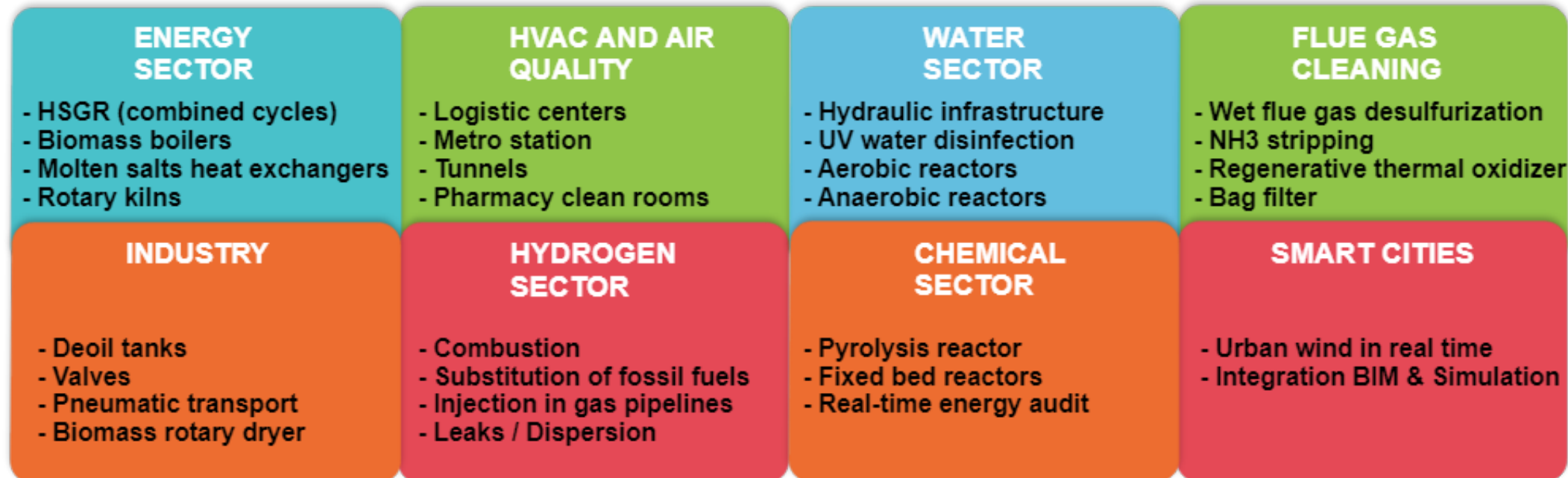# NABLADOT
COMPETENCES & IDEAS
CETP 2025

ANTONIO GOMEZ (R&D MANAGER)

AGOMEZ@NABLADOT.COM

+ Established in 2010 by researchers specializing in Computational Fluid Dynamics (CFD) at the University of Zaragoza (2010). We offer:

  + 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 the companies

+ Our team has experience across multiple sectors (see our Projects)

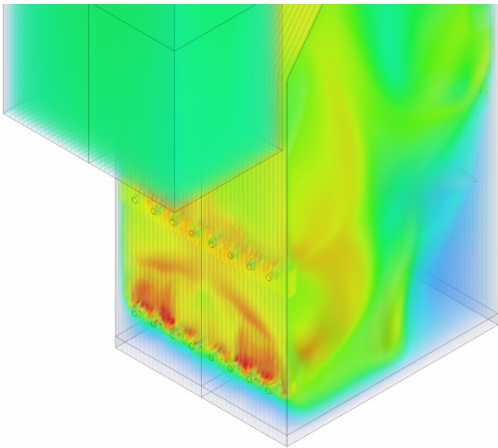| ENERGY SECTOR	HVAC AND AIR QUALITY	WATER SECTOR	FLUE GAS CLEANING
- HSGR (combined cycles) - Biomass boilers - Molten salts heat exchangers - Rotary kilns	- Logistic centers - Metro station - Tunnels - Pharmacy clean rooms	- Hydraulic infrastructure - UV water disinfection - Aerobic reactors - Anaerobic reactors	- Wet flue gas desulfurization - NH3 stripping - Regenerative thermal oxidizer - Bag filter
INDUSTRY	HYDROGEN SECTOR	CHEMICAL SECTOR	SMART CITIES
- Deoil tanks - Valves - Pneumatic transport - Biomass rotary dryer	- Combustion - Substitution of fossil fuels - Injection in gas pipelines - Leaks / Dispersion	- Pyrolysis reactor - Fixed bed reactors - Real-time energy audit	- Urban wind in real time - Integration BIM & Simulation

