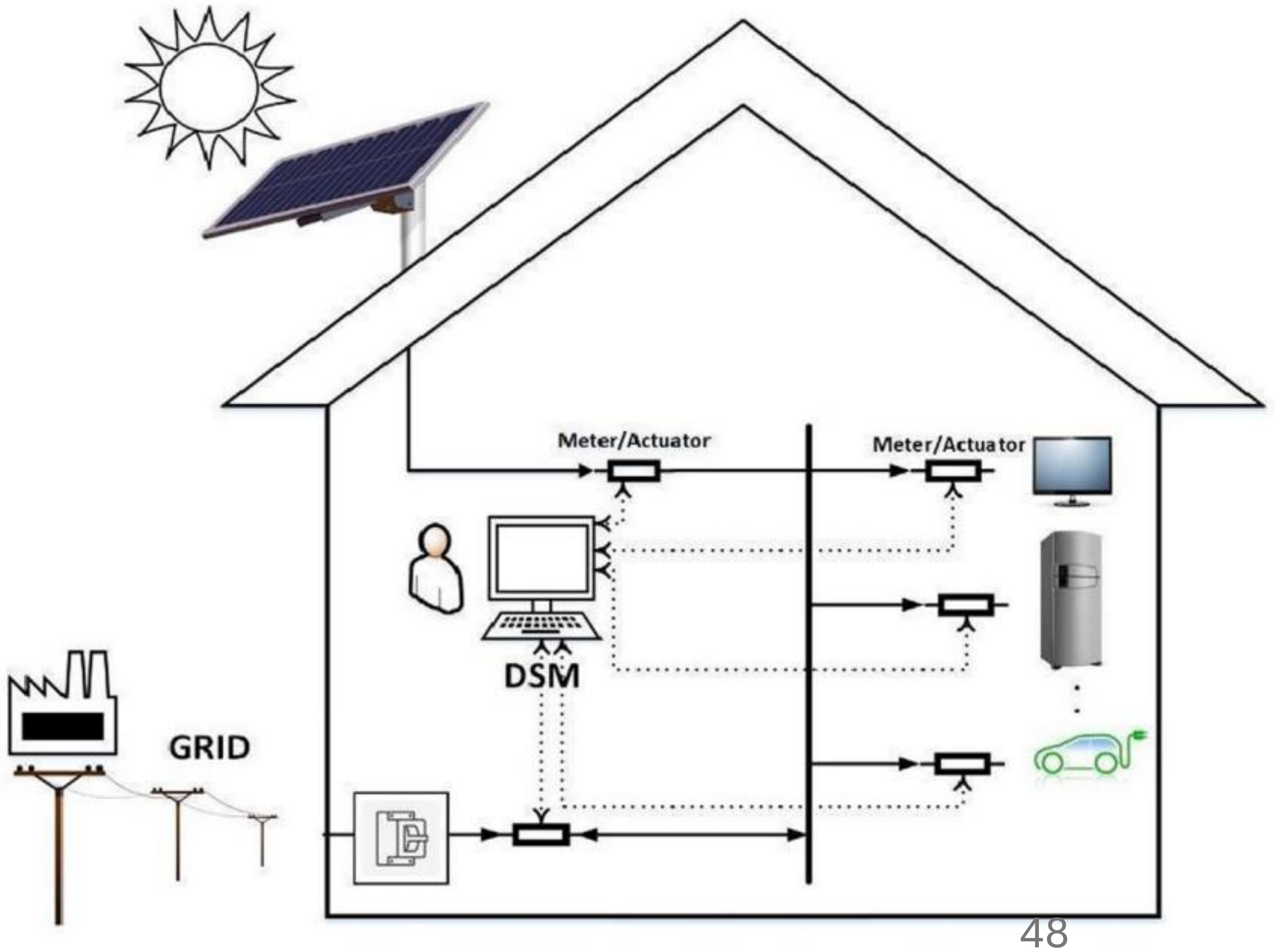


05/ Demand planification in NZEBs

Metaheuristic multi-start, consisting of two steps, constructive heuristics and refinement heuristics (local search)

