

HEPHAESTUS

PROJECT OVERVIEW

The research leading to these results has received funding from the European Union's H2020 Programme (H2020/2014-2020) under grant agreement nº 732513

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Highly automatEd PHysical Achievements and PerformancES using cable roboTs Unique Systems **HEPHAESTUS**

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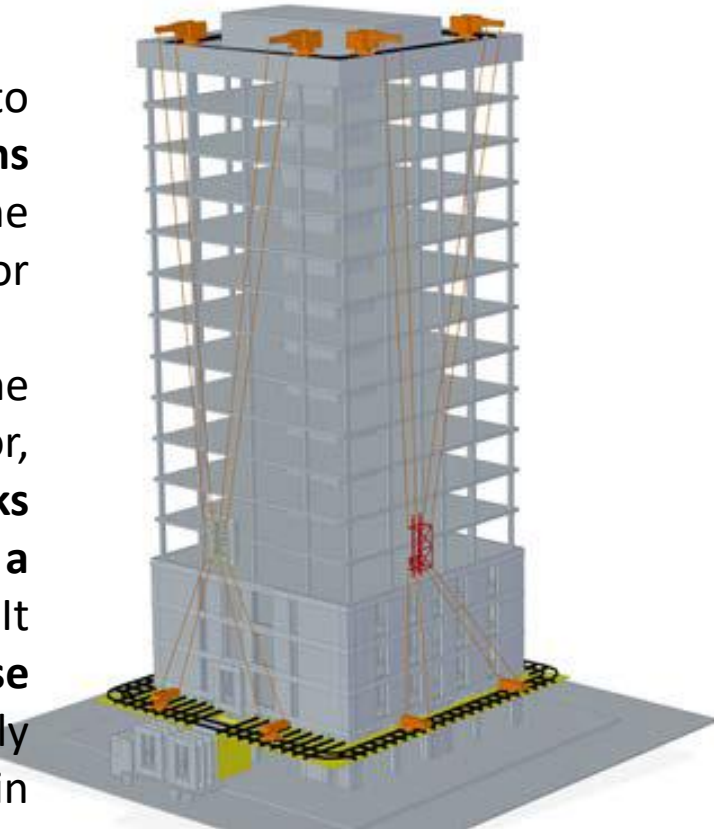
- **Goal of the project**
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- **Hephaestus** project aims at **automating the On-site Execution or Installation process of curtain wall systems**
 - **Hephaestus** project addresses novel concepts to **introduce Robotics and Autonomous Systems** use in the **Construction Sector** where the presence of this type of products is minor or almost non-existent.
 - It focuses to **give novel solutions** to one of the most important parts of the construction sector, the part related **to the facades and the works that need to be done when this part of a building is built or need maintenance**. It proposes a **new automatized way to install these products** providing a whole solution not only highly industrialized in production but also in installation and maintenance.

Goal of the project



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Added value of the project

- **Hephaestus** has been conceived as a solution for accomplishing multiple tasks on vertical or inclined planes of the built and outdoor environment. For that purpose, the **Hephaestus** is mainly based on a **cable-driven robot**.
- **Hephaestus** integrates several technologies that are already developed into a multiple job performer.
 - **Cable-driven robot**
 - **Modular end-effector kit**: capable of hosting several tools.
 - It can host task accomplishing tool, which can be different at each time where **Hephaestus** is applied. On the other side,
 - it also hosts all the accessory devices that are necessary for the sensing and controlling the system.
 - It must be pointed out the **Multi-functionality** of the **Hephaestus**.



