

Boosting Research for a Smart and Carbon Neutral Built Environment with Digital Twins – **SmartWins**



Future Directions – Challenges of Smart Buildings & IsZEB Hub

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CERTH SmartWins Summer School: Day 5

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Overview

- IsZEB and its digital tools for the construction sector
- EU: Transition Pathway for Construction
- Public Energy Savings / CERTH Facilities' Example

IsZEB Profile

IsZEB (*Intelligent Solutions for Zero & Positive Energy Buildings*) is a newly found **Cluster**, and is placed on the **Construction Domain**.

Established during 2020 in the region of **Northern Greece**, includes the leading Greek companies and authorities in the field of Smart and Energy Efficient Buildings

With **focus on smart, zero and positive energy buildings**, as active building blocks of the new smart grid paradigm, IsZEB aims to explore in depth how **smartness** (i.e. SRI) and **energy efficiency** combine through a unified label.

It covers the **phases** of planning, commissioning, construction, renovation, demolition and recycling of buildings and building components.



Goal: to provide tools and guidelines for the entire building's lifecycle for ultimately presenting Smart and Energy Sustainable Buildings.



Vision: to support & upgrade the Digital Construction in Greece, while strengthening every company related to the construction domain.

IsZEB Profile

IsZEB through its founding members:

- Has proven **vast experience in basic & applied research**, and delivers scientific results, based on **real-life needs** of SMEs and industrial key players in the Energy sector.
- Offers **connections and synergies** with the industry and can deliver **design and construction** services and **custom** solutions.



IsZEB Main activities

Research & Development

- Participation in a funded research program from the Region of Central Macedonia «**Cooperative formations for the promotion of innovation in local entrepreneurship**»
- Participation in 9 European Research projects (e.g. H2020)
- Design & Implementation of **internal research projects** (IsZEB Certify, IsZEB Charge, IsZEB Assist AR, 2 new under deployment)

Training & Education

Organization of **training sessions/webinars** in collaboration with IsZEB founding partners, tailored to the market and era needs

Synchronous and asynchronous learning

Indicative Thematic Areas:

- Emobility & Installation of Smart Chargers (Available)
- SRI Methodology (Upcoming)
- Building Insulation and Pathology (Upcoming)

Ecosystem & Events

Member of **Elevate Greece** and **European Cluster Collaboration Platform**



IsZEB Membership

Participation in **EDIHs** (European Digital Innovation Hubs)

Organization & Participation in events:

- Organization of events in collaboration with various organizations (such as Technical Chamber of Greece)
- Participation in conferences
- Participation in exhibitions

IsZEB: Smart cluster services for smart buildings



IsZEB DIH

RnD #1: IsZEB Certify



New online platform for calculating energy efficiency and intelligence of building infrastructure, with interconnection of BIM & CAD models

RnD #2: IsZEB Charge



System for converting electric chargers into intelligent interoperable units with remote monitoring and control, through an online platform

RnD #3: IsZEB Assist AR



Online support platform for workers/tradesmen with augmented reality technologies.

IsZEB DIH

RnD #4: IsZEB HygroThermal



Interactive Smart Insulation Systems

Smart Interactive system, aiming to model the thermal behavior of structural elements, taking into account the effect of the humidity of the individual materials (hygrothermal behavior)

RnD #5: IsZEB Flexify



Smart Buildings for Smart Electric Grids

Smart interactive system for the flexibility analysis of the smart buildings, using advanced artificial intelligence algorithms, to calculate reference consumption of available energy resources and the potential reduction or/and increase of them



IsZEB DIH

RnD #4: IsZEB HygroThermal



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Smart Interactive system, aiming to model the thermal behavior of structural elements, taking into account the effect of the humidity of the individual materials (hygrothermal behavior)

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Smart Buildings for Smart Electric Grids

