ACHIEVE Advancing the Combustion of Hydrogen-Ammonia blends for improved Emissions and stability

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Abstract

To support the energy transition gas turbine (GT) technology must move beyond fossil fuels like natural gas toward carbon-free alternatives. In this context the EU-funded project ACHIEVE aims to develop the foundational knowledge and tools needed to enable GTs to operate with unconventional, carbon-free fuel blends based on hydrogen (H_2) and ammonia (NH_3). Blends of H_2 and NH_3 are a promising solution, combining advantages and mitigating individual drawbacks, yet the combustion dynamics of such multi-component mixtures remain poorly understood. ACHIEVE is currently addressing these gaps through three main approaches: (a) experimental studies of combustor stability, emissions, and flame dynamics under increasingly realistic GT conditions; (b) advanced numerical modelling including detailed kinetics, data-driven sub-grid scale LES models, and novel tools to predict NOx formation, flashback, and instabilities; and (c) system-level engagement with manufacturers, end users, and stakeholders to accelerate adoption. The project is targeting TRL 4 for low-emission, fuel-flexible combustion systems, with real-time monitoring integrated into advanced burner concepts such as swirl-stabilized and jet burners for MILD and conventional regimes. The ACHIEVE consortium includes members from: Sapienza University of Rome, University of Florence, Technical University of Berlin, Technical University of Delft, CNRS and Central Supelec, Zabala Consulting, KAUST University and Phoenix BioPower (Switzerland). At the present stage, the project is advancing towards the first reporting period at month 18 on an overall 42-month envisaged duration.

All the information and news on the project development can be found in the dedicated website https://achieve-project.eu/ and on the CORDIS platform https://cordis.europa.eu/project/id/101137955 .