

## ES3003 RB211-DLE (Dry Low Emissions) conversion

Reduce nitrous oxide and carbon monoxide emissions



### Engineered solution purpose

To meet the emissions standards without the need for water injection

### Applicability

All RB211-24C and RB211-24G engines

### Technical description

This engineered solution reduces emissions through advanced lean-burn combustion technology. Fuel is supplied by the following 3 manifold systems:

**Torch** [for starting]

**Primary** [for part load operation]

**Secondary** [in conjunction with primary for full load operation].

DLE is only available for gas fueled applications. The conversion replaces the existing 04 module combustor assembly with 9 radial combustors, fuel valves and associated piping. This upgrade requires higher fuel gas supply pressure and temperature than a non-DLE engine. Other package modifications will be required.

A site survey and engineering study will be required to fully define the extent of the necessary upgrades. As part of the engineering study, a fuel gas composition and analysis will need to be undertaken.



The DLE conversion process will result in an approximate 4% power reduction. It may be possible to recover this power loss with a power turbine upgrade (ES4005) or (ES4013) and/or inlet cooling in high ambient environments [ES6004]. This can be determined by the engineering study.

### Benefits

Expected emission levels of 25 vppm NO<sub>x</sub> and 25 vppm CO at 15% O<sub>2</sub>, at base load. Expected emissions levels may vary depending on percent Load conditions and Power Turbine model used.

### Experience

There are in excess of 80 units with over 1.5 million hours of operation in both onshore and offshore applications.

A partial list of customers includes:

TCPL - 6 units

PG&E - 3 units

British Gas - 1 unit

## Fact sheet

### Scope of work

Upgrade HP turbine to Mod 1212  
[ES3001]

Replace existing annular combustion system with 9 radially mounted DLE combustors and associated manifolds

Install 17 T6 thermocouples, Mod 1221 [ES3013]

Install HP6 bleed, Mod 1514 [if required] [ES3015]

Install fuel valves

Install instrumentation

Add gas chromatograph

Control system modification or replacement

Fuel gas treatment and pressure boosting may be required

### Bill of materials

9 radially mounted DLE combustors and associated manifolds  
[For -24C to DLE, Mod 1227, 1234, 1272 or 1273  
For -24G to DLE, Mod 1369]

17 T6 thermocouples, Mod 1221 [ES3013]

HP6 bleed, Mod 1514 [if required] [ES3015]

Fuel valves

Required instrumentation

Gas chromatograph

Control system modification or replacement

Fuel gas treatment and pressure boosting as required

### Undertaken

At overhaul

### Bundling opportunities

Controls upgrade [ES6006]

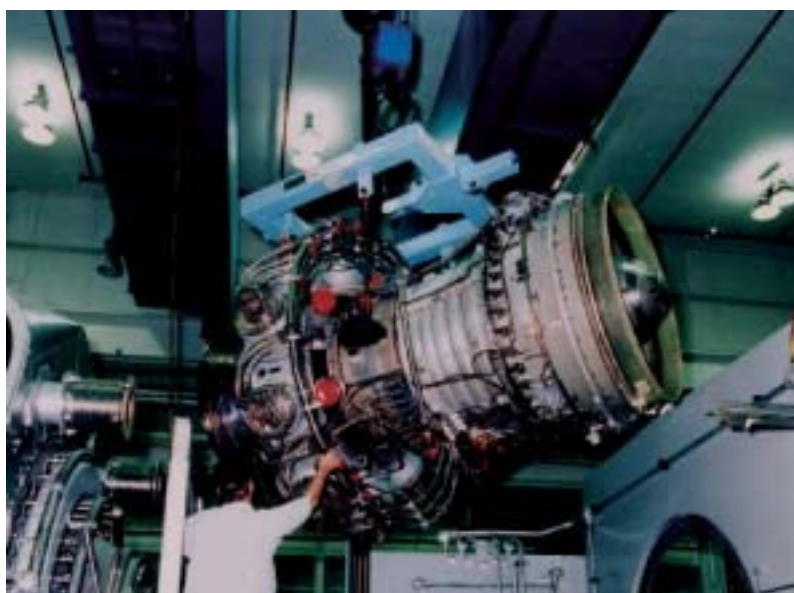
RB211-24C to 24G upgrade [ES3001]

RT56 to RT62 upgrade [ES4005]

RT62/RT56 RB211-24G rating upgrade [ES4013]



The first RB211 to be converted to DLE operates at this compressor station in the United Kingdom



The DLE variant of the RB211 entered service in 1994



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