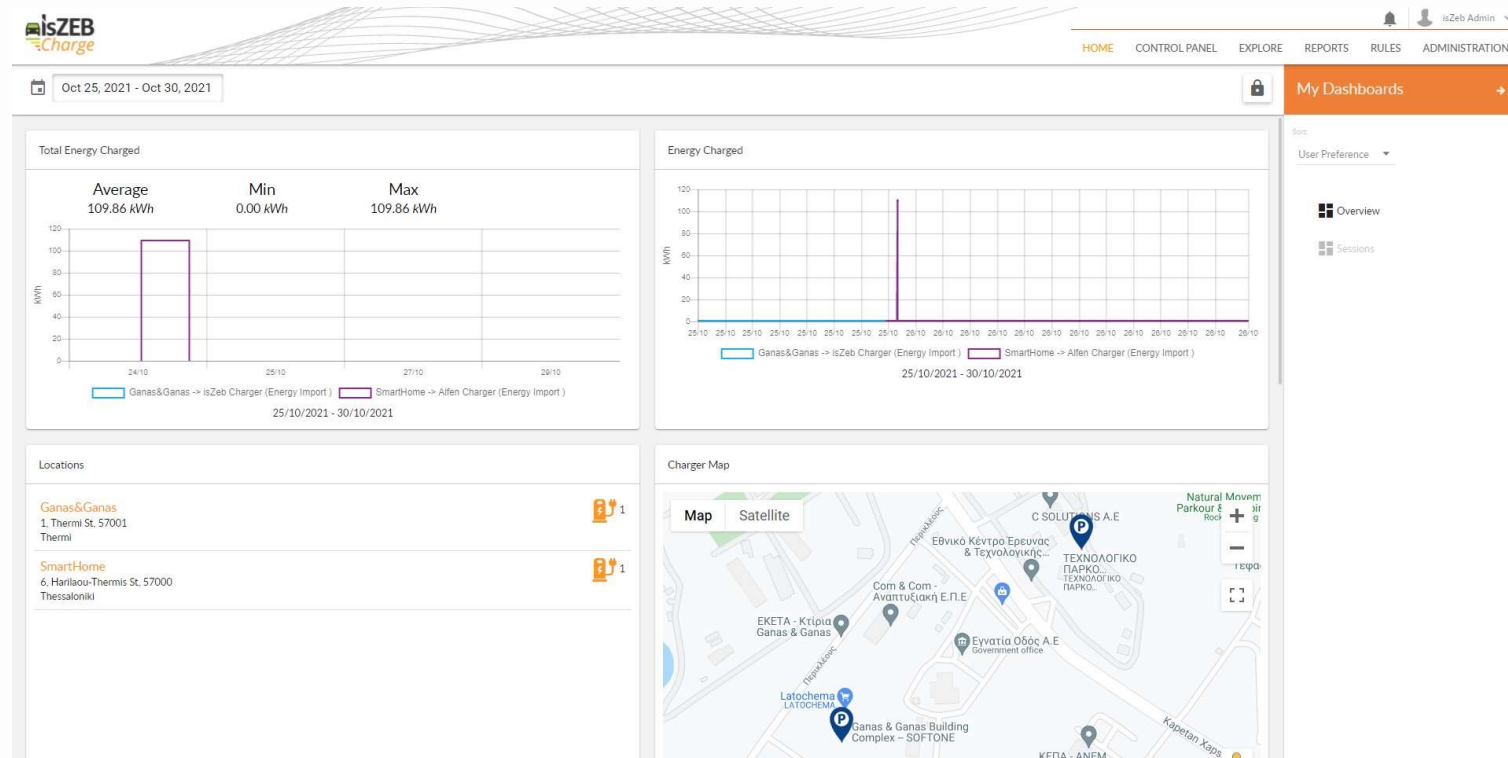
Smart interactive system for the flexibility analysis of the smart buildings, using advanced artificial intelligence algorithms, to calculate reference consumption of available energy resources and the potential reduction or/and increase of them



General Information

The project IsZEB Charge includes the design and implementation of a system for converting electrical chargers into intelligent interoperable units, with remote monitoring and control via an online platform.

- Device monitoring from compatible platform (sending measurements and receiving remote control commands)
- Charger management, remote monitoring and control of charging points.
- Statistical analysis of measurements & pattern recognition for better management.



