

NABLADOT

INTRODUCTION TO THE COMPANY AND ITS SERVICES

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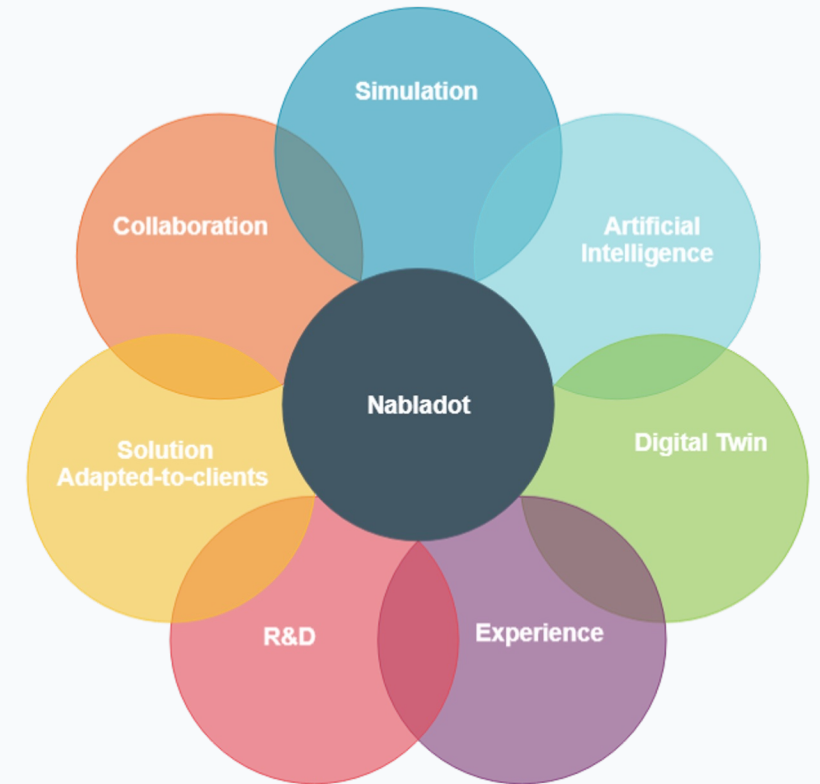
Established in 2010 by researchers specializing in **Computational Fluid Dynamics (CFD)** at the University of Zaragoza.

Innovative Character

We actively engage in research and development projects at both national and European levels.

Business Focus

We offer solutions tailored to the technical and economic needs of companies.



We offer a wide range of specialized services in simulation and digital innovation



Our experience covers multiple industrial sectors.

ENERGY SECTOR

- HSGR (combined cycles)
- Biomass boilers
- Molten salts heat exchangers
- Rotary kilns

HVAC & AIR QUALITY

- Logistic centers
- Metro station
- Tunnels
- Pharmacy clean rooms

WATER SECTOR

- Hydraulic infrastructure
- UV water disinfection
- Aerobic reactors
- Anaerobic reactors

FLUE GAS CLEANING

- Wet flue gas desulfurization
- NH₃ stripping
- Regenerative thermal oxidizer
- Bag filter

INDUSTRY

- Deoil tanks
- Valves
- Pneumatic transport
- Biomass rotary dryer

HYDROGEN SECTOR

- Combustion
- Substitution of fossil fuels
- Injection in gas pipelines
- Leaks / Dispersion

CHEMICAL SECTOR

- Pyrolysis reactor
- Fixed bed reactors
- Real-time energy audit

SMART CITIES

- Urban wind in real time
- Integration BIM & Simulation
- Solar PV generation forecast

The quality of our work is certified by:



Staff Training

50% of staff with a PhD in Fluid Mechanics.



Innovative SME

Recognition by the Ministry of Science and Innovation (Spain).



PYME INNOVADORA
Válido hasta el 26 de septiembre de 2026



Innovative Company

Accreditation from the French Ministry of Higher Education, Research and Innovation.



International Congresses

Active participation in the most relevant scientific events in the sector.



Scientific Journals

Publications in prestigious international journals.

NABLA DOT R&D COLLABORATION: RELEVANT PUBLIC FUNDED R&D PROJECTS



Name	Year	Funding body
CFD Desing of biomass boilers in the Cloud	2016	European Commission
Cloud-based Micrositting of Small Wind Turbines	2017	European Commission
Optimizing solar panel production	2018	European Commission
Digital Twin for Biomass Boilers	2020	European Commission
Development of reduced-order models and machine learning for high-resolution wind prediction	2020	Spanish Ministry of Science, Innovation and Universities
Digital twin of high-efficiency heat recovery units	2021	Spanish Ministry of Industry, Commerce and Tourism
Digital Twin for Rotary Dryers	2021	European Commission
Electrification and digitization of the regenerative thermal oxidizer for the decarbonization of industry (e-RTO)	2022	Spanish Ministry of Industry, Commerce and Tourism
Digital twin for the comprehensive management of ammonia emissions in pig farms.	2022	Spanish Ministry of Industry, Commerce and Tourism
Digital Twin for cost-efficient treatments of wastewater in Anaerobic Reactors	2023	Eureka - Eurostars
New technology to produce hydrogen from renewable energy sources based on AI with optimized costs for environmental applications.	2023	Eranet - Co-funded projects
HPC-based efficiency optimization of industrial fired preheaters	2024	European Commission
Intelligent Platform for Rapid Deployment of Scalable Digital Twins in Thermal Industrial Systems (iTWIN-TIS)	2026	Eureka - Eurostars