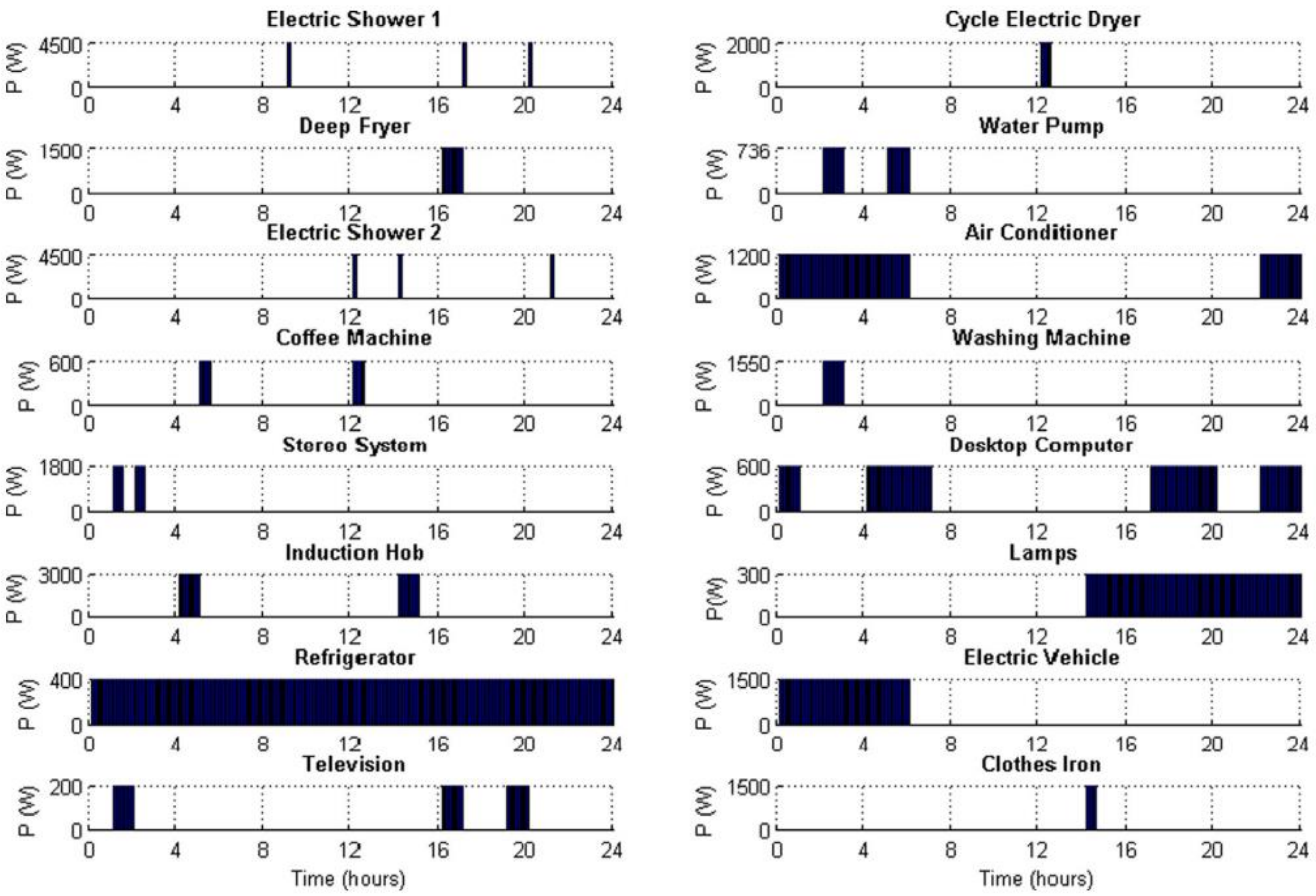
Equipment usage time for the Case Study

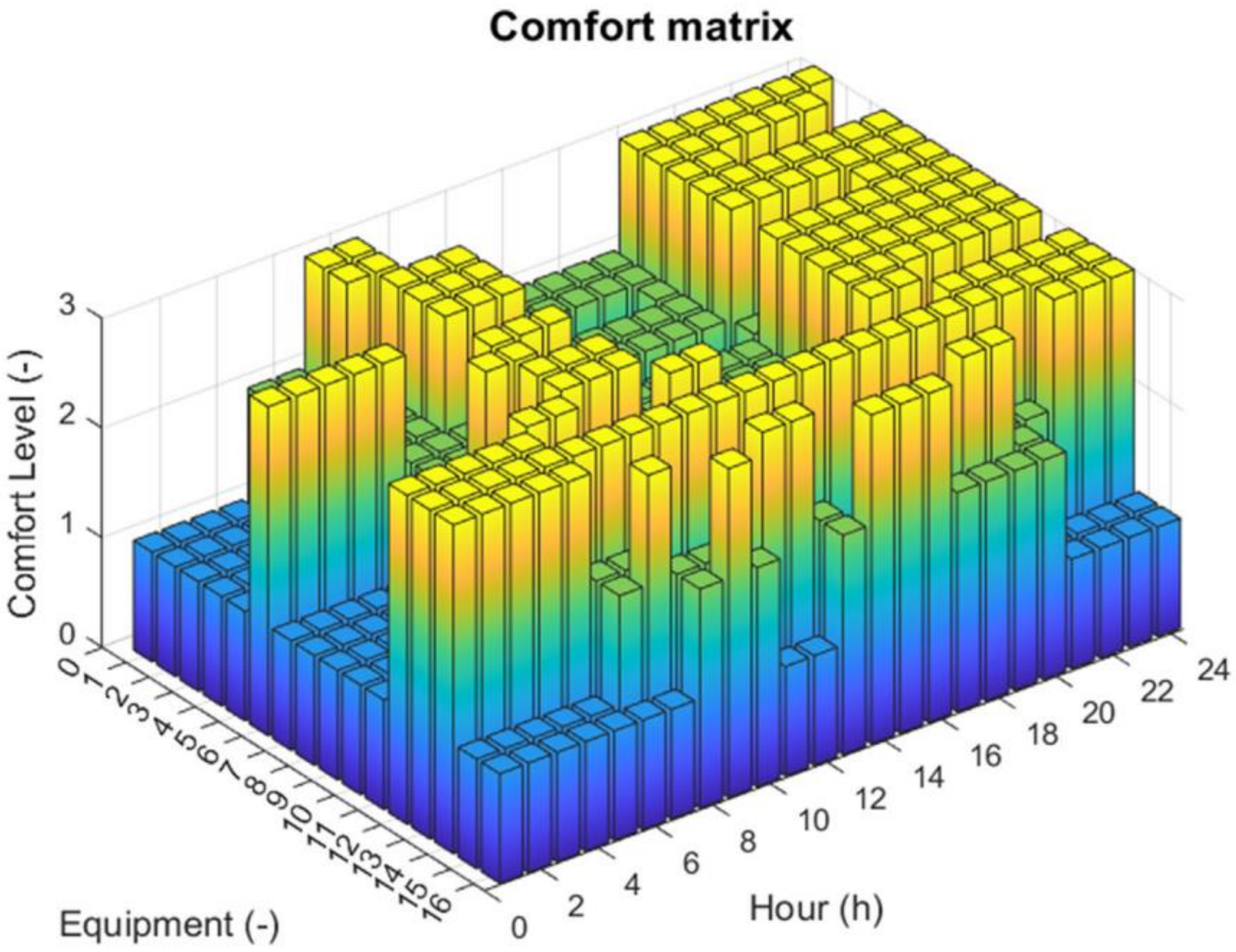
Ramal (j)	Nominal Power (W)	Numbers of cycles	Duration per Cycle (minutes)	Time available
1 - Electric shower	4500	3	10	5 a.m. up to 11 p.m.
2- Cycle Electric Dryer	2000	1	30	9 a.m. up to 2 p.m.
3 - Deep Fryer	1500	1	60	3 p.m. up to 9 p.m.
4 - Water pump	736	1	80	All day
5 - Electric shower	4500	3	10	5 a.m. up to 11 p.m.
6 - Air conditioner	1200	2	240	All day
7 - Coffee machine	600	2	60	5 a.m. up to 4 p.m.
8 - Washing machine	1550	1	120	All day
9 - Stereo system	1800	2	30	All day
10 - Desktop computer	600	3	180	All day
11 - Induction hob	3000	2	60	4 a.m. up to 10 p.m.
12 - Lamps	300	1	600	All day
13 - Refrigerator	400	1	1440	All day
14 - Electric car	1500	1	360	All day
15 - Television	200	3	60	All day
16 - Clothes iron	1500	1	30	7 a.m. up to 11 p.m.



05/ Demand planification in NZEBs

Metaheuristic multi-start, consisting of two steps, constructive heuristics and refinement heuristics (local search)





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Thanks!

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