Platform-ZERO

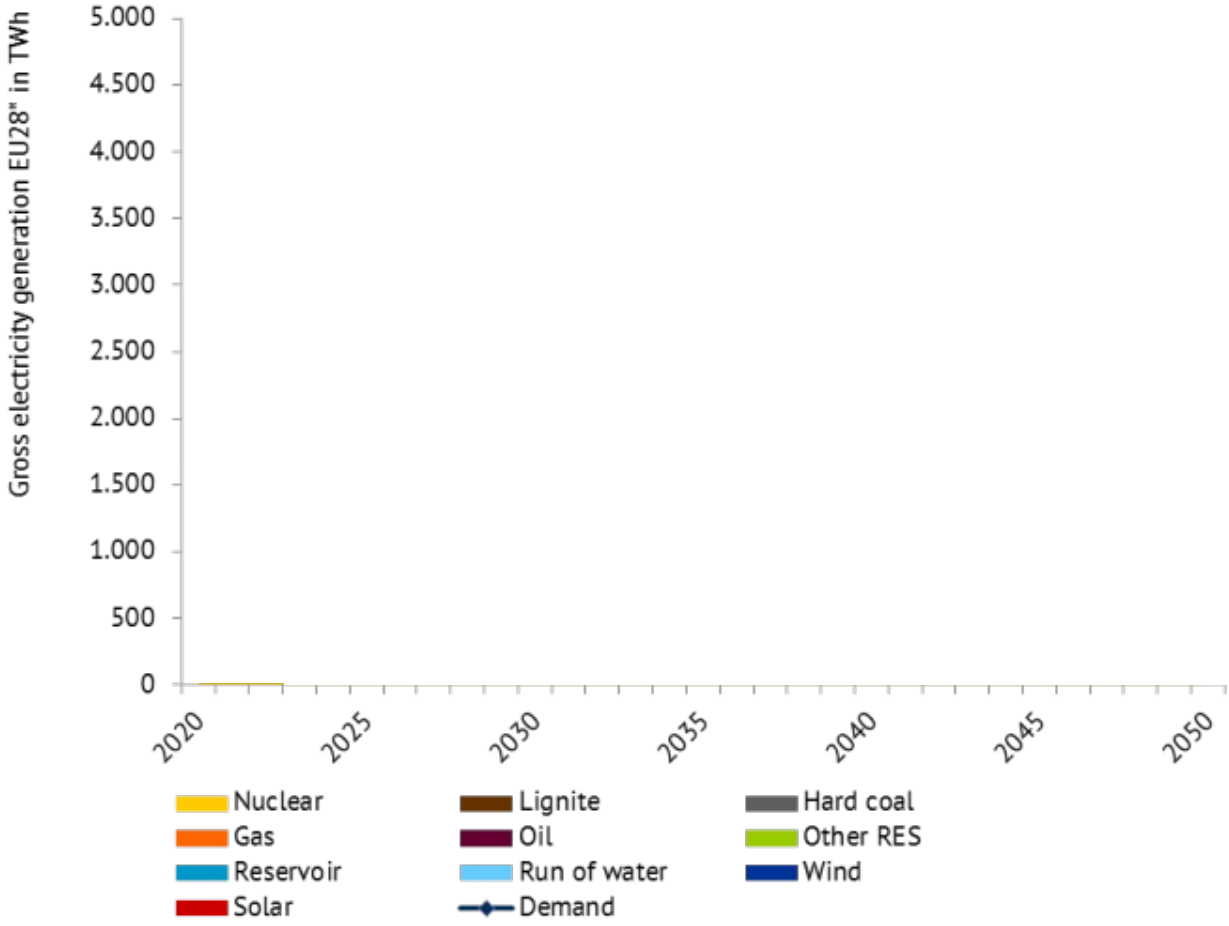
ACHIEVING ZERO DEFECT MANUFACTURING FOR THE PHOTOVOLTAIC INDUSTRY

The Manufacturing Partnership Day - 26/09/2023

Victor Izquierdo Roca

Co-funded by
the European Union

EU Energy mix



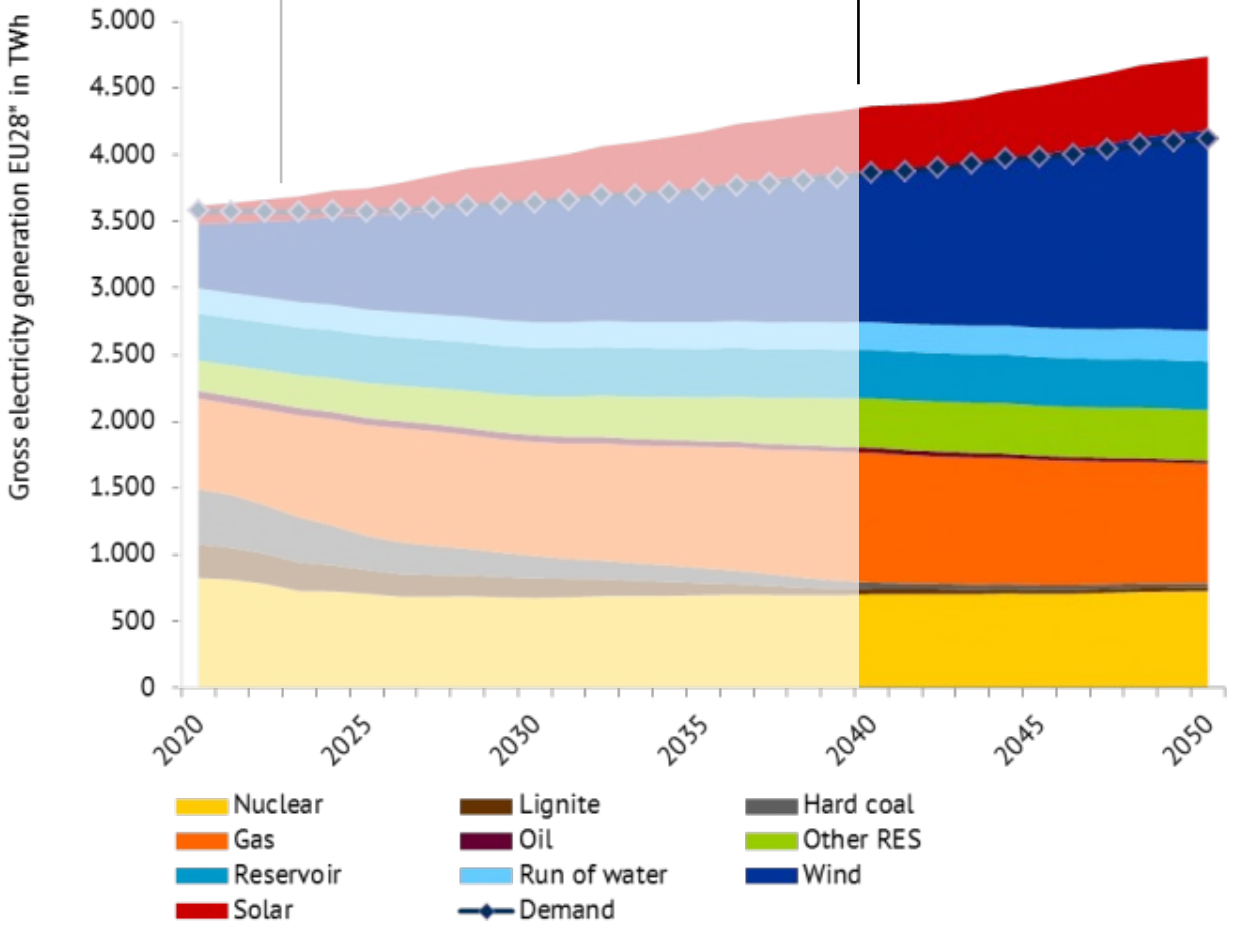
The CONTEXT

In the NEXT YEARS

… it requires increase the production of EU's PV manufacturing industry

Solar photovoltaic provides an important contribution of **7.3%** to the EU energy mix (Eurostat 2022)

Solar energy has the potential to meet **20%** of the EU's electricity demand in 2040 (Bloomberg)



The CONTEXT

Need for a competitive PV industry

Besides production, the competitiveness of EU's PV industry also needs to be increased ➔ new PV technologies with higher quality and performance that provide an added value