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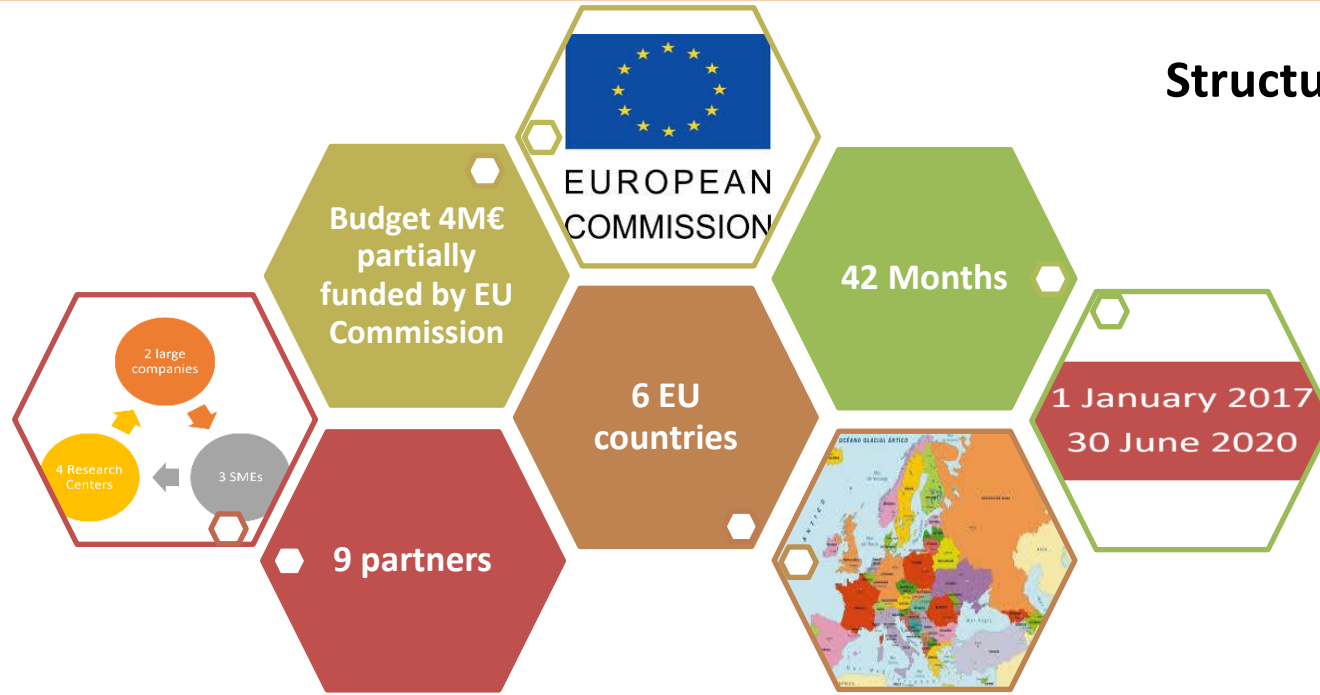
Added value of the project

- Hephaestus solution would be capable of **accomplishing several tasks** within the built environment:
 - Installation of prefabricated panels of curtain wall,
 - Replacing damaged elements,
 - Repair of cracks, maintenance , etc.
- Comparing to other systems, the apparatus of the **Hephaestus** is **lean** and easy to move.
- Hephaestus system is **compatible** with other **handling and support** systems such as gondolas, scaffoldings, aerial work platforms, mast climbing systems, etc.
- As it can be based on 8 or more cables, the Hephaestus is **high versatile**, and its **reachability** is very broad. This permits the system to cover **complex geometries**.
- The Controlling system would offer and **easy and fast calibration**.



