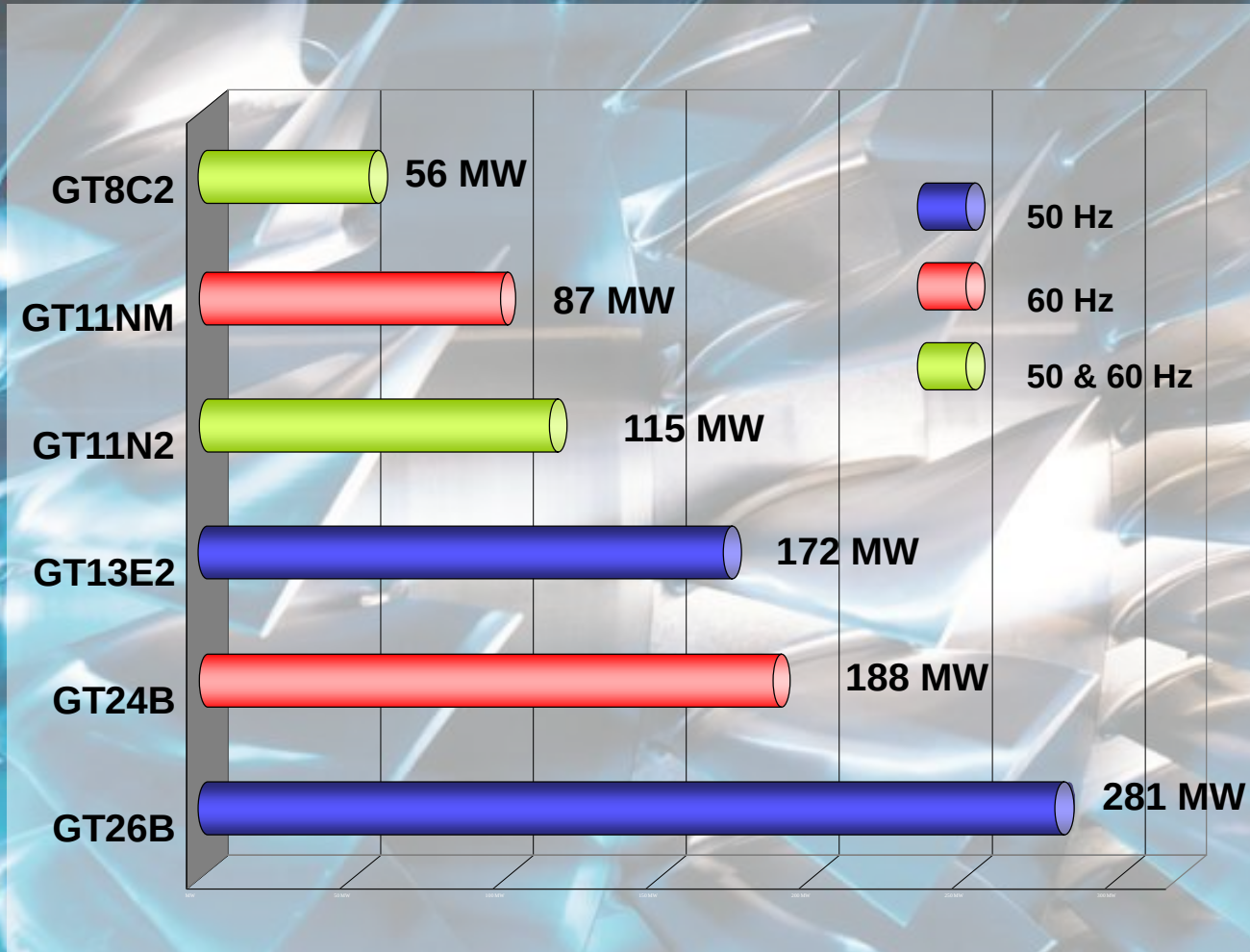


ALSTOM Heavy Duty Gas Turbines

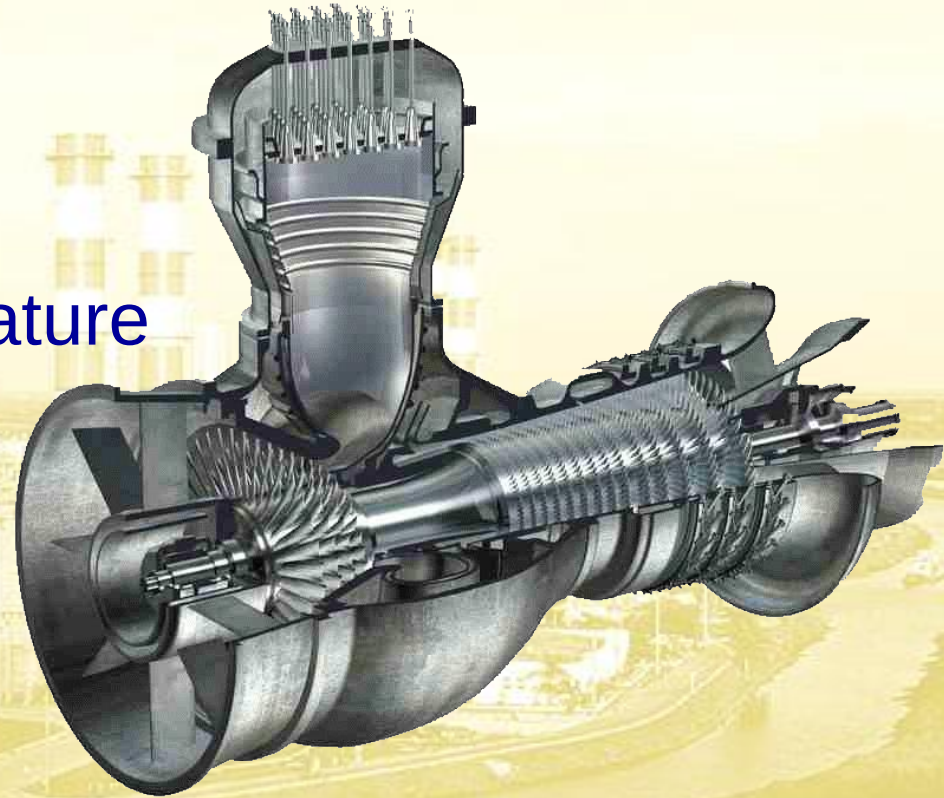


ISO conditions / at generator terminal

GT11N2

Key Features - Simplicity

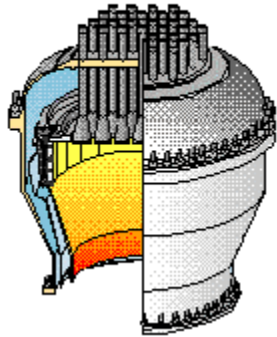
- Large silo combustor
 - Simple maintenance
 - reduced outage time
- Moderate firing temperature
 - Longer parts life
- All turbine airfoils conventional cast
 - Lower parts cost