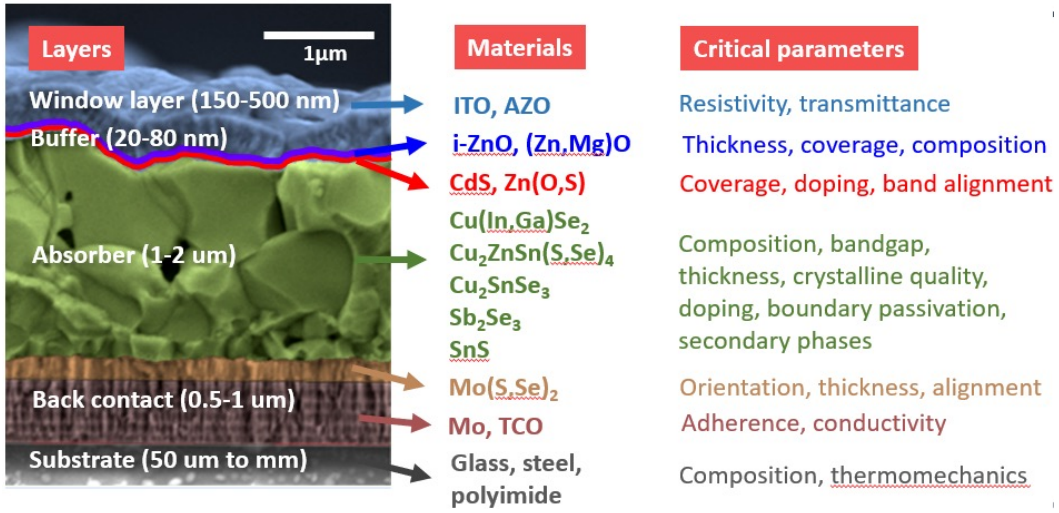
New PV technologies are key for EU's ecologic transition

The latest PV technologies combine high performance with a strong customizability and flexibility for integration in many applications: buildings, vehicles, agrivoltaics, infrastructures…

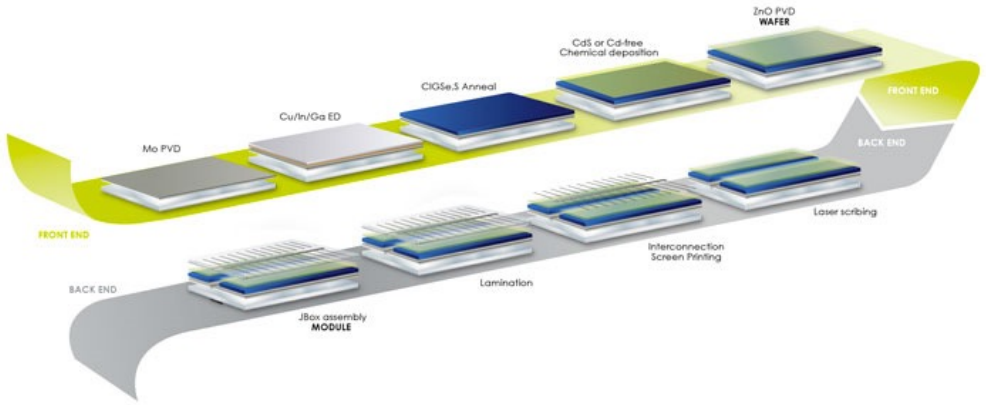
Towards ubiquitous integration of PV

The CONTEXT

HOWEVER



The latest generations of PV present a high-complexity: multi-layer, multi-material, micro- and nano- stack structures…



…and complex multi-process, multi-technique production processes

This complexity makes PV devices prone to the appearance of critical **defects during manufacturing**, leading to significant **production waste and low quality**

It is necessary to progress towards the digitalization of PV industrial manufacturing ➔ Process Monitoring