NABLADOT SERVICES

NABLA DOT: SIMULATION AS A SERVICE



Advanced simulation on demand to solve engineering challenges

What it includes



CFD & multiphysics studies



Real process and
equipment modeling



Scenario and what-if analysis



Technical issue diagnosis



Design and operation optimization



Reports, visuals, and
decision-ready KPIs

Value for the client



Less technical uncertainty



Lower development cost and time



Fewer risks before implementation



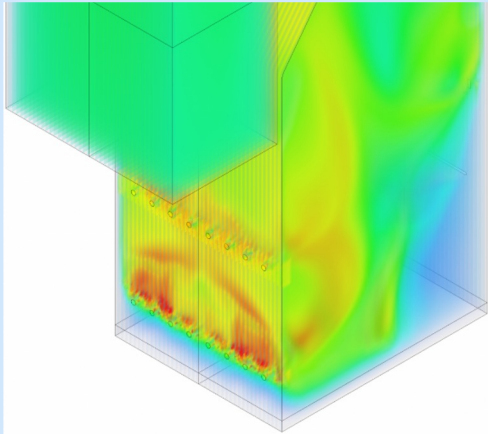
Better efficiency and performance



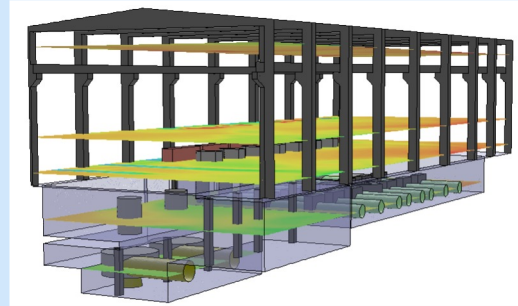
Clear, actionable engineering insight

NABLA^{DOT}: SIMULATION AS A SERVICE

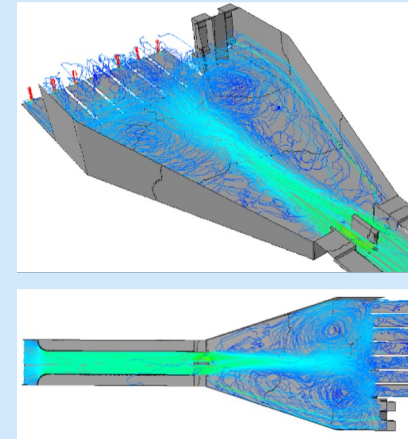
Energy
Biomass boilers



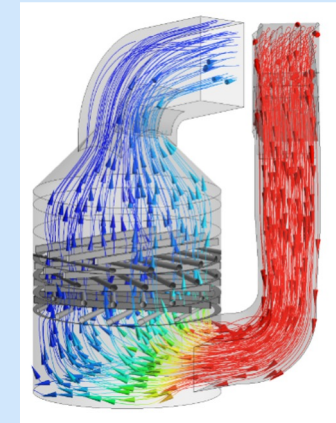
HVAC and Air Quality
Logistics warehouses