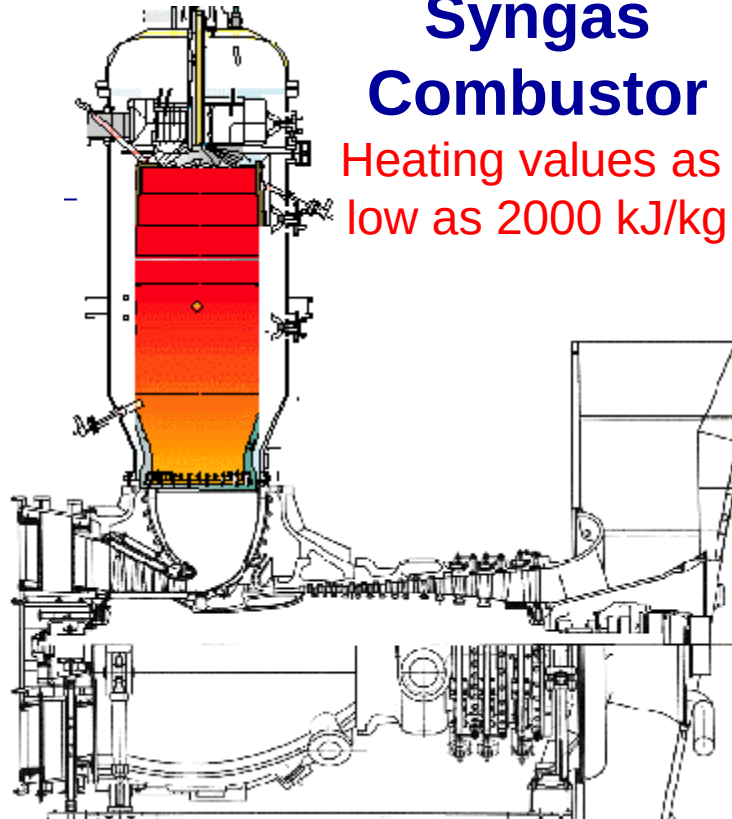
A simple, robust workhorse

GT11N2

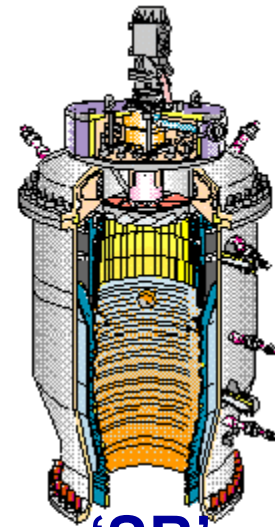
Key Features - Choice Of Combustors



'EV'
**Dry Low NOx
Combustor**
< 25 ppm NOx dry



**Low Btu
Syngas
Combustor**
Heating values as
low as 2000 kJ/kg



'SB'
**Single Burner
Combustor**

Oil dry operation
Massive power augmentation

**Three combustors:
A perfect match for whatever your application may be**

GT11N2 Performance Data

Simple Cycle Applications

Configuration:	ISO conditions, 100% CH ₄ fuel	EV 60Hz	EV 50Hz	SB 60Hz
• Output (gross)	MW	115.4	113.6	129.3 **
• Efficiency (gross)	%	33.6	33.1	31.7 **
• Heat rate (gross)	Btu/kWh LHV	10,150	10,305	10,772
	kJ/kWh LHV	10,708	10,872	11,365
• Exhaust mass flow	kg/s / klbs/hr	399 / 3,171	399 / 3,171	415 / 3,302
• Exhaust gas temp.	°C / F	531 / 988	531 / 988	522 / 971
• NOx emissions			* = with water injection for NOx control	** = performance at water/fuel ratio of 1.85
- Natural Gas	vppm at 15% O ₂ dry	25	25	25 *
- #2 Fuel Oil		42 *	42 *	42 *

**Larger frame size =
same plant output with less units = lower cost**

GT11N2 Performance Data

Simple Cycle Applications

Configuration:	ISO conditions, 100% CH ₄ fuel	EV 60Hz	EV 50Hz	SB 60Hz
• Output (gross)	MW	115.4	113.6	129.3 **
• Efficiency (gross)	%	33.6	33.1	31.7 **
• Exhaust mass flow	kg/s	399	399	415
• Exhaust gas temp.	°C / F	531	531	522
• NOx emissions			* = with water injection for NOx control	** = performance at water/fuel ratio of 1.85
— Natural Gas	vppm at 15% O ₂ dry	25	25	25 *
— #2 Fuel Oil		42 *	42 *	65 *