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Structure of the project



3 SMEs

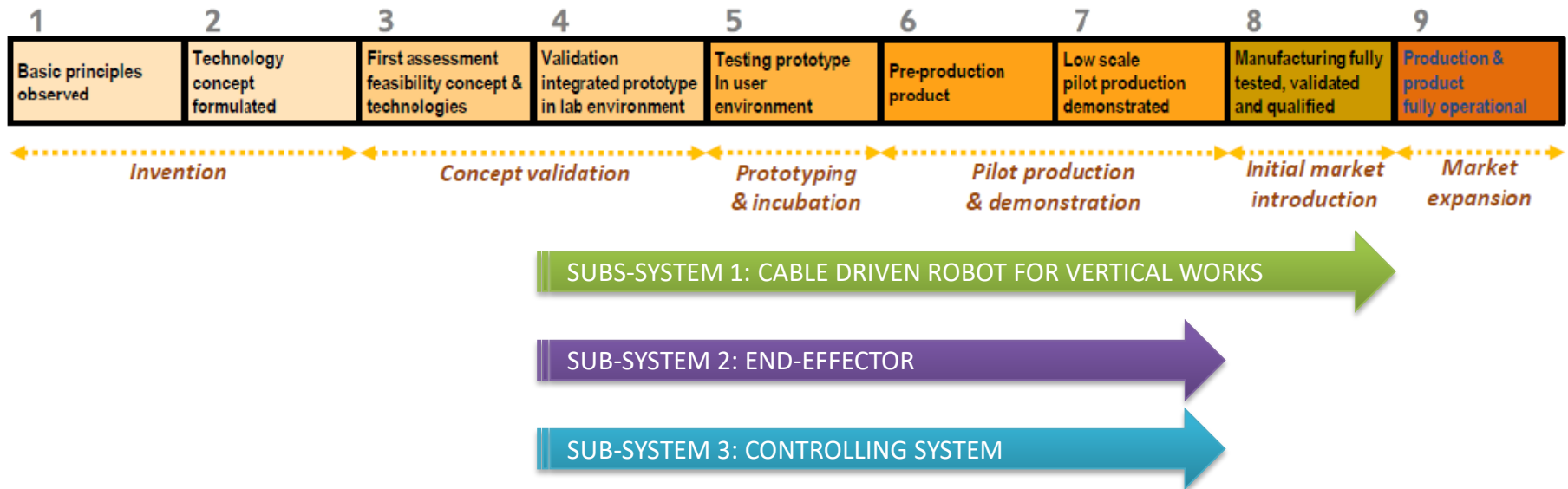
2 Large companies

4 RTDs



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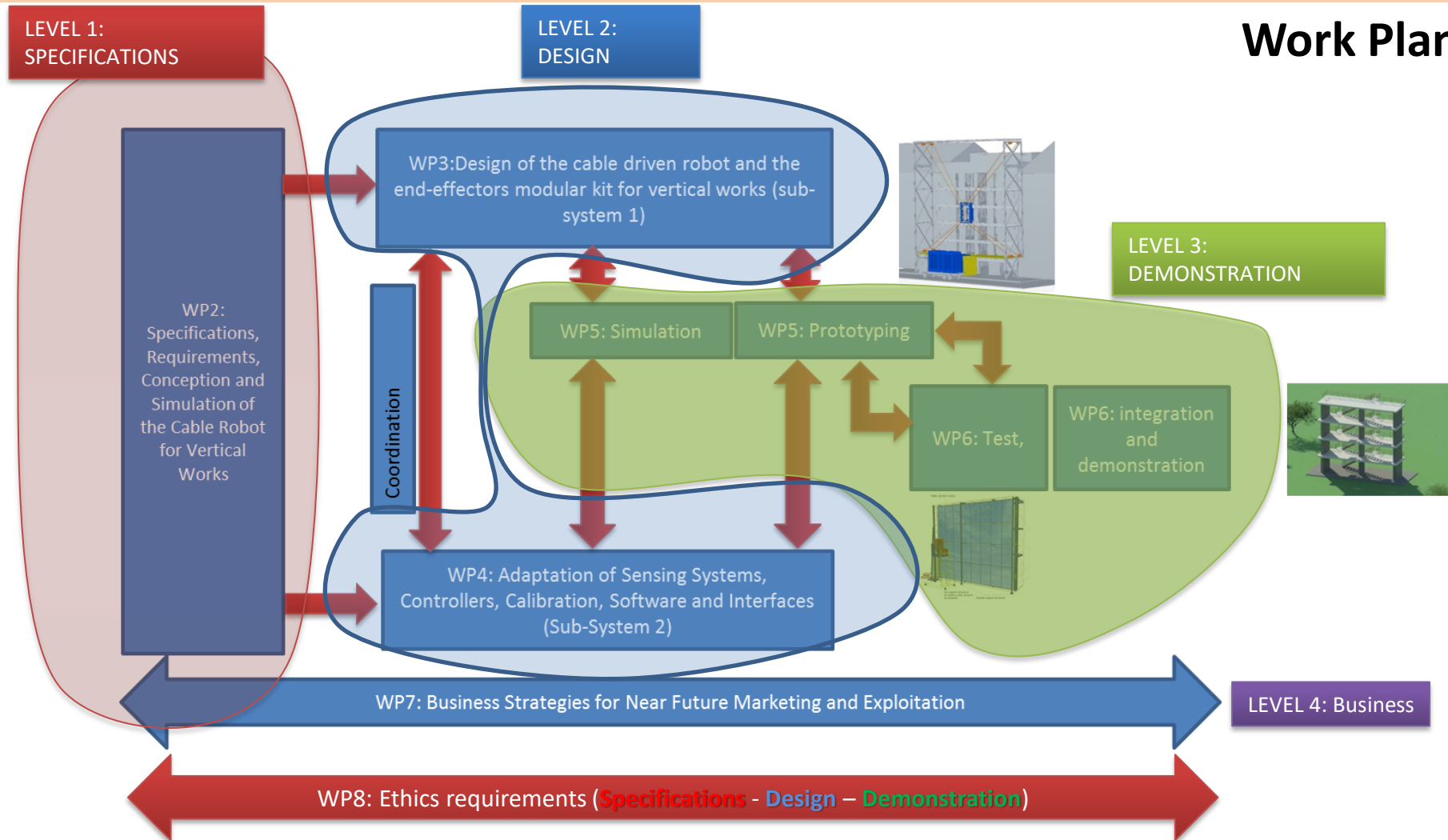
TECHNOLOGY READINESS LEVELS (TRL) – PROGRESS