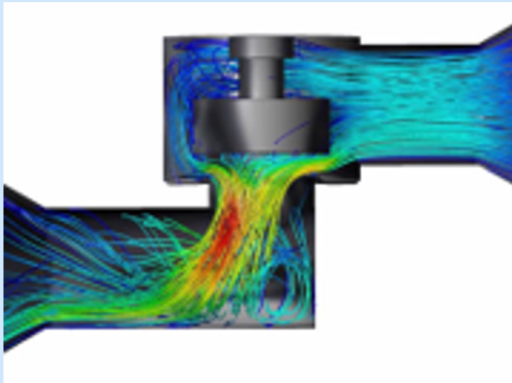
Water sector
Hydraulic infrastructures



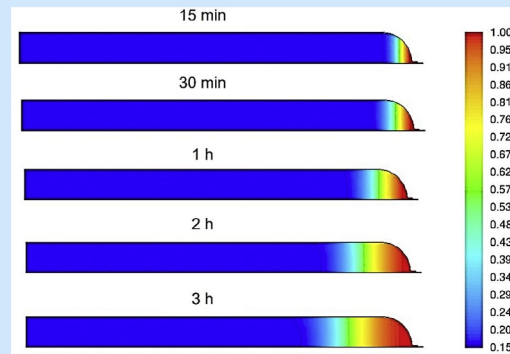
Flue Gas Cleaning
Desulphurisation



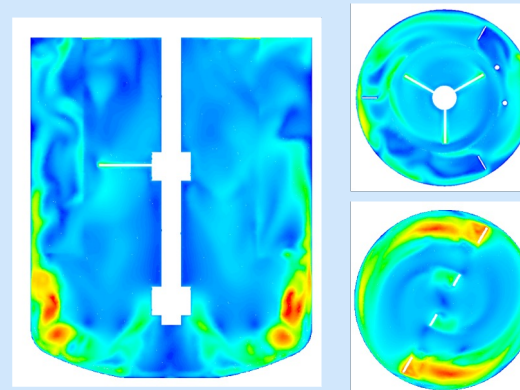
Industry
Valves



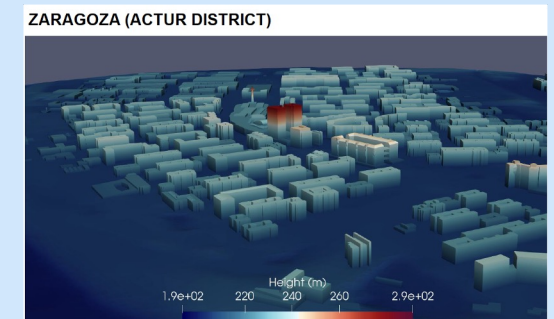
Hydrogen
Hydrogen injection



Chemical sector
Pyrolysis reactor



Smart Cities
Wind forecast in real time



NABLA DOT: SIMULATION AS SOFTWARE



Fast simulation software tailored for your design workflows

What it includes



Reduced-Order Models (ROMs) derived from CFD or multiphysics simulations



Fast scenario evaluation without rerunning full simulations



Interactive software tools for engineering, operation or technical sales teams



Physics- and data-based predictive models



User-friendly dashboards, web apps or internal tools



Integration with sensors, databases, SCADA, IoT platforms or digital twins

Value for the client



Turns simulation into a reusable software asset



Reduces calculation time from hours or days to seconds or minutes



Enables real-time or near-real-time decision-making



Makes advanced simulation accessible to non-expert users



Accelerates design, optimization and operational analysis

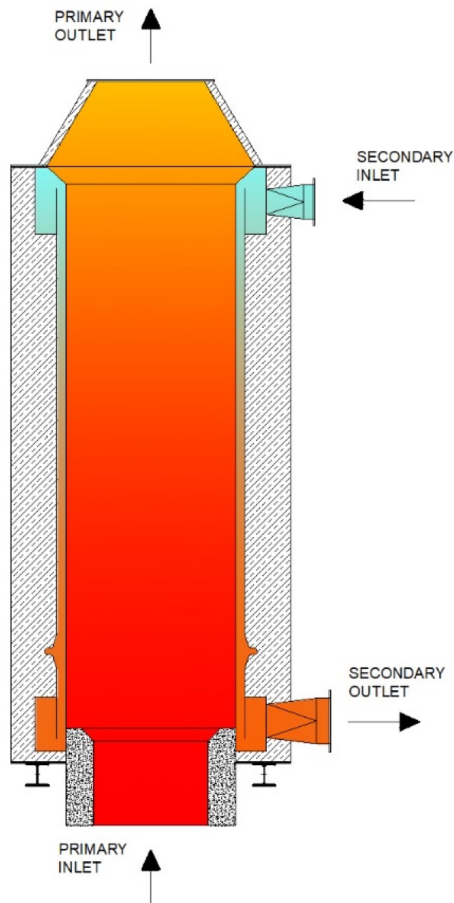


Provides a strong foundation for digital twins and predictive tools

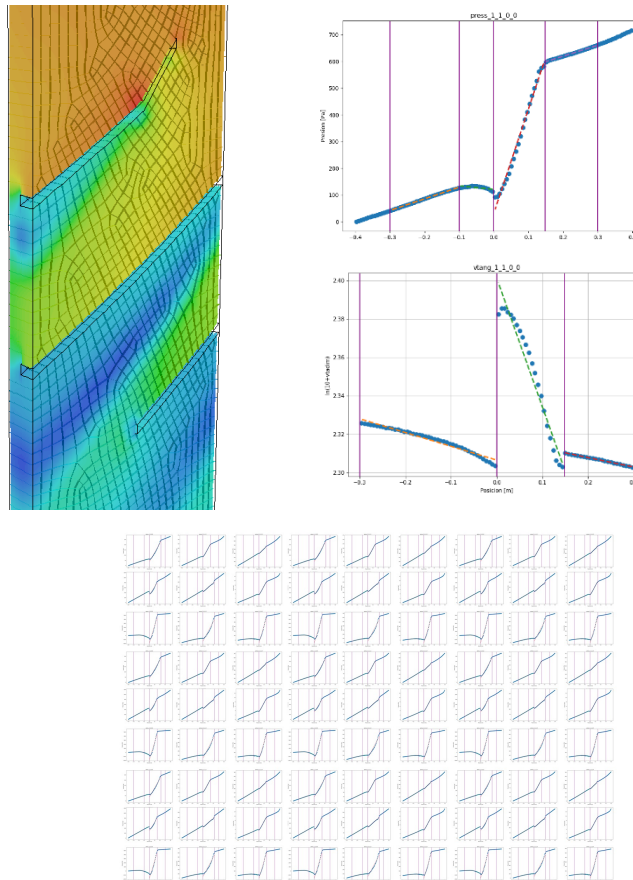
NABLA DOT: SIMULATION AS SOFTWARE

Simulation software (real-time model) for determining heat transfer, pressure drop, and wall temperatures in heat recovery units