COMPETENCIES – CETP 2025

+ We offer a wide range of services:

    + CFD simulation

    + Real time models (CFD simulation & Statisical Analysis & AI)

    + Statistical data analysis

    + Simulation & IoT (Sensors, Cloud Computing, Edge Computing)

    + Digital Twins

    + Collaboration in public funded R&D projects (wide experience in public funded R&D projects at national and European level)

+ We collaborate in the following ways:
    + Enhancing equipment and process design through simulations.
    + Conducting virtual tests to ensure that equipment, processes, or facilities meet specified requirements.
    + Troubleshooting issues that arise during equipment operation.
    + Scaling equipment and processes effectively.
    + Identifying unexpected problems in new designs.
    + Making informed decisions regarding design or operational changes.
    + Reducing uncertainties in equipment design and operation.
    + Providing better design tools.
    + Offering advanced tools for equipment operation, including simulation, IoT, and digital twin technologies.
+ As a result, we obtain the following results:
    + Improved energy efficiency.
    + Reduced greenhouse gas (GHG) and other pollutant emissions.
    + Prevention of unexpected downtime in facilities and enhanced maintenance.
    + Achievement of Key Performance Indicators (KPIs) for equipment and facility design and operation.
    + Enhanced competitiveness
    + Cost savings through lower energy consumption and fewer unanticipated downtimes.
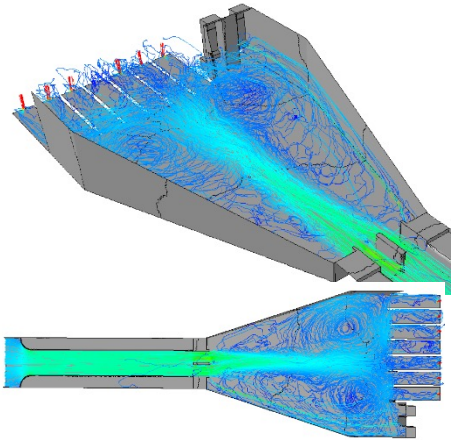   + Assurance of the effectiveness of their investments.
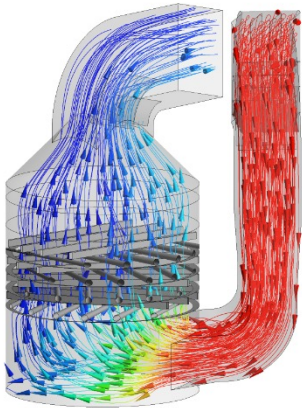
Energy
Biomass boilers

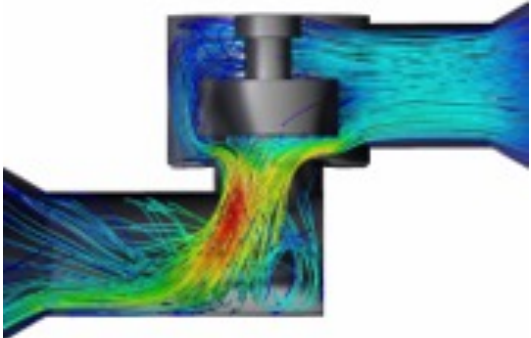**HVAC and Air Qualityç**
Logistics warehouses
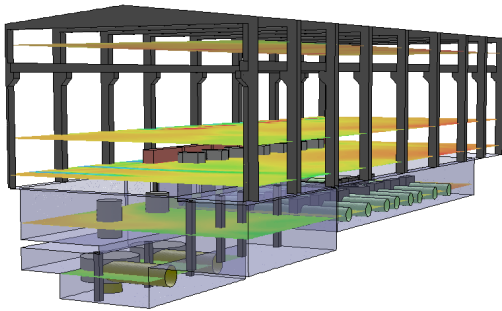
Water sector
Hydraulic infrastructures