Basic functionalities

End User:

- User account creation (Personal/Business)
- Payment methods management
- Historical data & statistics about charges and payments
- Preview of available charging spots on the map & navigation

The user will be able to find information about the charging process, charging level, billing, times, as well as other relevant information that can be sent to the user as notifications.

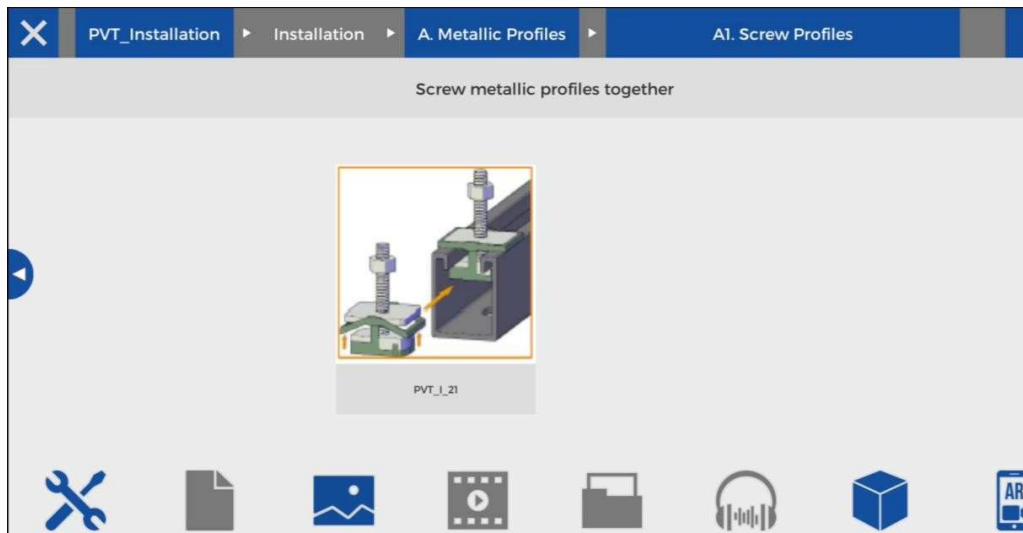
Charging Point Manager:

- Charging points management: Registration of new charging points, modification & deletion of existing ones
- Real-time monitoring of the availability and the status of the charging point
- Remote control of each charging point

The online platform can provide calculations and draw conclusions about the operation of the system, the operation of the charging points, and other useful parameters.

Basic functionalities

IsZEB Assist AR is a support system for technicians/engineers, which uses Augmented Reality (AR) technologies for on-site assistance in performing tasks with kinematic visual instructions directly on the physical object of the task.



Basic functionalities



Training Scenario Authoring

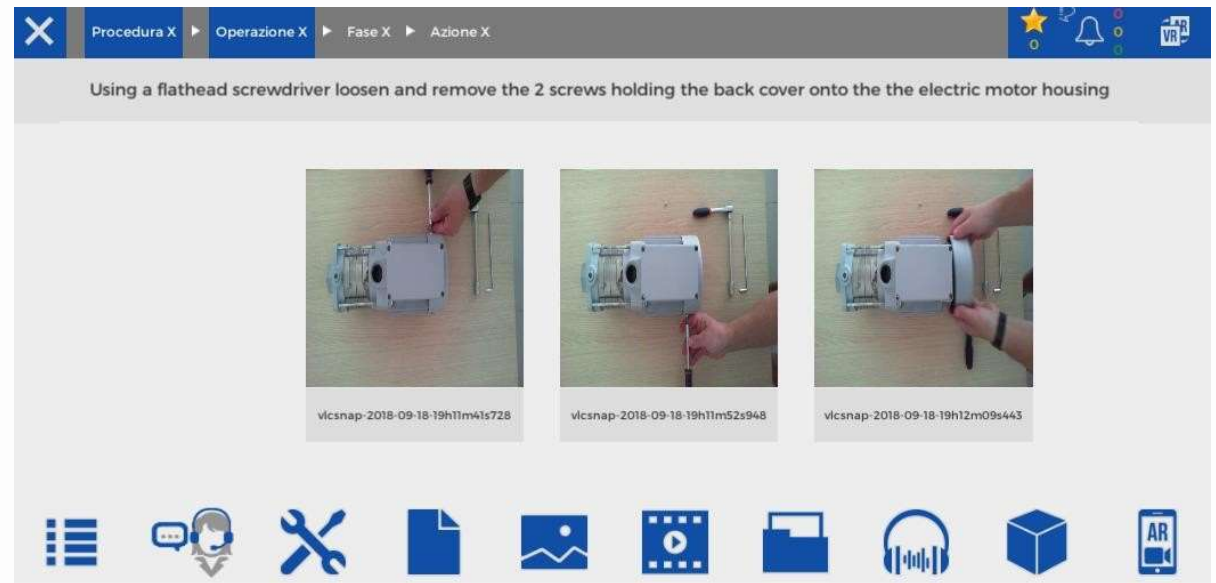
1. Procedure Step Definition
2. Multimedia content/3D animations generation
3. Information/Media assignment to tasks
4. Finalization and upload to Server
5. Deployment to mobile devices



