

TRINEFLEX HUMAN DIMENSION

TRINEFLEX also promotes a people-centered adaptation strategy, adopting several strategies:

- Engaging different stakeholders (industrial sectors, researchers, local communities and citizens) in a inclusive and active way
- Promoting gender equality
- Enhancing workplace safety and well-being through OHSE protocols
- Conducting sustainability assessments (LCA)

PUBLICLY ACCESSIBLE TOOLS

- **TRINEFLEX Distributed Energy Storage toolset** (<https://trineflex.csd.auth.gr>)
A platform to support the adoption of DES among energy actors with the industrial sector at forefront
- **TRINEFLEX SustainLoop** (<https://sustainloop.csd.auth.gr>)
An info hub promoting TRINEFLEX pilots and engaging communities in energy flexibility initiatives



THE TRAINING FRAMEWORK

A series of lessons on an e-learning platform, designed to promote knowledge sharing to support energy flexibility and decarbonization skills

COORDINATOR



PARTNERS



www.trineflex.eu



Co-funded by
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TRANSFORMATION OF **ENERGY INTENSIVE** PROCESS INDUSTRIES THROUGH INTEGRATION OF ENERGY, PROCESS, AND **FEEDSTOCK FLEXIBILITY**

Project funded by the **European Union** Under the **Horizon Europe** programme – Innovation Actions.
Call: HORIZON-CL4-2021-TWIN-TRANSITION-01-21

Duration: 1 September 2022 - August 2026

Total project cost: approximately **€19.3 million**
EU contribution: over **€16.3 million**

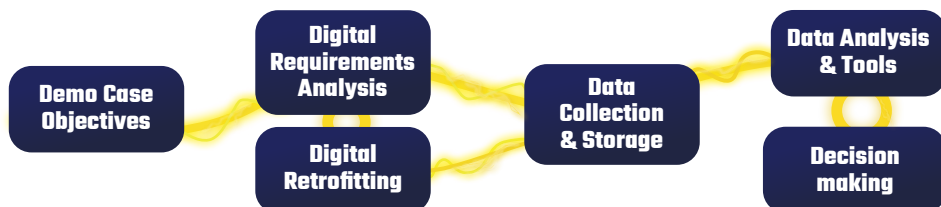
Grant agreement ID: 101058174

THE TRINEFLEX APPROACH



TRINEFLEX is a comprehensive toolkit designed for Energy Intensive Industries. It serves as a platform for managing the digital transformation, as well as facilitating the transition towards more flexible and sustainable industrial processes. Through TRINEFLEX lessons learned the approach can be easily replicated in other industrial settings or sectors.

To achieve these objectives, the project is organized according to the following structure:



Demo Case Objectives

- Clear definition of the objectives for a specific demo case

Digital Requirements Analysis

- Identification of digital tools, data, and infrastructure needed
- Input for digital retrofitting in a continuous feedback loop

Digital Retrofitting

- Hardware/software upgrade and integration (e.g., sensors, SCADA)
- Enabler for real-time data collection
- Refining digital needs through iterative cycle with the requirement analysis

Data Collection & Storage

- Real-time/time-series data acquisition via sensors, PLCs, monitoring systems
- Secure storage via Kharon Solutions (KS) platform
- Input and output to analytical tools

Analytical tools

- Evaluation of stored data to extract actionable insights
- TRAIN(TRINEFLEX Analytical INfrastructure) platform for tool deployment
- Custom digital tools and technology models per demo case

Digital tools

- Digital Twin
- Knowledge Graph
- 3D - Visualisation process
- Energy Management System
- Forecast models
- Aeration optimisation process
- Process Optimisation Agent
- Feedstock Adaptation Agent
- Biomass Recommender
- Minimization of GHG production (C-FOOT-CRL)
- Virtual Power Plant (VPP)
- Smart Contracts

Technology models

- Green and Clean Hydrogen models
- Heat Recovery model
- CCUS model
- Gasification model

Decision-Making

- The industrial decision making is supported by Decision Support System (DSS)
- Combination of real-time analysis, optimization model and HMI
- Data-driven actions for sustainability and efficiency

THE FIVE

DEMO CASES



The TRINEFLEX methodology will be demonstrated in 5 Energy Intensive Industries

Verallia Glass

Trineflex's objectives :

- Reducing energy amount required and increase the efficiency, through digital-twinning of the process and optimization simulations
- Implement electricity source instead of natural gas combustion



Refial Aluminium

Trineflex's objectives :

- Reduce energy consumption in the rotary furnace
- Increase the flexibility through digital retrofitting & digital twinning
- Evaluate the use of hydrogen as an alternative energy source



Esamur Water

Trineflex's objectives:

- Aeration process optimization
- Implementation of co-digestion
- Implementation of PV panels



Eydap Water

Trineflex's objectives :

- Reduction of primary energy demand
- Reduction of process emission
- Explore RES flexibility scenarios
- Co-creation of a digital energy factory (VPP)
- Implementation of transferability studies



Halcor Copper

Trineflex's objectives :

- Reduction of primary energy demand
- Reduction of process emission
- Reduction of peak load
- Improvement in equipment availability

