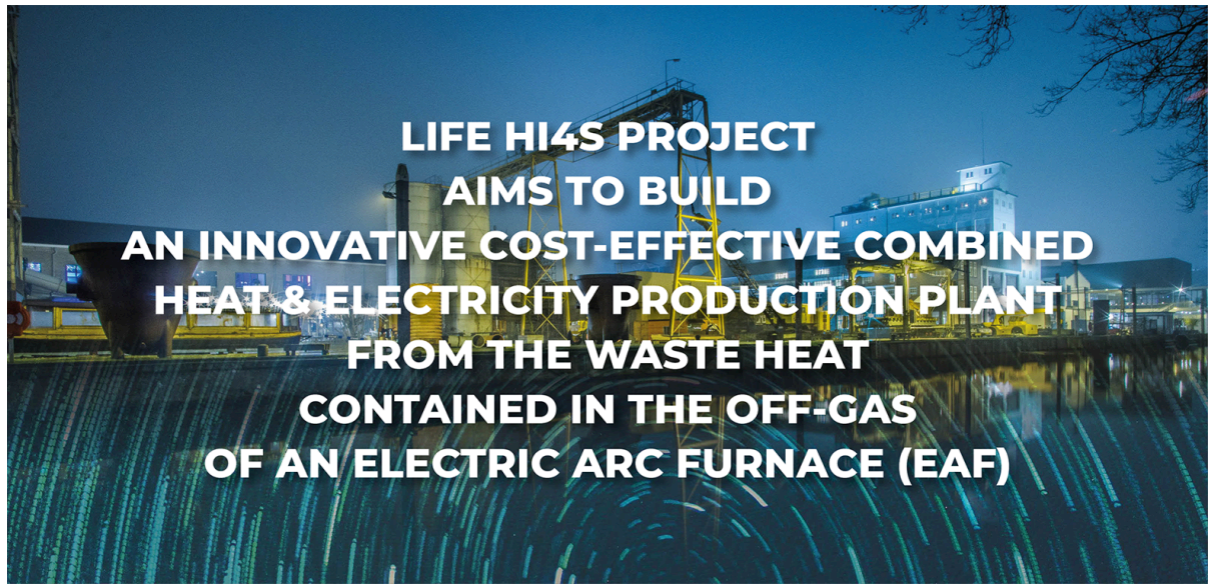
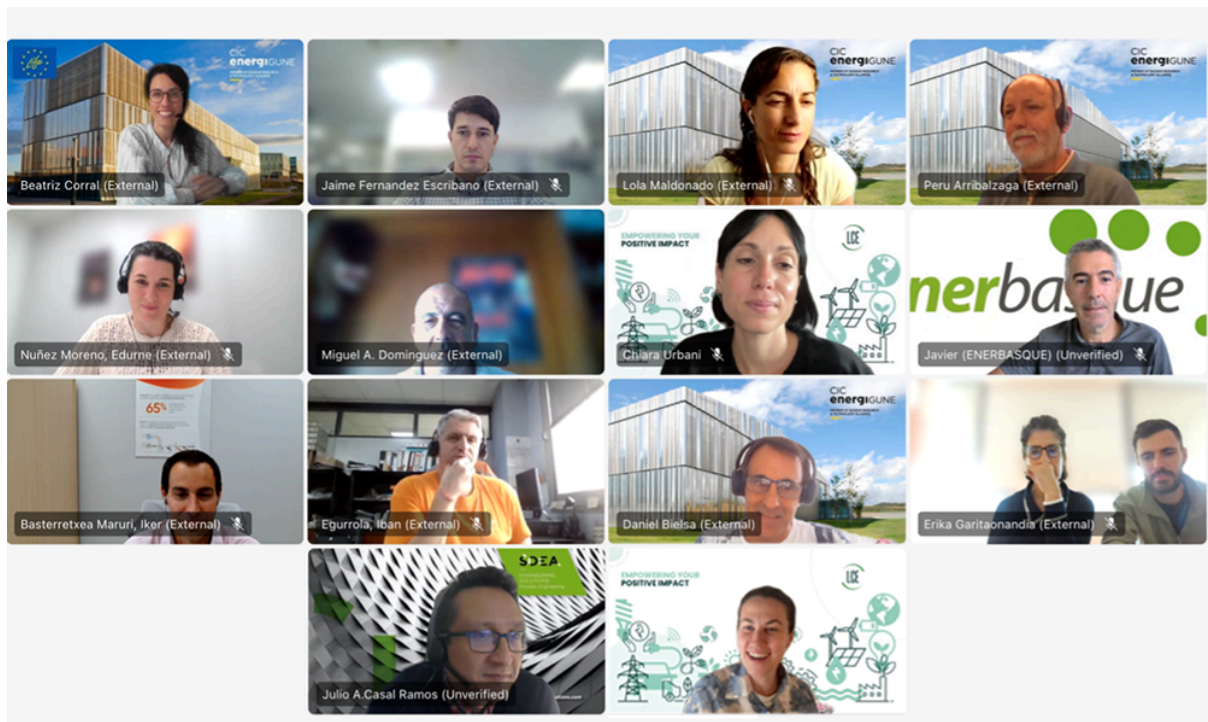




With the contribution of the LIFE programme of the European Union
LIFE20 CCM/ES/001733



LIFE HI4S project is almost over!