- 5 companies to make profit (3 SMEs)
- Demo building will be a showcase
- High flexibility of the system

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Work Plan



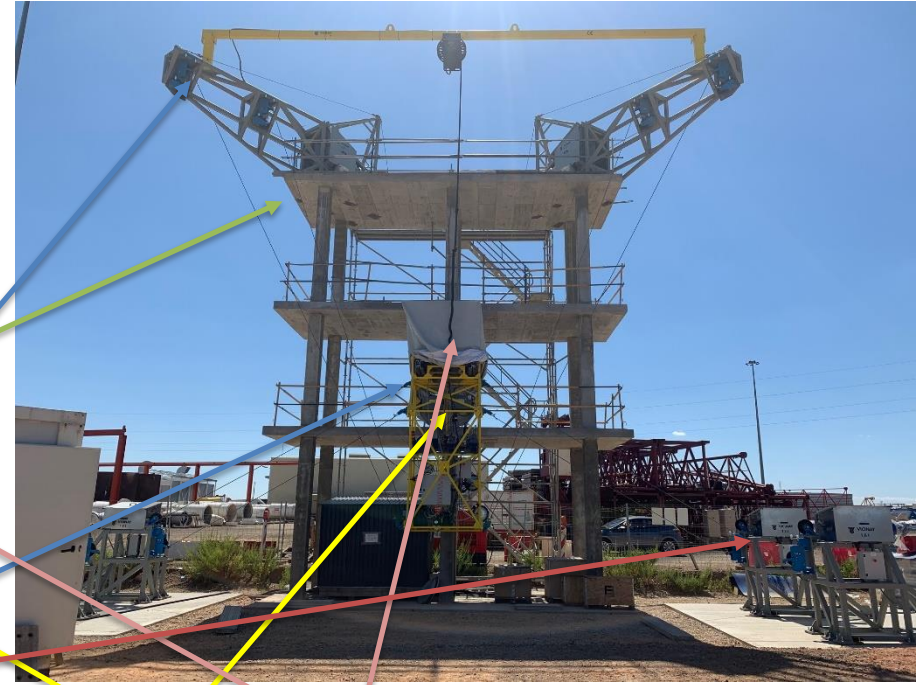
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Added value of the project