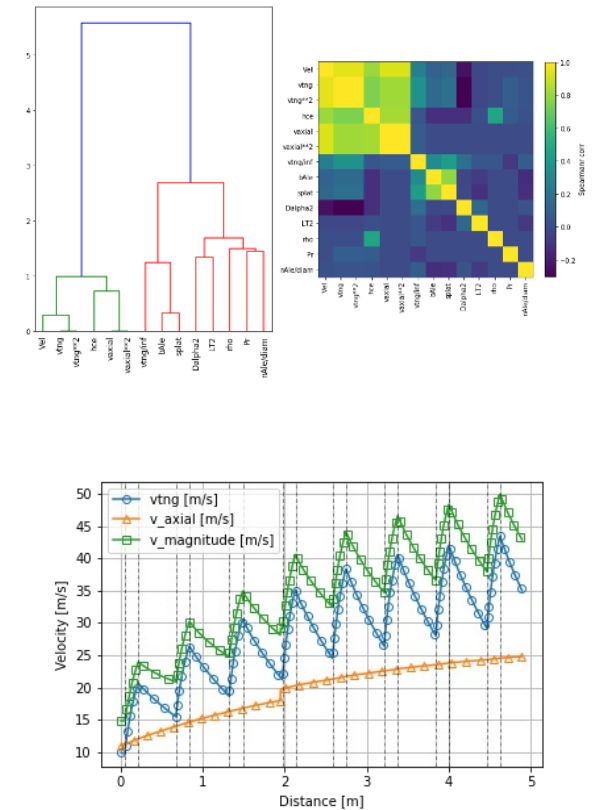
Equipment



CFD & Design of experiments



Machine learning & Results



Smart monitoring to transform operational data into reliable, actionable insight

What it includes



Operational data integration

Sensors, SCADA, PLCs, databases and IoT platforms



Data reconciliation & validation

Noise reduction, consistency checks and estimation of unmeasured variables



KPI dashboards

Real-time visualization of performance, efficiency, consumption and alarms



Anomaly detection

Identification of deviations, abnormal behavior and performance losses



Reference models

Comparison between actual operation and expected behavior



Smart alerts & decision support

Prioritized insights to support operation and maintenance teams



Historical analysis & trends

Root-cause analysis and early detection of recurring issues



Connection with predictive models or digital twins

Integration with ROMs, physics-based models and optimization tools

Value for the client



More reliable operational data



Better visibility of process performance



Faster detection and diagnosis of issues



Early warning of failures or efficiency losses



More stable and efficient operation



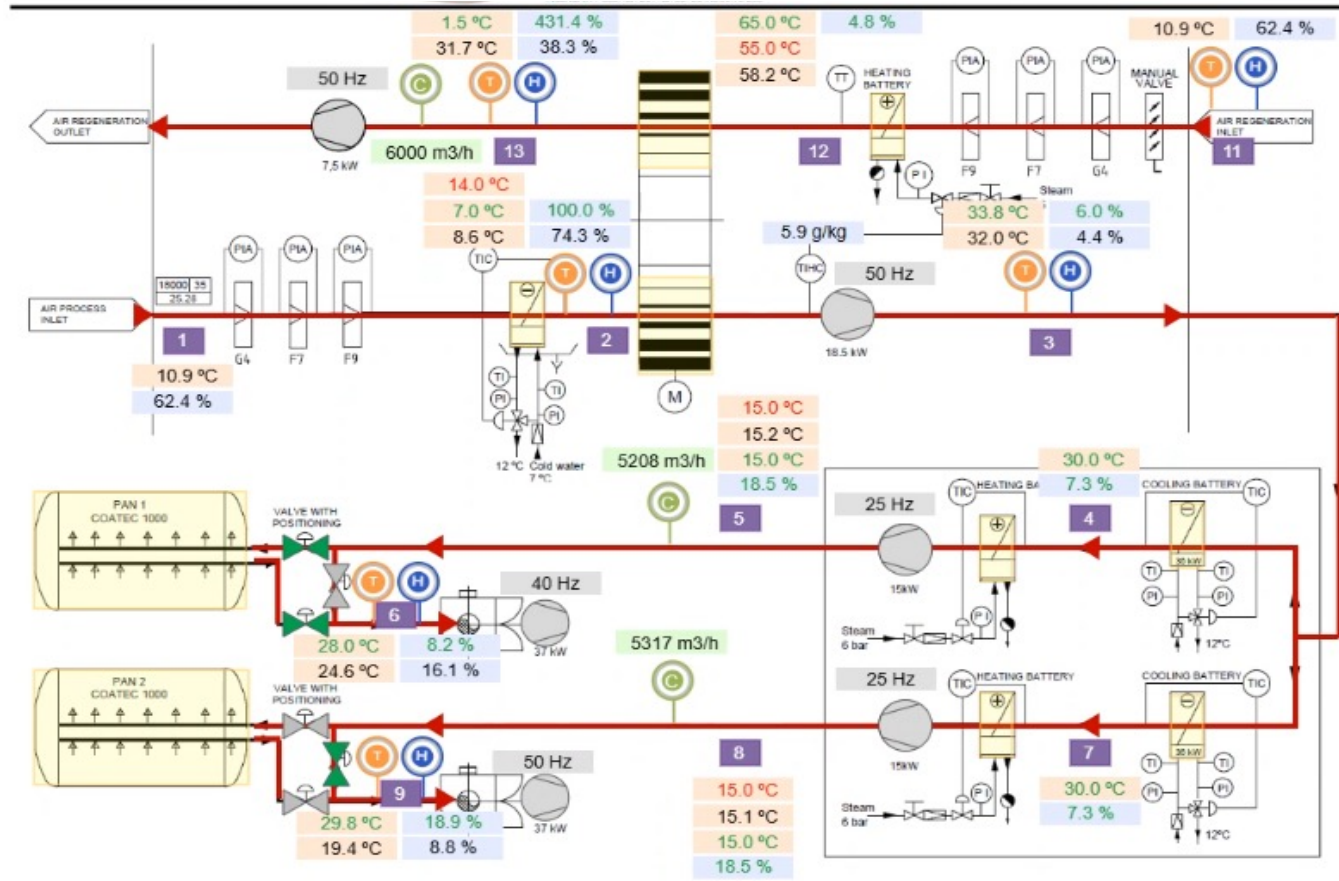
Lower downtime, energy losses and operating costs



Actionable insight for operation, maintenance and engineering teams

NABLA DOT: ADVANCED MONITORING

Real-time energy audit of drying processes in the food industry



- Mostrar posiciones ☒
- Mostrar valores medidos ☒
- Mostrar valores calculados ☒

LEYENDA	Temperatura	Caudal
Medida		
Calculado		
Consigna		
	Humedad rel.	Frecuencia

Temp.	REAL	IDEAL
P1	10.89	-
P2	8.59	7.00
P3	32.04	33.81
P4	-	30.00
P5	15.19	15.00
P6	24.57	28.01
P7	-	30.00
P8	15.08	15.00
P9	19.42	29.80
P11	10.89	-
P12	58.17	65.00
P13	31.71	1.53

VALVULAS	APERTURA B15	APERTURA B16
PROCESO	76.0	0.0
BYPASS	0.0	64.0
ASPIRACION	100.0	0.0

Connected virtual replicas that combine physics, data and real-time operation to understand, predict and optimize asset performance

What it includes



Virtual model of the asset, equipment or process



Integration of physics-based models, ROMs and operational data



Connection with real-time data sources SCADA, PLCs, sensors, databases and IoT platforms