Basic functionalities

Training Scenario Reproduction on-the-job

1. Online Scenario/User Management Platform
2. Training Scenario Viewer
3. Augmented Reality Presentations
4. Gamification
5. Evaluation/Statistics/Visual Analytics



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Transition pathway for Construction

On March 2023 EU published “The transition pathway for Construction”

Purpose:

To describe the conditions and the necessary actions to achieve a resilient, competitive, greener, and more digital construction ecosystem.

In addition, it proposes actions that support the transition towards safer buildings and affordable housing for all Europeans.

Transition pathway for Construction - Facts

Construction is the second largest **industrial ecosystem** in the European Union in economic terms, employing around 25 million people. As a result, it offers enormous potential to contribute to the European Green Deal and the Digital Decade

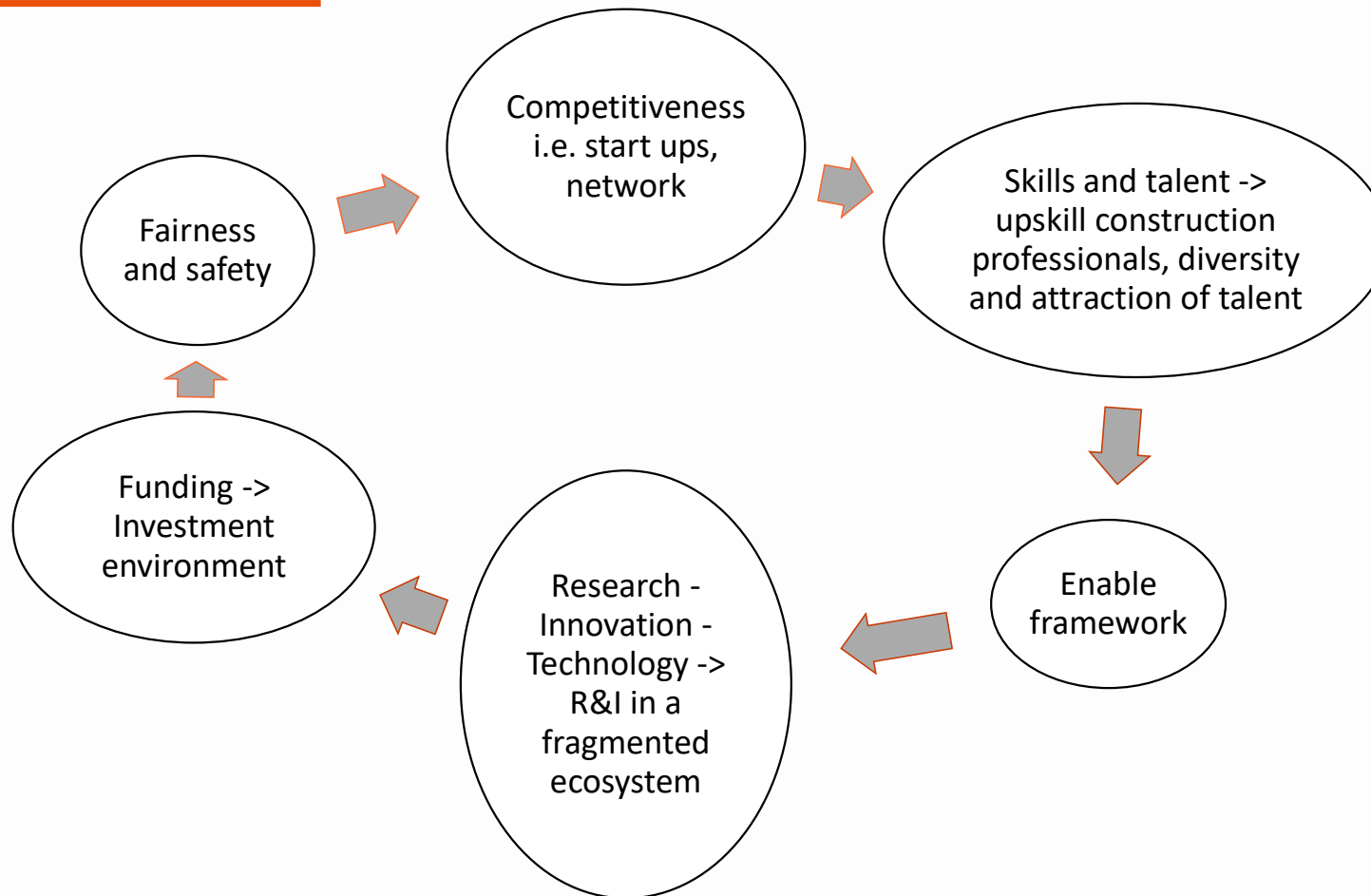
Europeans spend, on average, 85-90% of their **time** in buildings. Policymakers need to take into account the challenges faced by companies in the ecosystem, of which over 90% are micro-enterprises, to navigate a complex policy and regulatory framework.