Tecnalia Laboratory demo building



Acciona demo building



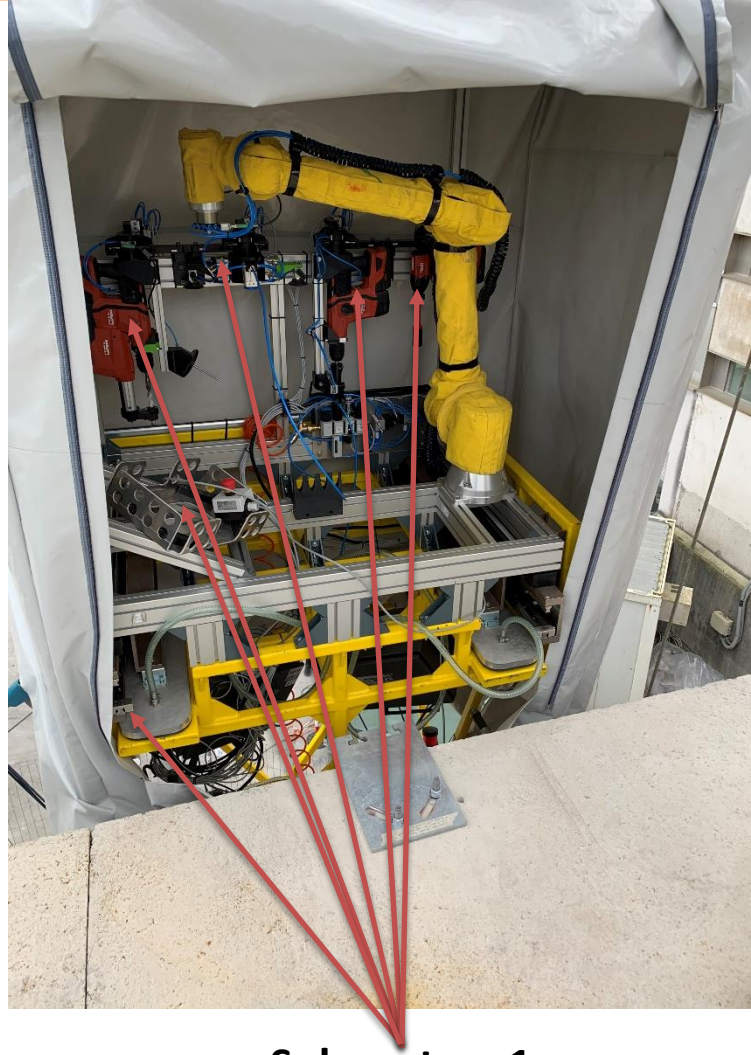
- Building - Winches hosting structure
- Cable robot - Winches to Platform
- Platform
- Modular end-effector
- Sensing and control devices



