



Shell Hydrogen Fuel Experience Gas Turbines



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Definitions & cautionary note

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This PRESENTATION contains forward-looking statements (within the meaning of the U.S. Private Securities Litigation Reform Act of 1995) concerning the financial condition, results of operations and businesses of Royal Dutch Shell. All statements other than statements of historical fact are, or may be deemed to be, forward-looking statements. Forward-looking statements are statements of future expectations that are based on management’s current expectations and assumptions and involve known and unknown risks and uncertainties that could cause actual results, performance or events to differ materially from those expressed or implied in these statements. Forward-looking statements include, among other things, statements concerning the potential exposure of Royal Dutch Shell to market risks and statements expressing management’s expectations, beliefs, estimates, forecasts, projections and assumptions. These forward-looking statements are identified by their use of terms and phrases such as “aim”, “ambition”, “anticipate”, “believe”, “could”, “estimate”, “expect”, “goals”, “intend”, “may”, “objectives”, “outlook”, “plan”, “probably”, “project”, “risks”, “schedule”, “seek”, “should”, “target”, “will” and similar terms and phrases. There are a number of factors that could affect the future operations of Royal Dutch Shell and could cause those results to differ materially from those expressed in the forward-looking statements included in this PRESENTATION, including (without limitation): (a) price fluctuations in crude oil and natural gas; (b) changes in demand for Shell’s products; (c) currency fluctuations; (d) drilling and production results; (e) reserves estimates; (f) loss of market share and industry competition; (g) environmental and physical risks; (h) risks associated with the identification of suitable potential acquisition properties and targets, and successful negotiation and completion of such transactions; (i) the risk of doing business in developing countries and countries subject to international sanctions; (j) legislative, fiscal and regulatory developments including regulatory measures addressing climate change; (k) economic and financial market conditions in various countries and regions; (l) political risks, including the risks of expropriation and renegotiation of the terms of contracts with governmental entities, delays or advancements in the approval of projects and delays in the reimbursement for shared costs; (m) risks associated with the impact of pandemics, such as the COVID-19 (coronavirus) outbreak; and (n) changes in trading conditions. No assurance is provided that future dividend payments will match or exceed previous dividend payments. All forward-looking statements contained in this PRESENTATION are expressly qualified in their entirety by the cautionary statements contained or referred to in this section. Readers should not place undue reliance on forward-looking statements. Additional risk factors that may affect future results are contained in Royal Dutch Shell’s Form 20-F for the year ended December 31, 2019 (available at www.shell.com/investor and www.sec.gov). These risk factors also expressly qualify all forward-looking statements contained in this PRESENTATION and should be considered by the reader. Each forward-looking statement speaks only as of the date of this PRESENTATION, March 18, 2021. Neither Royal Dutch Shell plc nor any of its subsidiaries undertake any obligation to publicly update or revise any forward-looking statement as a result of new information, future events or other information. In light of these risks, results could differ materially from those stated, implied or inferred from the forward-looking statements contained in this PRESENTATION.

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Summary

- Shell has several turbines that operate primarily on Hydrogen based fuel.
- Diffusion combustors with steam injection for NOx control.
- Turbines have been in operation for 10+ years.
- Oil and Gas operational profile is typically continuous operation
- Fuels are typically an off gas fuel from our Oil & Gas processing facilities.
- Turbines are typically started on natural gas fuel and switch to the hydrogen based fuel online
- Parts in the turbines are identical (materials, coatings, design, etc.) to same engine types in just Natural Gas service.
- No impact in parts life or maintenance interval due to hydrogen fuel operation.

GTG- Operating Status								
Total Fired Timer- hrs	Total NG fired Timer -hrs	Total Mix fired Timer-hrs	Total HOG Fired Timer- hrs	Manually Initiated Starts	Total start Counter	Fast Load Counter	Fired Starts Counter	Emergency Trip counter
83873.6	23261.8	14.3	60597.2	7	81	0	60	36

Hydrogen Fuel

Hydrogen fuel cases	Gas Properties			
	T, deg C	Pressure , barg	MWI	H2
Case 1: High H2, mid MWI	82.2	41.9	18.98	52.74
Case 2: Mid H2, low MWI	89.8	42.6	12.83	16.42
Case 3: Low H2, low MWI	60.4	60	14.03	7.04
Case 4: High H2, high MWI	68.6	59.5	21.32	31.97



- Last HGPI was carried out in October 2015-, HGPI counter -35383 hours
- Major inspection done on October 2020 . MI Counters :- 83873 hours
- All the combustion parts have done two service during first CI and HGPI . Later No CI was done
- The removed Liner and Transition piece were scrapped after the MI as it reached the service life

Combustion Can Cover



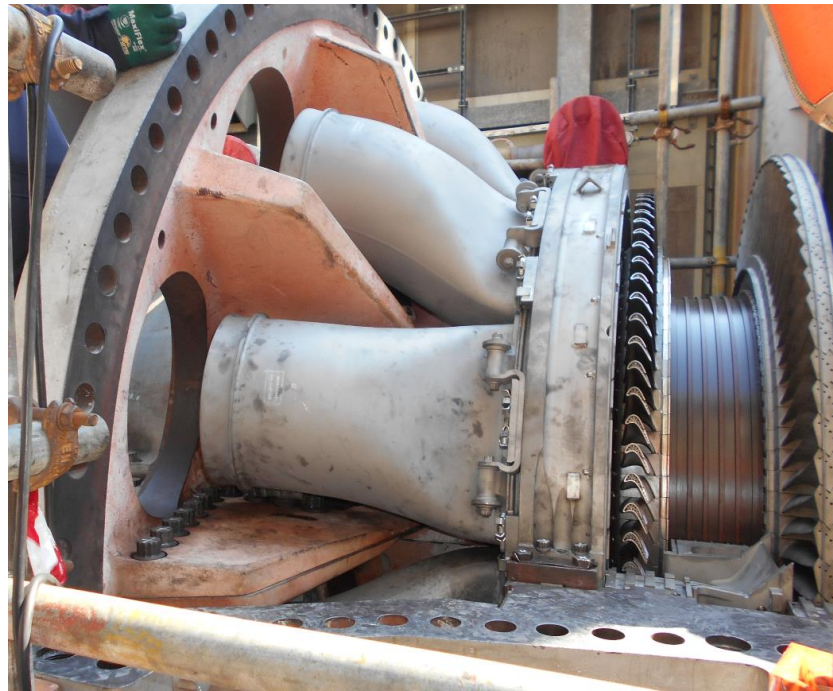
Fuel Nozzle



Combustion outer casing



Transition Piece



Combustion Liner



Cross Fire Tube



1st Stage Turbine Blades



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