The CONTEXT

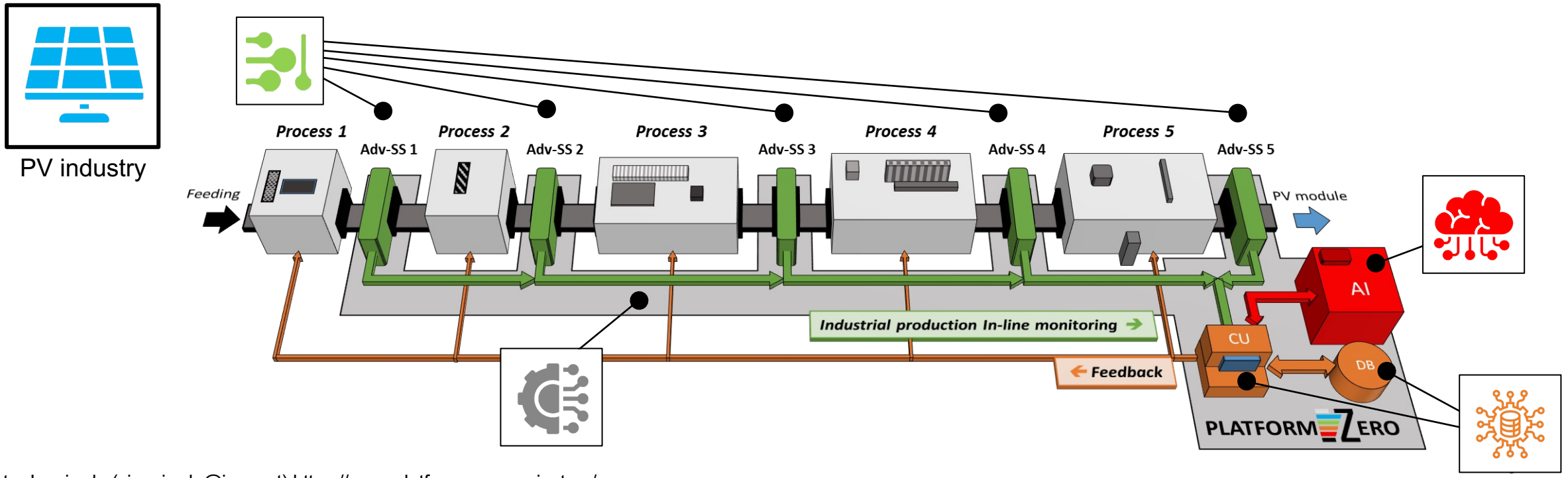
The PROJECT

Platform-ZERO…

….develops a new customizable in-line process monitoring platform, supported by Artificial Intelligence, for achieving zero-defect manufacturing for the PV Industry

HE Grant agreement ID: *101058459* ***Start date:*** *1-1-2023* ➔ ***End date:*** *31-12-2026*

https://www.platform-zero-project.eu/
https://cordis.europa.eu/project/id/101058459



The AIMS

Create dedicated optical and spectroscopical based sensors compatible with fast non-destructive in-line monitoring in the PV industry

1) Development of advanced sensor stations

The AIMS

Create non-supervised methods for fast data analysis, data management and decision-making using AI and big data management

1) Development of advanced sensor stations

2) AI system for autonomous monitoring and control

3) Implementation of a big data management infrastructure and control system

Victor Izquierdo (vizquierdo@irec.cat) https://www.platform-zero-project.eu/

The AIMS

Develop automatized modular and customizable process monitoring platform prototypes with easy industrial integration

1) Development of advanced sensor stations

2) A system for autonomous monitoring and control

3) Implementation of a big data management infrastructure and control system

4) Implementation and installation of functional process monitoring platforms

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The AIMS

Demonstrate the effectivity of the technology in real operation conditions (4 demonstrators) for increasing PV productivity by:

1) Minimizing the economical and ecological impact of production waste
2) Improve production quality of PV devices

1) Development of advanced sensor stations

2) A system for autonomous monitoring and control

3) Implementation of a big data management infrastructure and control system

4) Implementation and installation of functional process monitoring platforms

5) PV manufacturing optimization

Expected direct impacts:

- **10% increase in productivity of the EU's PV industry**
- **10% decrease in consumption of high-value critical raw materials**

Expected indirect impacts:

- **Provide new tools for optimization the EU’s semiconductors industry**
- **Provide solutions for research acceleration through automatized methodologies and technologies for materials and devices inspection and analysis**

