

# Newsletter



## Comprehensive Testing Campaign



The acceptance testing campaign was designed to be thorough and comprehensive, encompassing both **cold and hot tests** to ensure the complete functionality and reliability of the SO-FREE integrated system. These tests verified the integration of main components, the performance of auxiliary subsystems, and the system's overall operational readiness.

The system was evaluated across the full **hydrogen/natural gas fuel spectrum**, covering **0–100% H<sub>2</sub>/CH<sub>4</sub> blends**, to validate its ability to operate seamlessly under varying fuel compositions. The system consistently demonstrated **stable and reliable operation**, automatically adapting to changes in the fuel mixture without any intervention. At **full load (5 kWe)**, the prototype achieved a **net electrical efficiency of approximately 50% when running on pure hydrogen and 56% on natural gas**, confirming that the system meets the expected performance targets and operates at optimal efficiency across different fuel conditions. These results confirm the system's robustness, versatility, and readiness for the next stages of demonstration and deployment in flexible, fuel-adaptive energy systems.

## Welcome to the SO-FREE project:

The SO-FREE project has reached a significant milestone with the completion of the factory acceptance testing (FAT) of its integrated system at ICI Caldaie's facilities in Italy. This phase marks a critical step towards demonstrating the system's readiness for real-world operation and its potential deployment in flexible, fuel-adaptive energy solutions.

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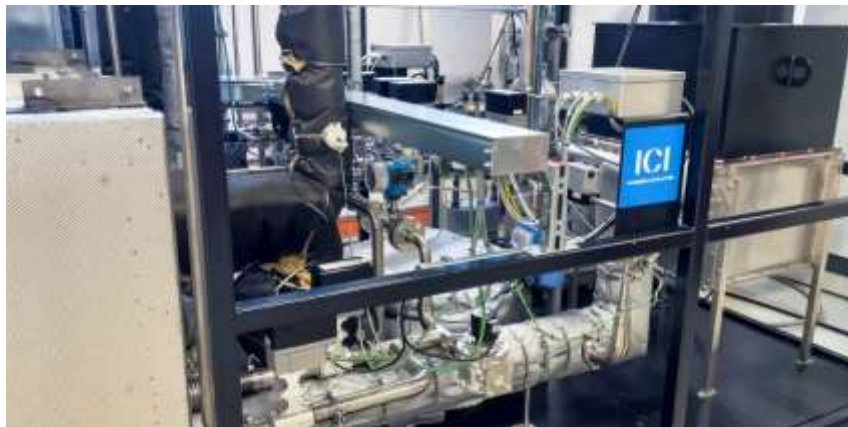
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## System Architecture and Flexible, Stack-Agnostic Design

The FAT phase highlighted the effectiveness of the **system architecture and control strategies**, demonstrating that they perform reliably under representative operating conditions. Close collaboration between project partners enabled the validation of system layout, gas routing, and control and monitoring solutions, providing a solid baseline for the next stages of experimental operation and performance assessment.

Beyond verifying technical performance, the campaign also demonstrated the **flexibility and adaptability** of the SO-FREE platform. Its design allows operation with a wide variety of fuels and blends while maintaining high efficiency, safety, and reliability. The system incorporates a “**stack-agnostic**” approach, enabling the integration of **solid oxide fuel cells (SOFCs) from different manufacturers** without requiring redesign of the plant, further enhancing modularity, maintainability, and overall system versatility.



The SO-FREE prototype assembled in the ICI laboratory

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