Continuous monitoring of KPIs and operating conditions



Scenario simulation and predictive analysis



Operation and maintenance optimization



Interactive dashboards and user-friendly interfaces



Continuous model update with new operational data

Value for the client



Better understanding of real system behavior



Early detection of failures, deviations and performance losses



Lower operation and maintenance costs



Improved energy efficiency, productivity and stability



Reduced risk by testing decisions before implementation



Real-time or near-real-time decision support

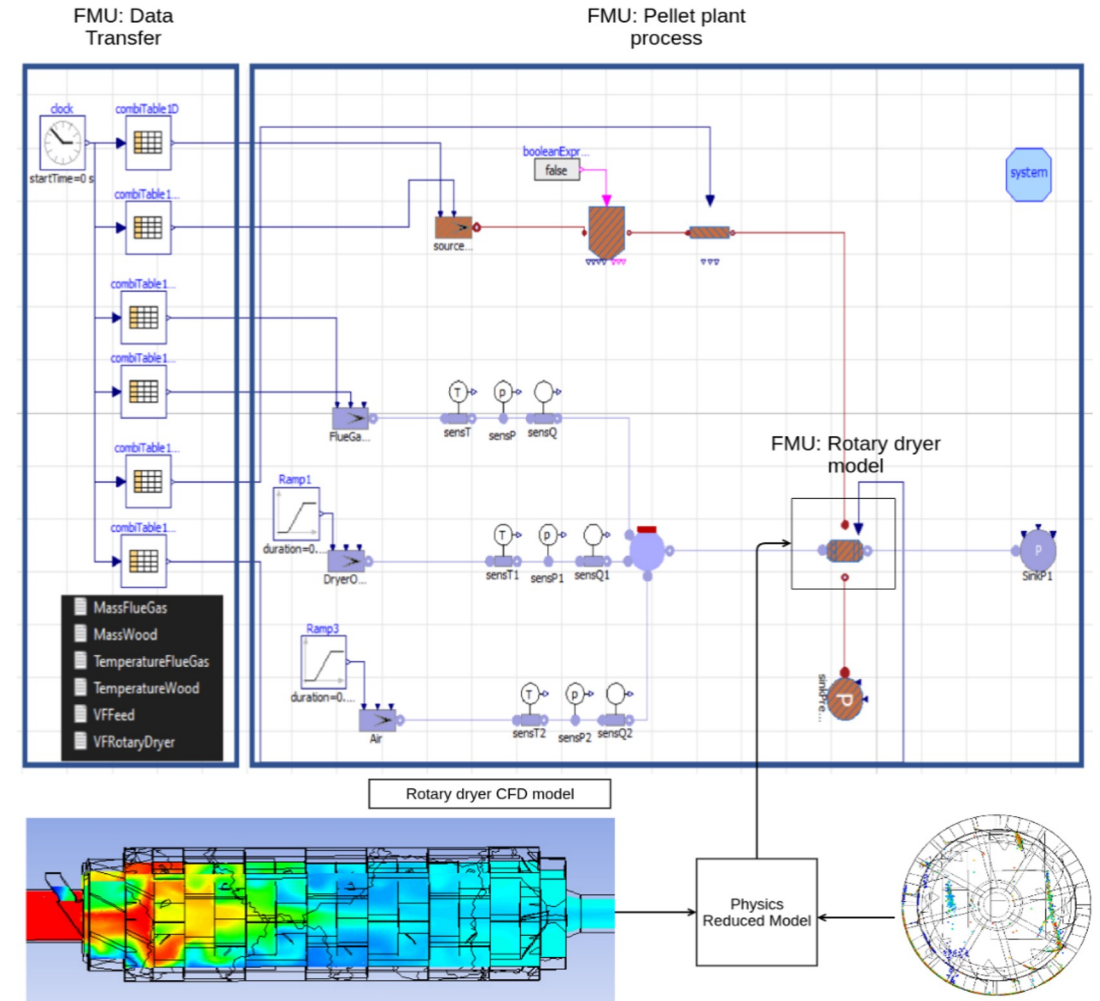


Strong foundation for predictive maintenance, optimization and advanced control

Digital Twin Features

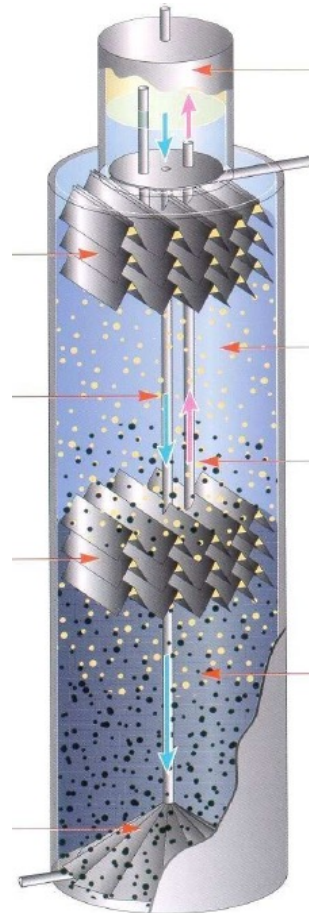
- Automatic communication with SCADA data
- Automatic data processing
- Real-time simulations using SCADA input
- Optimal operation configuration selection
- Process and system control co-simulation

Developed from **CFD simulations** and **Reduced Order Physics** techniques



NABLA DOT: DIGITAL TWIN OF AN ANAEROBIC REACTOR

Digital Twin for cost-efficient treatments of wastewater in Anaerobic Reactors (DT4ART)