OUTCOMES

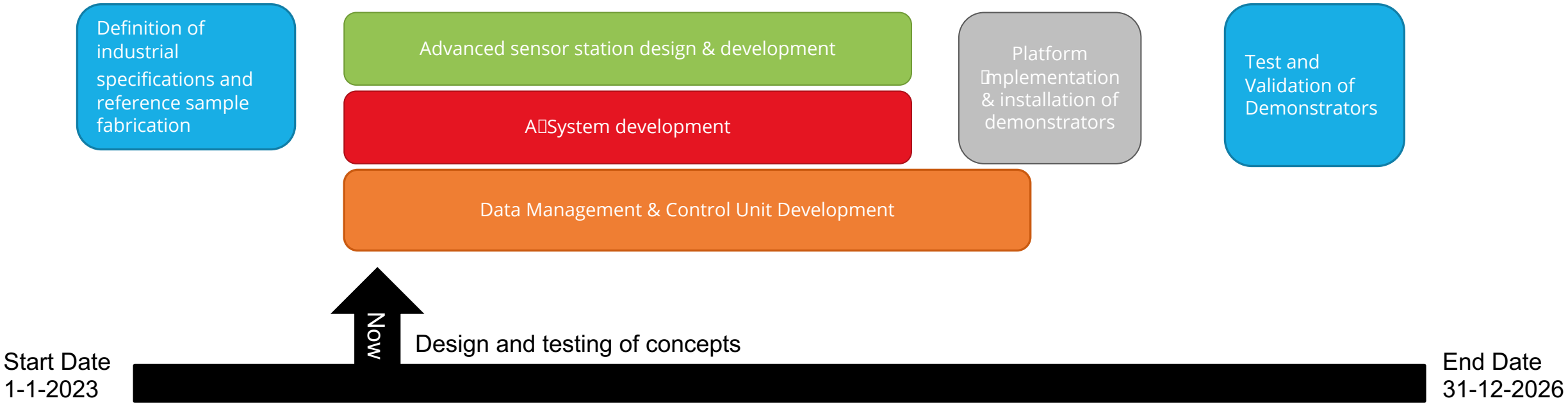
The Consortium

Projects is developed by

- **Four research centers** and **one university** with a strong knowledge in the development of spectroscopic methodologies, imaging, artificial intelligence and data management
- **A Metrology SME** with strong know-how in the implementation of industrial process monitoring applications
- **Two SMEs** in charge of dissemination, exploitation and communication actions

The Consortium

… and the innovations will be tested and demonstrated at TRL 7 in 4 PV industrial pilot plants across Europe

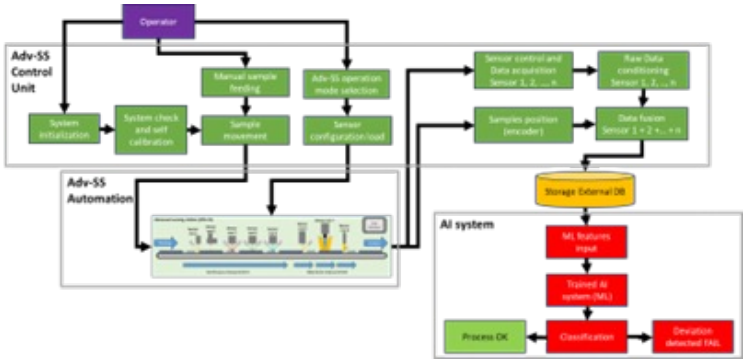


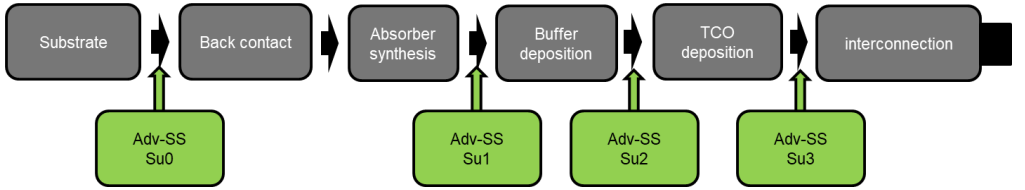
TECHNICAL MAPPING & METHODOLOGY

PHASE 01
Mapping
6 month

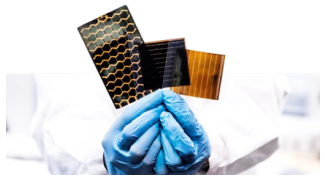
Definition of
Industrial
Specification and
Reference sample
fabrication