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Description of the system



Sub-system 1



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Description of the system



Sub-system 2



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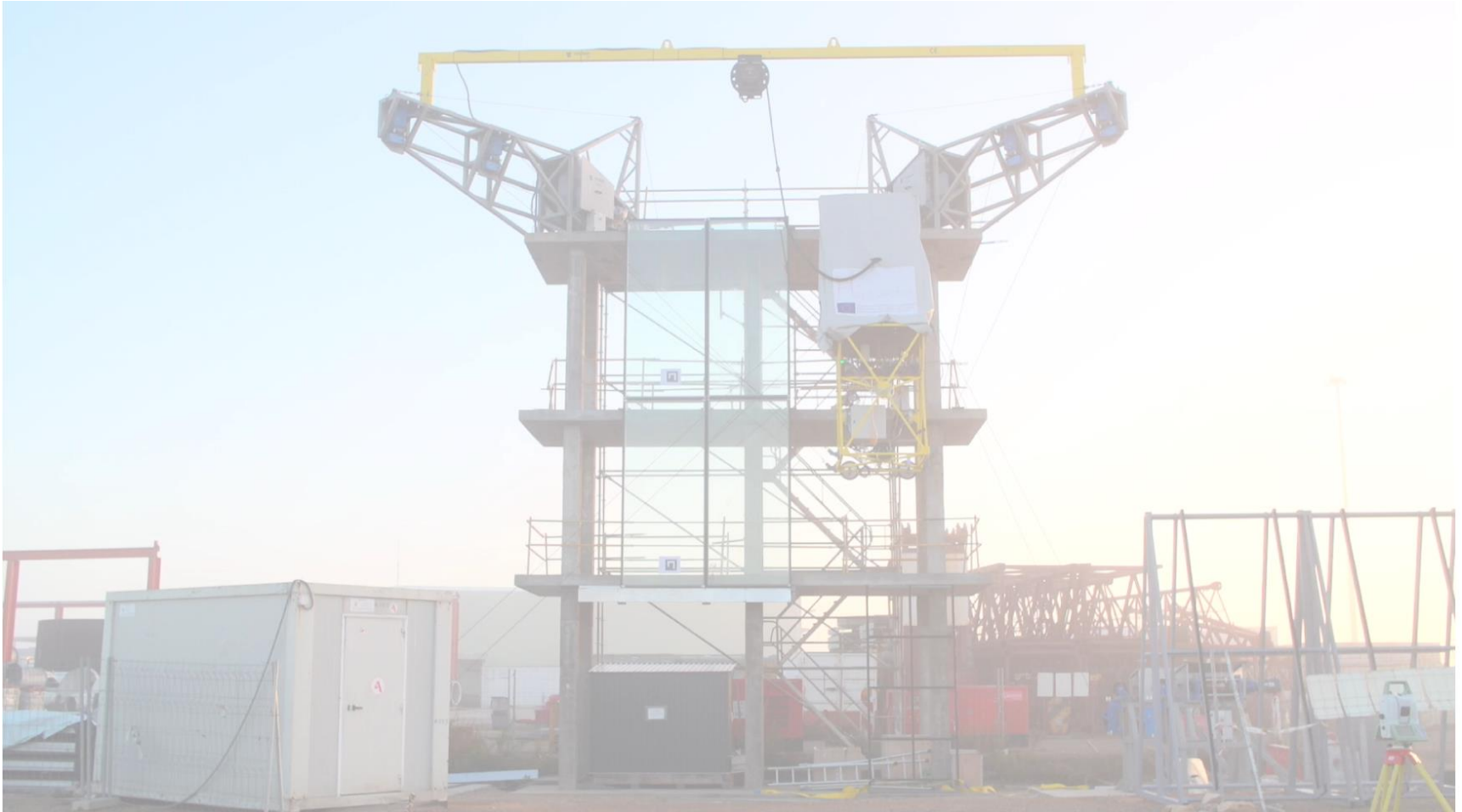
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<https://youtu.be/RWdCGVauZmo>

Results



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Conclusions

- The project validated the possibility of using robotic systems in the construction sector and, specifically, in the installation of façades.
- Added value of the Project:
 - Time/Quality: Reduction of facades installation time in a 50%. Increase of final quality of the installation.
 - Safety: The system increases the safety of the workers during the entire process.
 - Cost: The value of the implementation of the system is similar to the Cranes/Gondolas used in the target buildings.
- Next steps
 - To increase the flexibility of the system.
 - To improve the perception of the environment and the objects to be used during the execution process.
 - To include additional tools in the system (cleaning, etc.).
 - **To apply to renovation: HORIZON-CL5-2021-D4-01-02: Industrialisation of deep renovation workflows for energy-efficient buildings**



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**Thank you for
your attention!**

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