Flue Gas Cleaning
Desulphurisation

Industry
Valves

Hydrogen
Hydrogen injection
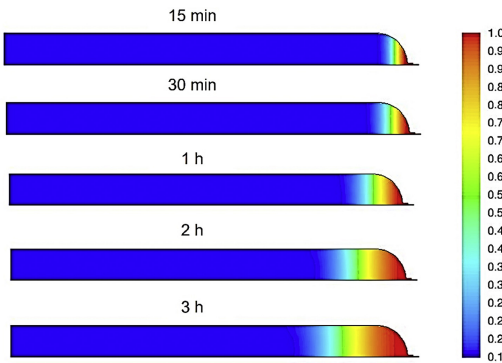
Chemical sector
Pyrolisys reactor
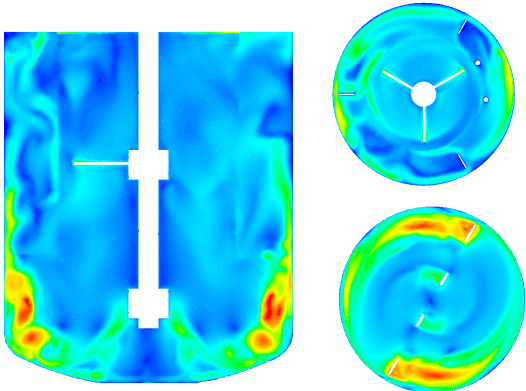
Smart Cities
Wind forecast in real time

ZARAGOZA (ACTUR DISTRICT)
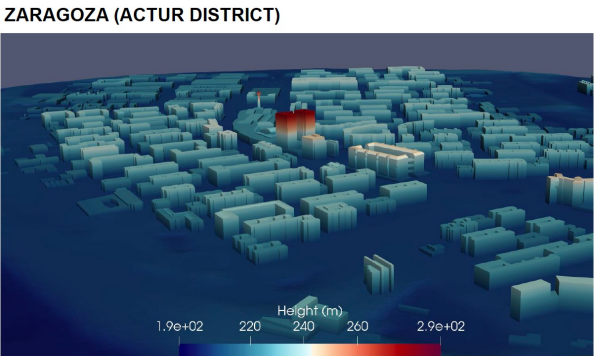
+ Real-time model for the calculation of the CH4-H2 mix in natural gas pipes

  + More details at: *C. Montañés et al., Comprehensive assessment of hydrogen injection in natural gas networks: Using dimensional analysis and reduced-order models for mixture quality prediction, International Journal of Hydrogen Energy,* https://doi.org/10.1016/j.ijhydene.2024.09.045

+ Combination of CFD & Dimensional Analysis & Statistical Analysis
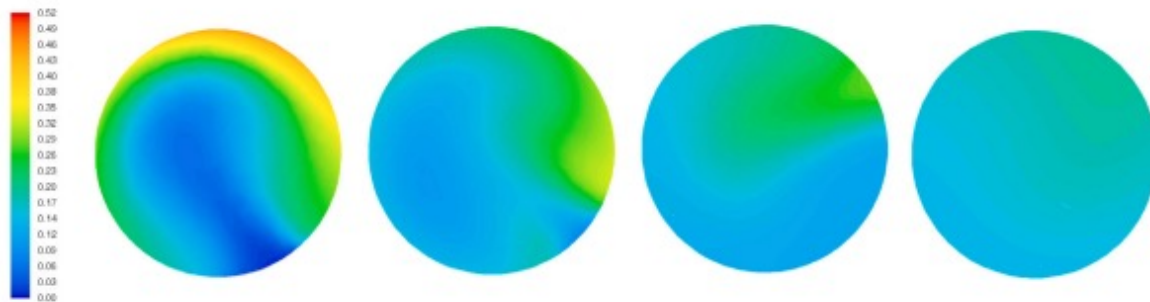
Fig. 3. Contours of H_2 mass fraction in sections of a pipe for L/d_{CH_4} equal to 2, 5, 10 and 50 (from left to right).
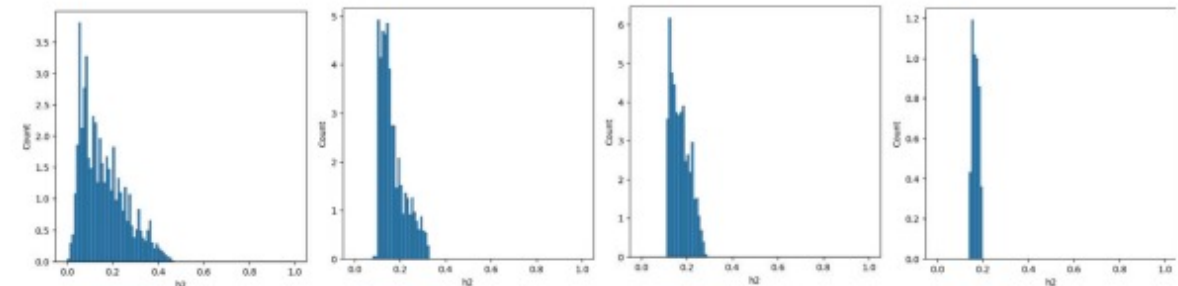
Fig. 4. Histogram of H_2 mass fraction (weighted with cross area) in sections of a pipe for L/d_{CH_4} equal to 2, 5, 10 and 50 (from left to right).
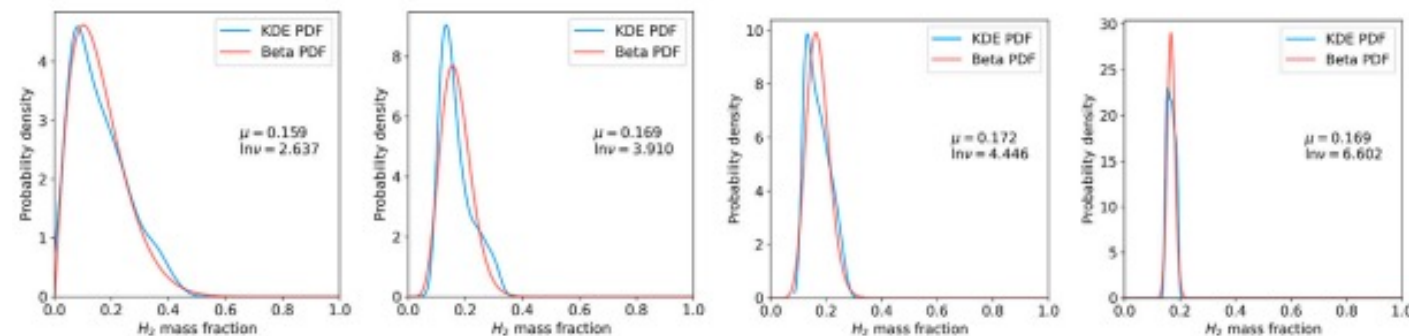
Fig. 5. PDF and beta approximation for H_2 mass fraction in sections of a pipe for L/d_{CH_4} equal to 2, 5, 10 and 50 (from left to right).