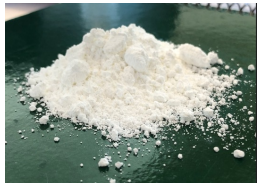
Definition of full process monitoring flow of the Platform-ZERO process monitoring platform as well as the specifications, requirements and constraints of the implementation of the process monitoring platform at the different 4-demo sites.





Fabrication of reference samples.





Inspection time
weight
Space limitations
size
Sample format
Measurement configuration
thickness
Others

MAIN PROJECT RESULTS (9 month)

Advanced sensor station design & development

PHASE 01
Mapping
6 month

Definition of
Industrial
Specification and
Reference sample
fabrication

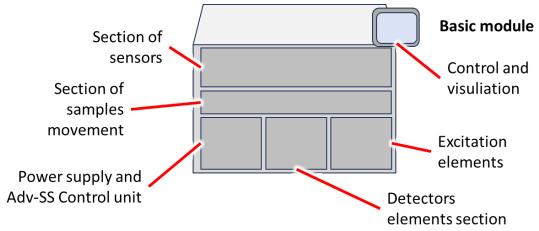
PHASE 02
Development
1.5 years

Advanced sensor stati

AI System

Data Ma

Now

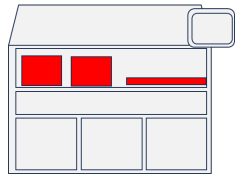


Design of a sensor station architecture easily customizable to different production configurations:

- Sheet-to-Sheet
- Roll-to-Roll
- “Stages”

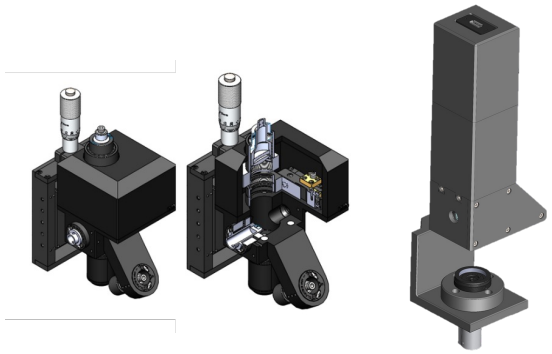
StS configuration (conveyor)

RtR configuration (Roll control)



