High Hydrogen Gas Turbine Combustor High Pressure Test (Pilot)

Publieke samenvatting / Public summary

Aanleiding

Flexibility is key to supporting future energy generation. The growth in renewable solar and wind energy has emphasized the need for flexibility. Flexibility to reliably balance the load on the energy grid with the ability to rapidly adjust output while using cost effective fuels which also minimize carbon output. Gas turbines with a retrofit for hydrogen operation offers a low carbon solution to support the stability of the energy grid. This pilot project provides the key step for a solution capturing the needs for energy storage, in the form of hydrogen, and flexible power generation. Making use of the existing installed gas turbine base with a modest retrofit provides a compelling and cost-effective solution. Currently there is a pilot gas turbine from a competitor developed for firing 100% H2 as the fuel, with no control of NOx emission. The aim of this pilot project is to develop a gas turbine combustion system to run on 0~100% hydrogen with Dry Low Emission (DLE) to maintain low NOx and CO (when natural gas is in the fuel mixture) emission at the same time.

Doelstelling

The major objective of this pilot project (as phase 2 of the whole development plan) is to validate the low emission gas turbine combustor design, targeting the full retrofit MS5 engine operations in the future, for fuel flexible operation from 100% Natural Gas to 100% Hydrogen and any mixture thereof at low emissions level. Combustion rig tests (including an intermediate high-pressure rig test)

Projectinformatie / Project information

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DEI120081
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€ 745.860,00

Algemene informatie / General information

Penvoerder / Secretariat
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will be executed to validate the design. The pilot project is one key step to enable the gas turbines in the industry (either existing gas turbines via retrofit or new installed gas turbines) to use green hydrogen (production of hydrogen from renewable energy by means of electrolysis) with all possible H2 proportion in the fuel while fulfilling the environmental emission requirement. Thus, this pilot project will promote the utilization of green hydrogen as the mean for the large-scale storage and conversion from green electricity (solar and wind) to other energy carriers and / or products.

Korte omschrijving

The engine proven FlameSheet™ combustion system will be the basis for the pilot project development to achieve extended capability to operate flexibly from 100% natural gas to 100% hydrogen. A major challenge is the further development of robust hydrogen air premixing to ensure stable engine operation. Advanced analytical models will be used to benchmark previous high hydrogen operation on the FlameSheet™. These analytical tools will then be used to further optimize the FlameSheet™ design to ensure stable 100% hydrogen operation. Test hardware will be designed, manufactured and operated at high pressure test conditions, to validate the atmospheric test results, analytical predictions and validate the 100% hydrogen capability of FlameSheet™, while meeting the objectives described above.

Resultaat

The result of the project will be a proven high hydrogen retrofit applicable to the majority of industrial gas turbines and a proven engine and support systems capable of zero carbon emissions. The technology developed will feed the next phase of Fr5 gas turbine demonstration and bigger (>50MW gas turbine) units commercial engine demonstration. Lessons learned during this project will be applied to the subsequent development and demonstration of FlameSheet™ technology.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
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