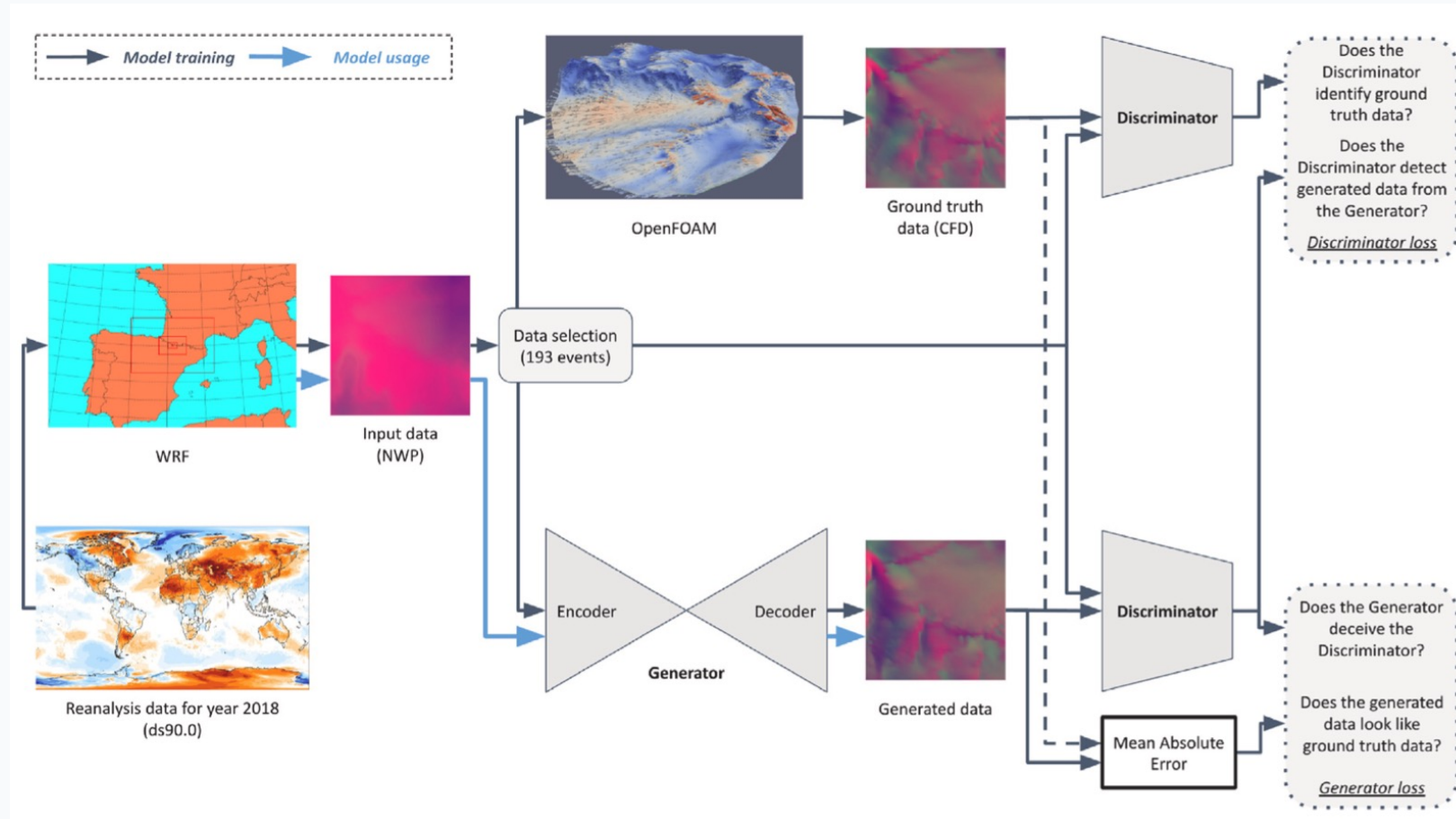
Real time
dashboard

Simulation
setup

WIND FORECAST IN REAL TIME

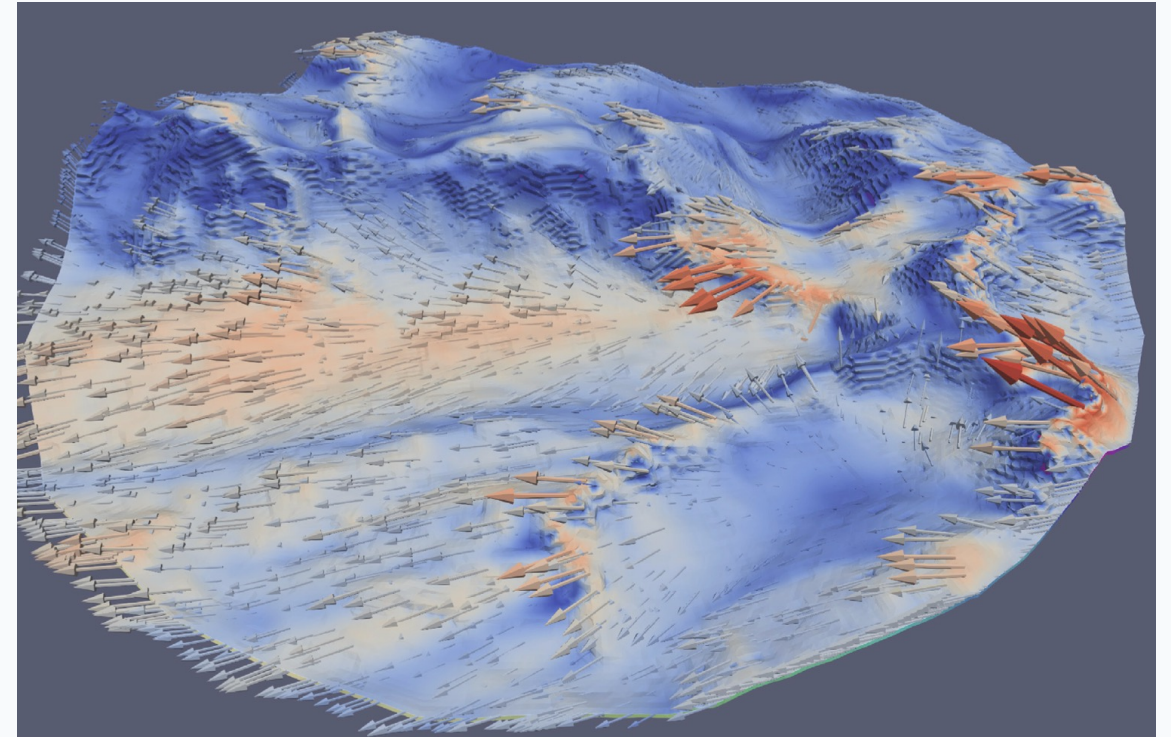
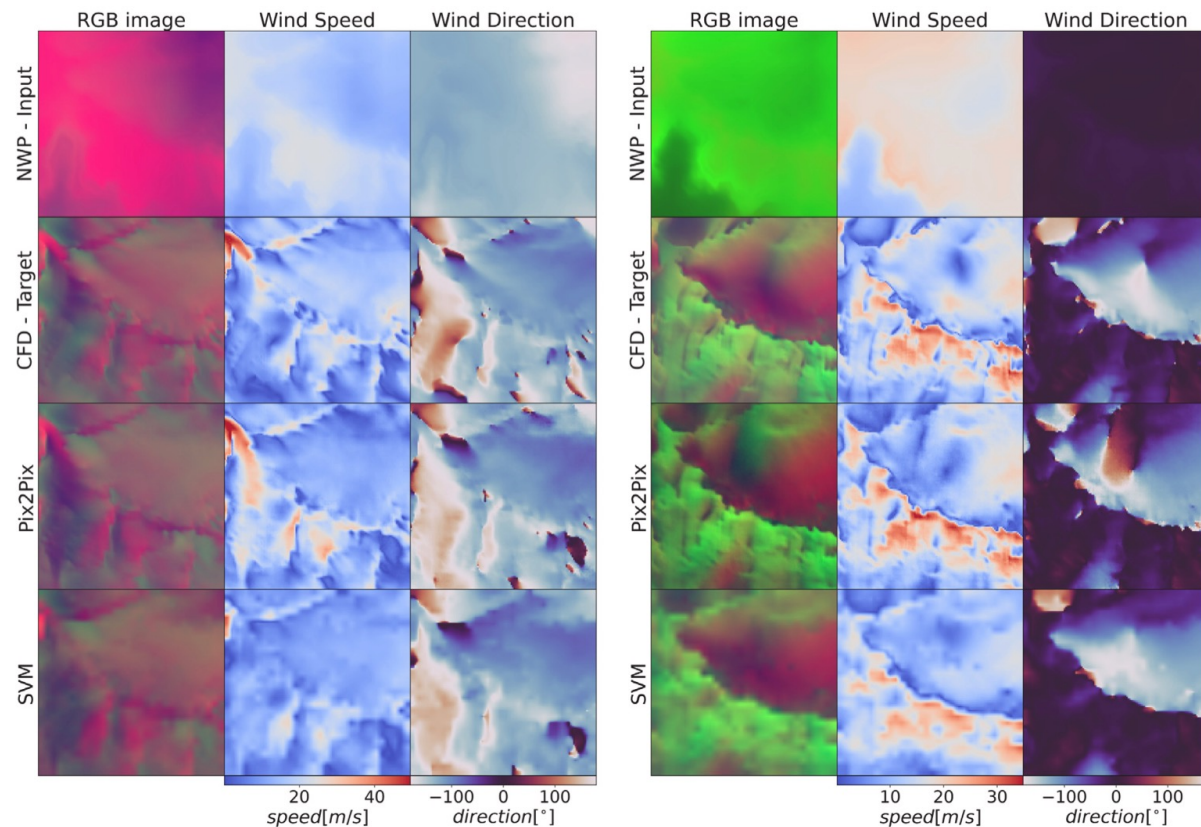
NABLA DOT: URBAN WIND FORECAST IN REAL TIME