+ Digital twin of a rotary biomass dryer

+ Digital twin features:

  + Automatic communication with SCADA data

  + Automatic data processing

  + Real-time simulations of the operation of the rotary dryer using SCADA data as input

  + Selection of optimal operation configuration based on simulation results and data analysis

  + Co-simulation of the process and system control using FMUs

+ The real-time model of the rotary dryer is developed from CFD simulations and Reduced Order Physics techniques
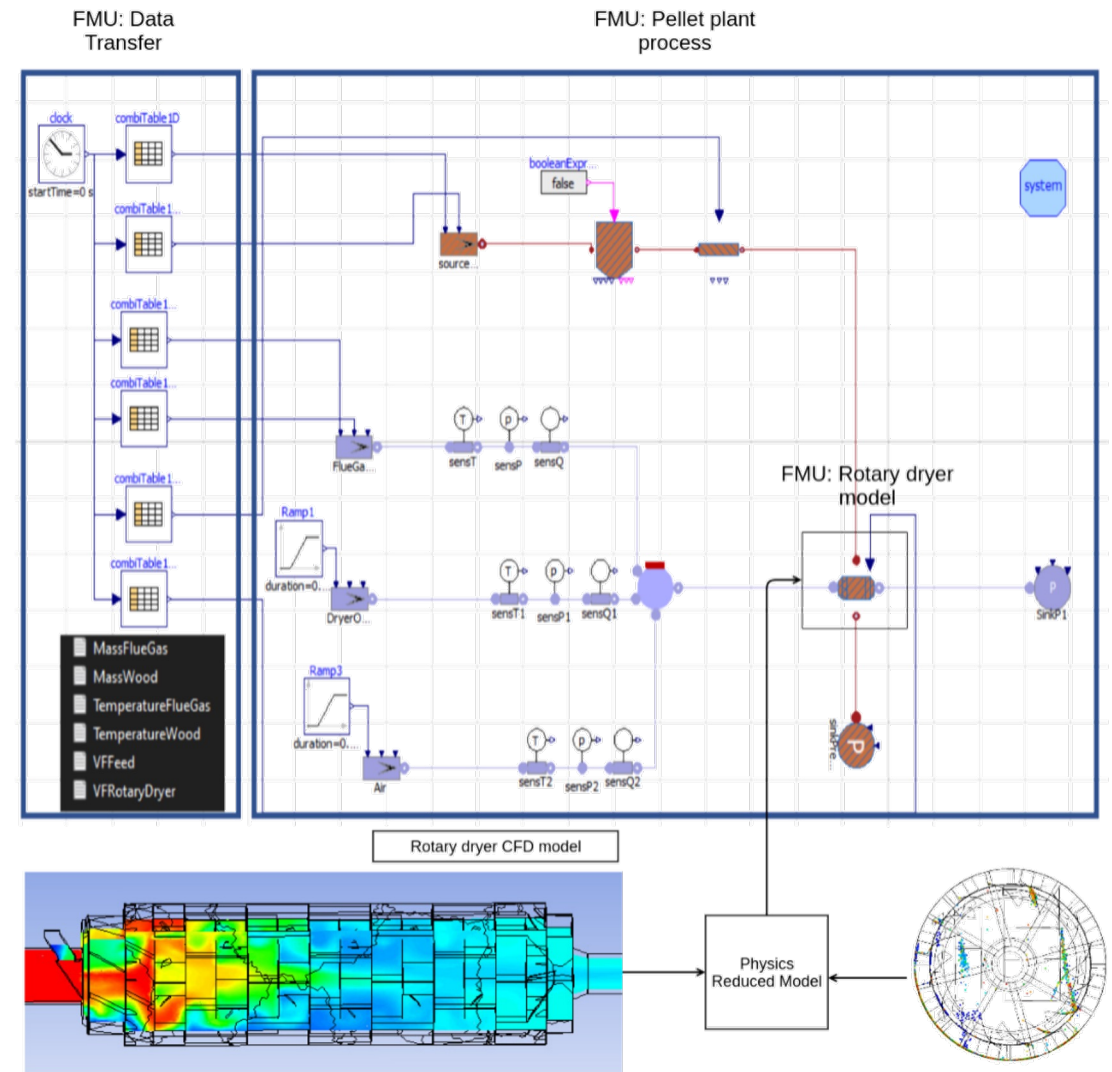
References: European Biomass Conference
Digital Twin Performance

