# Reduced Chemical Kinetics for CDF Studies of Ammonia-Hydrogen Blends in Gas Turbine Swirl Combustors

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Ammonia has been widely used in various applications over the years. From internal combustion engines during the Second World War to modern developments, ammonia has always presented a unique opportunity to store hydrogen for power and heat generation. Ammonia is currently expanding further, with companies and institutions such as the International Energy Agency (IEA), International Chamber of Shipping (ICS), Committee on Climate Change (CCC), Energy Transitions Commission (ETC), Clean Air Task Force (CATF) and the Electric Power Research Institute (EPRI) recognizing the necessity of ammonia to supplement hydrogen to large power production systems, heavy trucks and long distance transportation vehicles (i.e. marine industry). However, there is still a considerable gap of understanding to employ ammonia for fuelling power production system whilst keeping low NOx profiles. Complex chemical reactions combined with 3-dimensional hydrodynamics create scenarios difficult to solve for the production of clean power at high combustion efficiencies. Therefore, this work presents the first set of results obtained from a CFD-RANS/LES campaign that seeks to evaluate the complexity of the combustion process in swirling flows, i.e. representative to industrial equipment, for future validation with experimental trials. The final aim of this research is to improve the understanding of the impact of various species that are the product of ammonia-hydrogen combustion across representative industrial combustors, thus further implementation of novel injection methodologies in larger scale devices can be achieved.