- + Surrogate Model Approach, using open-source tools: Numerical Weather Prediction (WRF), Computational Fluid Dynamics (OpenFoam) and machine learning techniques
- + Drastically reduces computation time: From 10-12 hours to just seconds
- + Maintains high accuracy with only minor deviations from full CFD simulations
- + Scalable: Capable of generating large datasets efficiently



NABLA^{DOT}: EXAMPLES OF PROJECTS RELATED TO HEAT TRANSFER

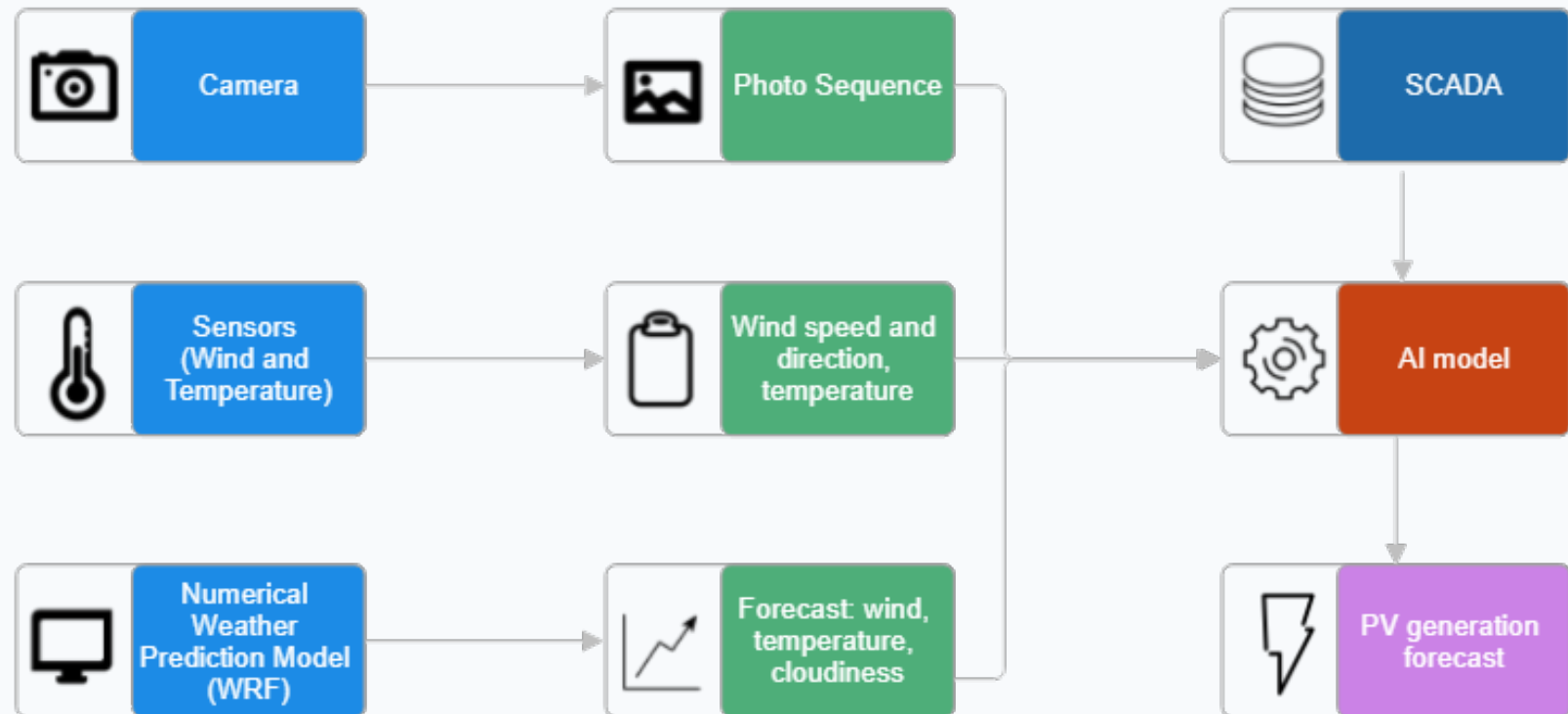
+ Minor deviations from full CFD simulations