IDEAS & CETP - 2025

+ Our solutions integrate simulation, IoT (sensors, SCADA, cloud computing, edge computing), and AI techniques. Our solutions include:

  + Advanced simulations (CFD)

  + Physics-based reduced order model

  + Real-time data analysis

  + Optimization using real-time data-driven models (artificial intelligence) or synthetic data (generated through simulations)

  + Optimization using real-time physics-based models (Physics Reduced Order Model)

  + Digital twin technology
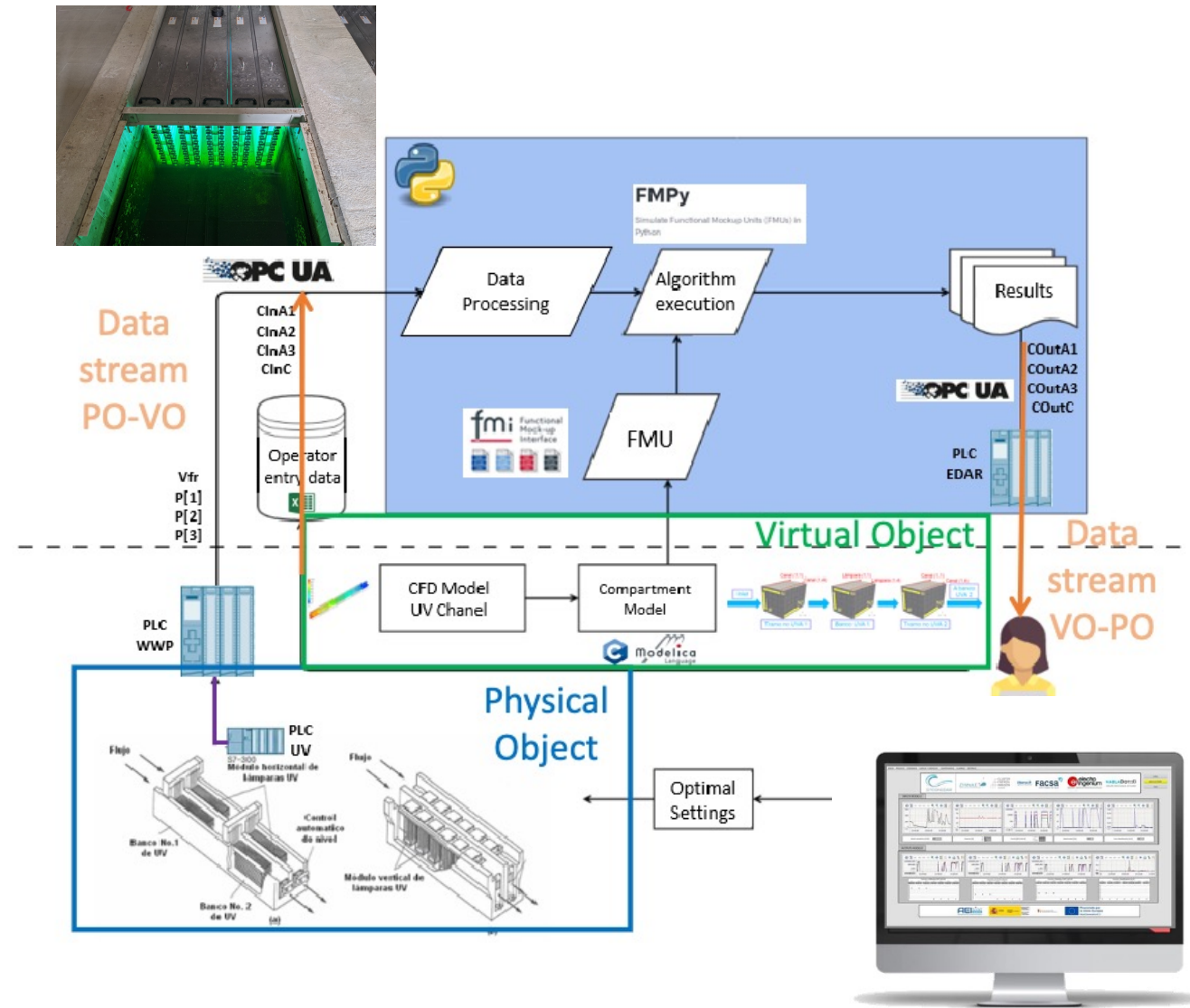
- Short-term forecasting (from minutes to hours) of electricity generation in PV power plants
- Nowcasting workflow combines:
  - Sky images (camera installation)
  - Sensor data (temperature, wind speed, and direction)
  - Weather forescast simulation
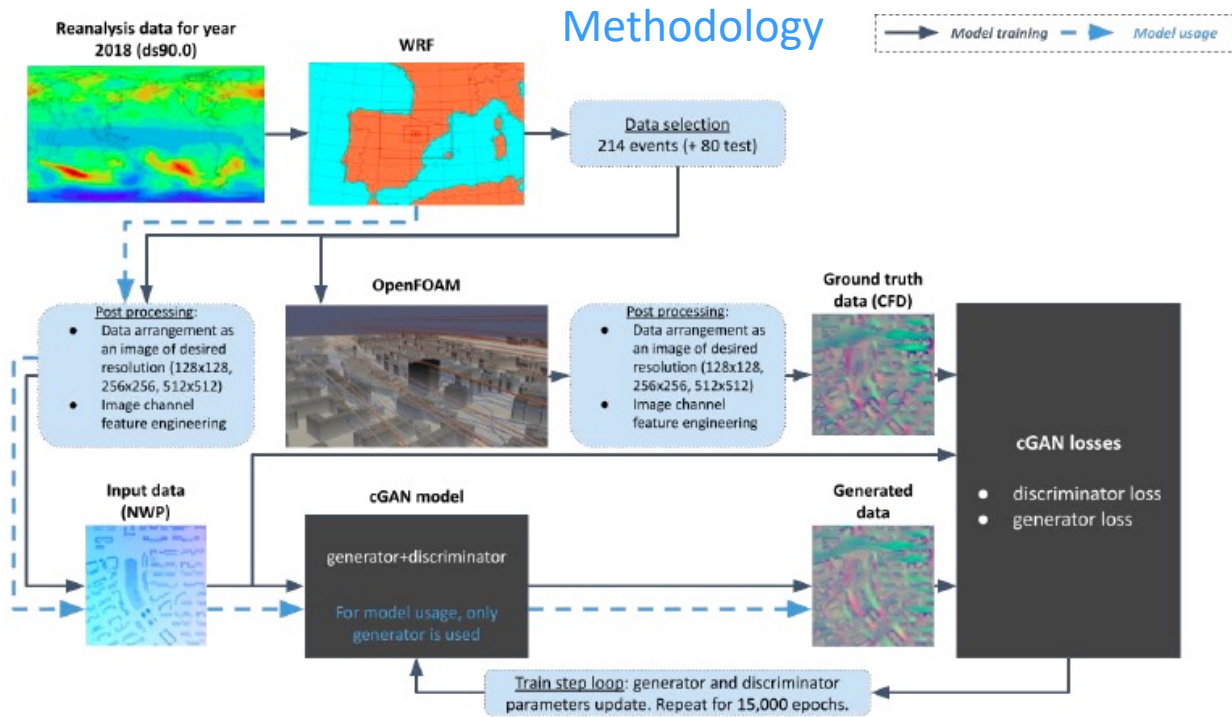 - SCADA data
  - Artificial intelligence models