After more than four years the LIFE HI4S project is approaching its end. Four intense years of material research and development, components design, installation and testing, but especially of mutual collaboration among partners. Four years of regular online and in-person meetings where issues, roadblocks and challenges have been faced, technical difficulties overcome with partners looking for solutions and building innovation together.

On 22nd of September 2025 LIFE HI4S partners gathered online for the **last Project Consortium Committee** where partners gave updates on tasks and activities and together reflected on the outcomes, ongoing activities and potentially future collaborations.

TECHNICAL RESULTS

Commissioning milestones achieved at the LIFE HI4S pilot plant

The LIFE HI4S project has reached an important milestone with the successful commissioning of the pilot plant at ArcelorMittal Sestao. This phase included both *cold tests*, verifying that all systems and components operated as expected, and *hot tests*, which validated the technological approach under real operating conditions. These first campaigns have confirmed the plant's ability to capture and harness the energy content of the Electric Arc Furnace (EAF) off-gases—a step never before achieved in such a direct and efficient way in research or industrial practice.

First-of-a-kind energy recovery and scrap preheating

During the initial trials, the team managed to recover off-gas heat and channel it effectively into downstream applications. For the first time, the energy content of EAF exhaust gases was directly captured, demonstrating that a significant share of what was once considered waste can be transformed into a valuable energy resource. Additionally, the pilot plant successfully dried three tonnes of scrap metal, removing all residual moisture and raising its temperature up to 140 °C before feeding it into the furnace. This result alone points to remarkable potential energy savings in the melting process, while also improving furnace stability and productivity.

Tangible benefits: energy, emissions, and economics

If deployed at full scale, when applied to a single EAF, LIFE HI4S technology could deliver *up to 50 GWh in primary energy savings per year* while reducing *CO₂ emissions by around 10,000 tonnes annually*. For a typical steelworks, this translates into significant energy bill reductions and lower costs associated with emission allowances. The financial plan developed within the project shows that these benefits can be achieved with a *payback time of less than three years*, making the solution not only environmentally compelling but also economically attractive for industry.

Next steps: electricity production and storage

Looking ahead, the next test campaigns are more focused on producing electricity through the innovative Organic Rankine Cycle (ORC) system developed for the project. In parallel, the team is validating the thermal energy

storage (TES) unit, which makes use of steel slag—an abundant by-product of the steel industry—thus contributing to circular economy objectives. Both features will be critical to ensure that the system can operate flexibly and continuously, even with the variable nature of EAF operations.

Towards autonomous operation

Another key goal for the coming months is to demonstrate the autonomous operation of the plant. Once achieved, this will confirm the robustness and reliability of the LIFE HI4S concept, paving the way for its replication not only across the steel sector but also in other energy-intensive industries such as cement, glass and ceramics.

DISSEMINATION RESULTS

Several significant results have been achieved in terms of dissemination activities of LIFE HI4S technology to potential users and general public.

We engaged with more than 1,500 experts from industry, research centers and academia through congresses attendance and workshops organization;

In fact, CIC energiGUNE and Fundacion Azterlan - two partners of the project – organized two successful and high-level workshops in November 2023 and February 2025 (TEDS25) with almost 150 participants in total.



WORKSHOP
JORNADA TÉCNICA

9th Nov
Centro Tecnológico
AZTERLAN



MEJORANDO LA EFICIENCIA ENERGÉTICA MEDIANTE LA
RECUPERACIÓN DEL CALOR RESIDUAL:
OPORTUNIDADES Y RETOS

MAXIMIZING ENERGY EFFICIENCY THROUGH WASTE
HEAT RECOVERY: OPPORTUNITIES AND CHALLENGES

ORGANIZA / ORGANIZER



<https://www.hi4s-life.eu/>

COLABORA / COLLABORATORS



LIFE HI4s project has been presented in 4 major international events, with large audience of industrial stakeholders:

- METEC ESTAD in Dusseldorf on 12-16 June 2023, presenting the preliminary conclusions of the study on slag under thermal fatigue, with the title '**Access the mechanical and thermal fatigue in packed bed thermal energy storage concept**';
- 11th International Conference on Nanomaterials and Advanced Energy Storage Systems (INESS 2023) presenting the study on the benefits of including a slag-based thermal energy storage in the LIFE HI4S pilot plant, using a digital replica, with the title '**Application of steel slag as sensible thermal energy storage for continuous operation of a waste heat energy reuse plant**';
- 7th International Conference on Energy Research and Technology (ICERT '23) in August 23 in London, presenting the preliminary conclusions of the study on the thermal energy storage under thermal discharge, with the title '**Experimental testing of a 400 kWh steel slag-based Thermal Energy Storage prototype for industrial waste heat recovery applications**';
- SolarPACES in Almeria, Spain in September 2025 showcasing the conclusions of the study on the thermal endurance of steel slag, with the title '**A validated thermo-mechanical modelling approach to simulate Thermal Ratcheting in Packed Bed Thermal Energy Storage systems**';
- During the project we have elaborated two technical articles, 2 press releases, 6 newsletters (including this one), 1 noticeboard, one dedicated website (www.lifehi4s.eu) with more than 2,000 visits and a LinkedIn project page with more than 7,000 impressions in the last year.

Make sure to visit LIFE HI4S website and follow LIFE HI4S LinkedIn page (<https://www.linkedin.com/company/hi4s/about/>) to stay informed on the latest update on the project!

LIFE HI4S EU Project

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