SOLAR PV FORECAST

NABLA DOT: SOLAR PV NOWCASTING

- + Short-term prediction of photovoltaic generation will combine:
 - + Photos of the sky (camera installation)
 - + Sensor data (temperature, wind speed and direction)
 - + Weather forecast simulations
 - + SCADA data (mainly power generation)
 - + Artificial intelligence models
 - + Edge-to-Cloud IoT Architecture



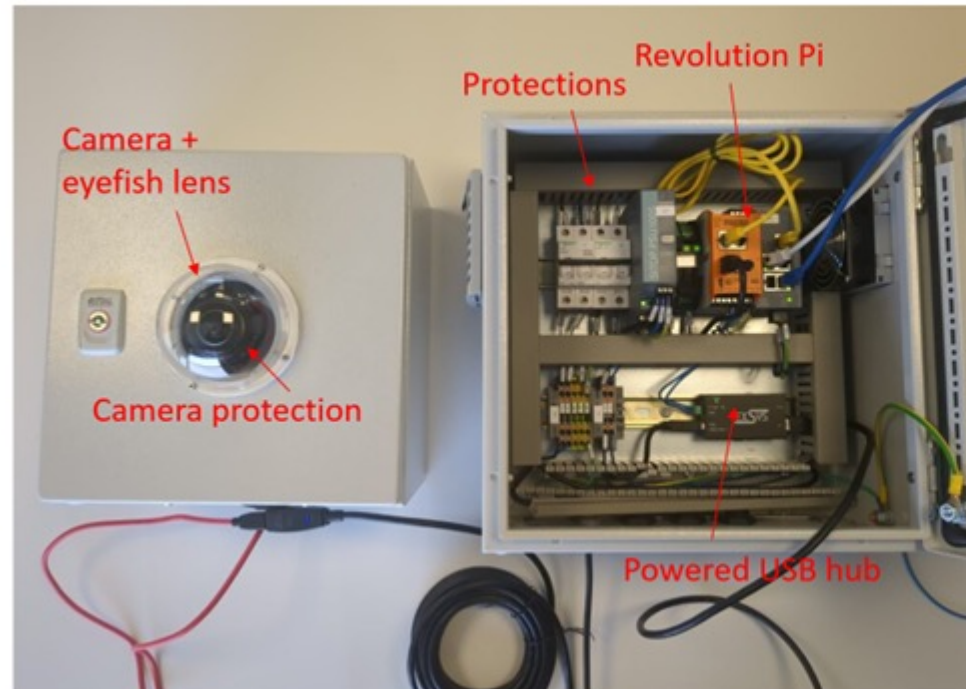
NABLA DOT: SOLAR PV NOWCASTING

+ IoT architecture

- + Camera
- + Raspberry-Pi
- + Computer



Edge computer – Rev Pi (CONSUMER Cluster)



OTS Server (PROVIDER Server)

→ Net

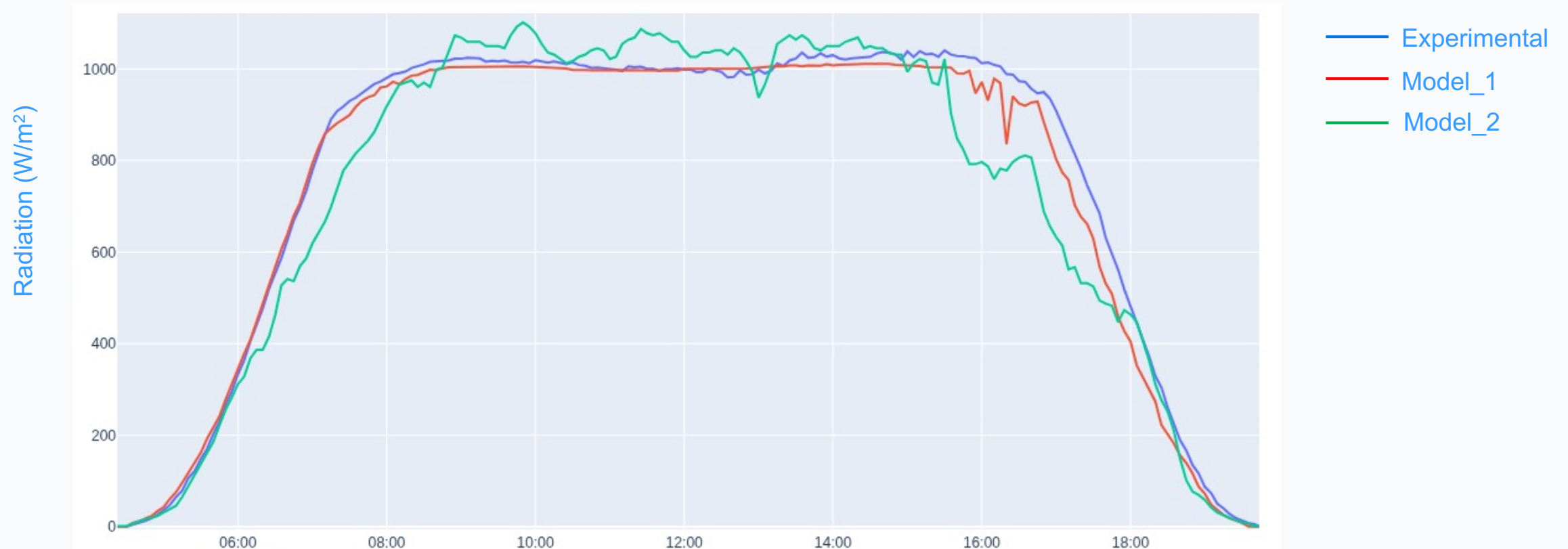


← Net



+ Applications

- + Management of solar PV generation, particularly when connected to batteries





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