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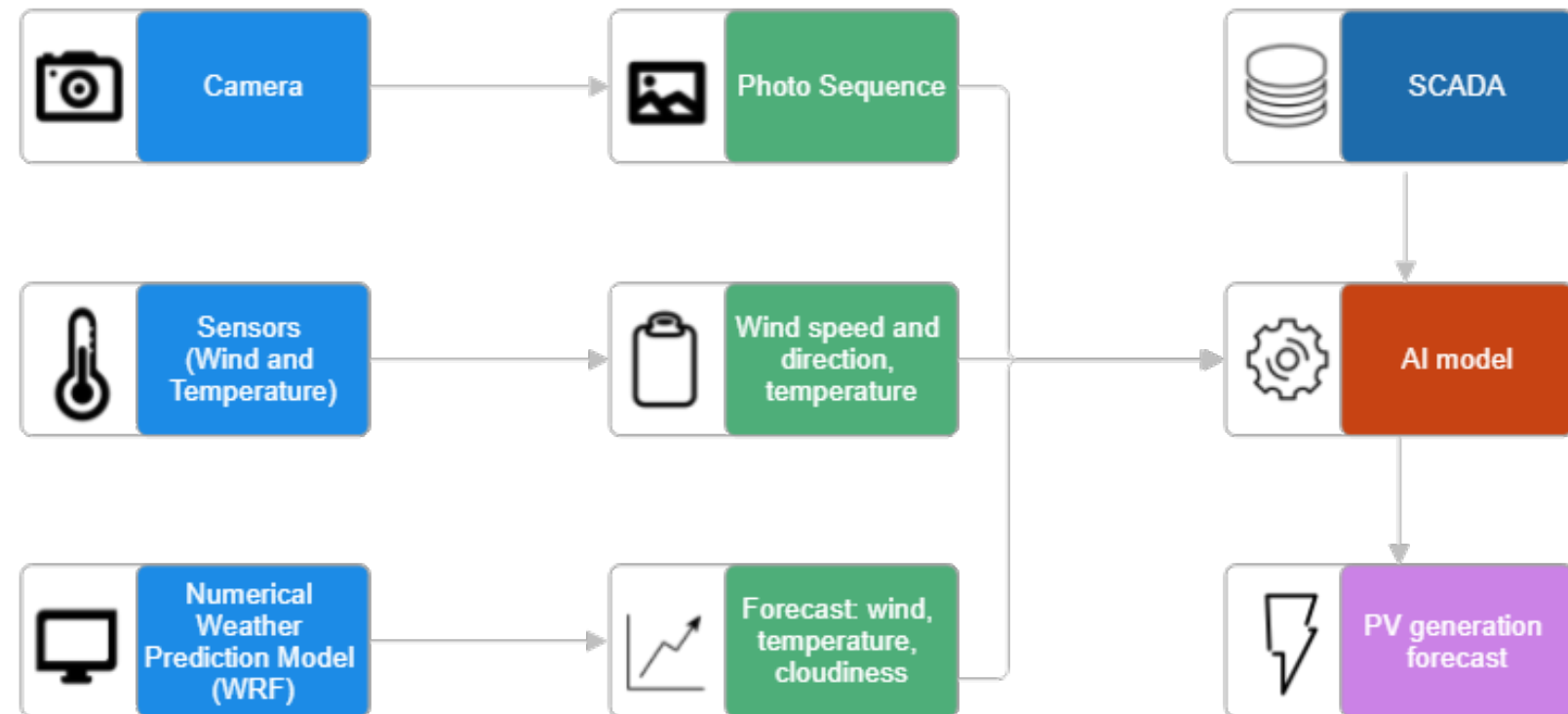
+ **High resolution wind data in real time**