Stages configuration

Start the design of integrable optical and spectroscopical sensors



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1.5 years

Advanced sensor stat

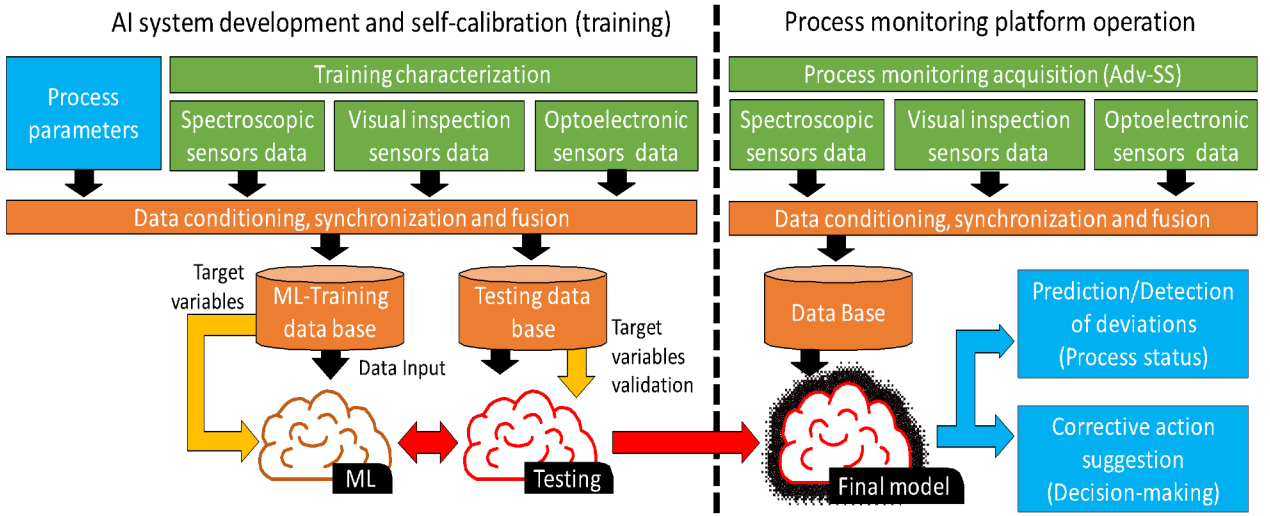
A System

Data Ma

Now

A System development

Design and definition of AI flow diagram including the training mode and operation mode



MAIN PROJECT RESULTS (9 month)

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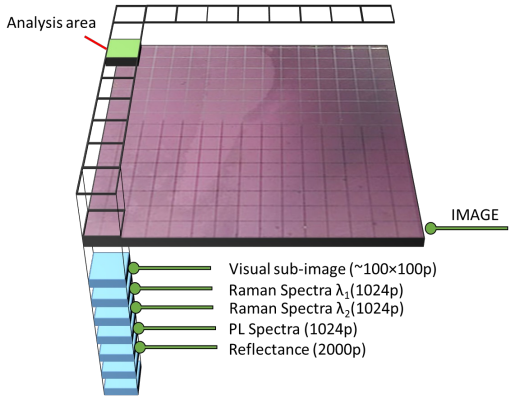
Advanced sensor stat
A System
Data Man

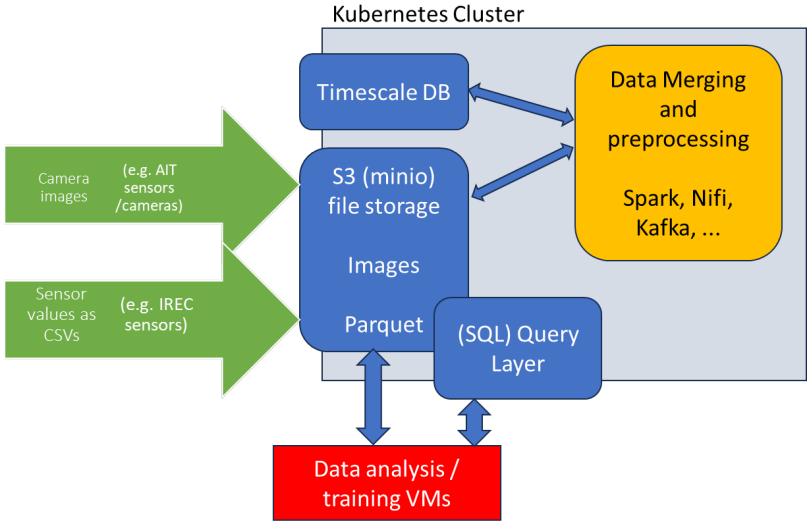
Now

Data Management & Control Unit Development

Creation of protocols for data fusion and tracking

Design of 1st version of DB architecture and data management infrastructure





MAIN PROJECT RESULTS (9 month)

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Advanced sensor station design & develo

A System development

Data Management & Control

DESIGN OF SEMI-AUTOMATIZED MODULAR SENSORS PROTOTYPES
FEB 2024

DESIGN OF SENSORS FOR ADVANCED SENSING STATIONS
1ST GENERATION A IMPLEMENTATION
MAY 2024

2ND GENERATION A
IMPLEMENTATION
OCT 2024

SEP 2023
GENERATION OF FIRST DATABASE

MAR 2024
FABRICATION OF SECOND REFERENCE SAMPLES

JUN 2024
UPDATE OF THE 2ND GENERATION DATABASE

Now

Next 12 Month

FUTURE ACTIONS (12 month)

Co-funded by the European Union

6th month meeting
Wrocław (Poland)

THANK YOU, GET IN TOUCH!

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