Construction represents the biggest source of Europe's **waste**, with 37.5% of the total generated in 2020 by mass.

Construction sector is responsible for approx. 40% of **energy consumption** worldwide.

In terms of **digitalisation**, construction bears the negative reputation of a slow adopter of technology and innovation.

Transition pathway for Construction – EU Proposals



The **Greek Ministry** of Infrastructure and Transport, together with other competent Greek Ministries as well as Industry and Academia, is preparing a strategy and roadmap for the implementation of Building Information Modelling (BIM) in Greece, covering aspects such as public works, private developments, and skills. In addition, the Strategy is meant to prepare the ground for unlocking funding opportunities for buildings and construction linked to the green transition and digitalisation. The way of working and orientations are very close to our own transition pathways. The EC is supporting the effort through the Technical Support Instrument. In the same spirit of digital reform, Greece made in 01. 2021 the Electronic Building ID (local logbook) obligatory.

Transition pathway for Construction

What is your view on that?

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Public Energy Savings / CERTH Facilities' Example

27/05/2022

Greek Government Law **4936/2022**

National Climate Law Transition to climate neutrality and adaptation to climate change, emergency provisions to address the energy crisis and protect the environment.

02/07/2022

Joint Ministerial Decision **68315/502/1-7-2022 KYA (B' 3424)**

Circular on: Measures to improve energy efficiency and save energy in buildings and facilities owned by or used by Public Sector bodies - Designation of Energy Infrastructure/Facilities Manager and Administrative Managers



07/07/2023

CERTH SmartWins Summer School, Thessaloniki, Greece

Public Energy Savings / CERTH Facilities' Example

Installed Smart Meters & Developed a Monitoring Platform -> Control multiple zones & fault detection

Switched to LED Bulbs

Replaced old devices without energy labelling

Reactive Power Compensation

Conducted Sustainability Study (ESG Criteria)

GHG Emissions Calculation

} On going effort

During the 2nd semester of 2022 CERTH achieved 7.7 % less energy consumption compared to 2019..

Thank you

Questions?

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Project Partners



CERTH
CENTRE FOR
RESEARCH & TECHNOLOGY
HELLAS



POLITECNICO
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