  + Numerical Weather Prediction Models & CFD & AI

  + Multiple applications

    + Small wind energy

    + Air Quality
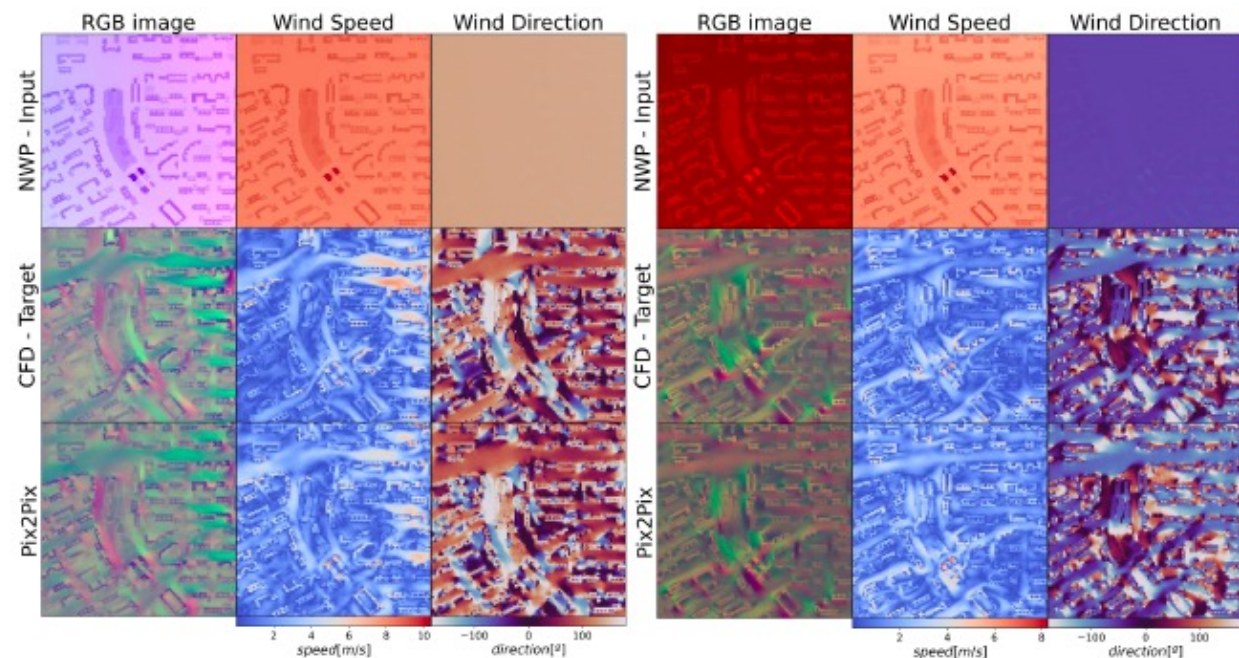
    + Forecast of extreme events

  + References: here

ZARAGOZA (ACTUR DISTRICT)
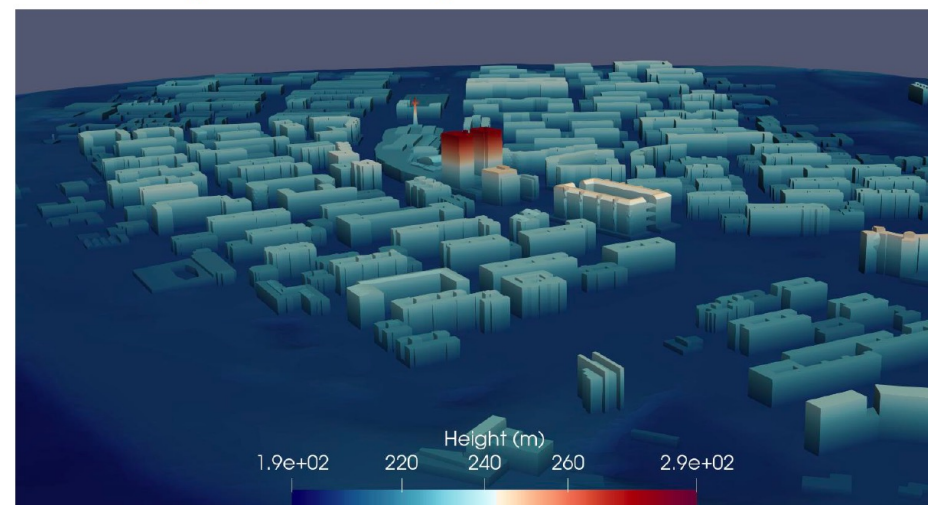
Methodology

Results

ND

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