**Larger frame size -
less units for given plant size = lower overall cost**

GT11N2 Performance Data

Combined Cycle Applications

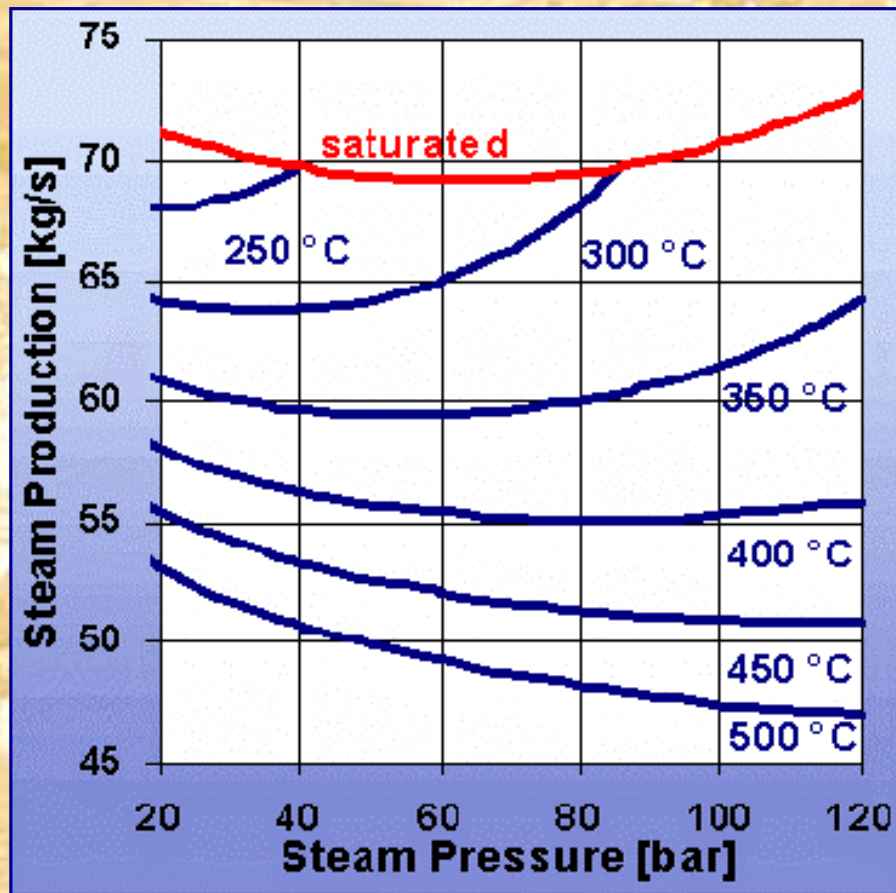
Cycle Type		2 pressure non-reheat	2 pressure non-reheat
'Typical' EV configuration, 15°C / 60% rh, 1013 mbar, 100% CH ₄ fuel, 45mbar condenser pressure			
Plant Type	GT x ST	2 x 1	2 x 1
• Grid Frequency	Hz	60	50
• Pressure Levels	HP, bar	71.3	71.3
	LP, bar	6.2	6.2
• Output (net)	MW	348.4	345.0
• Efficiency (net LHV)	%	51.3	50.8
• Heat rate (net LHV)	Btu/kWh	6,651	6,717
	kJ/kWh	7,018	7,087

Flexible solutions for power generation, co-generation, and phased construction

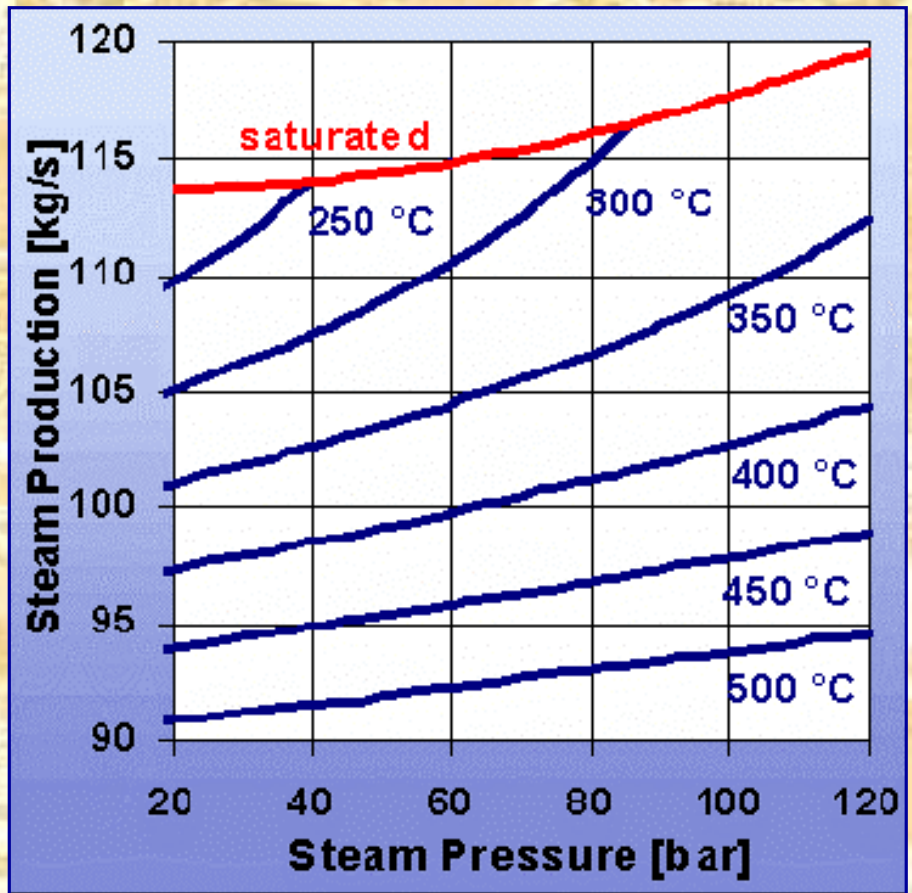
GT11N2 Performance Data

Steam Production

Unfired HRSG

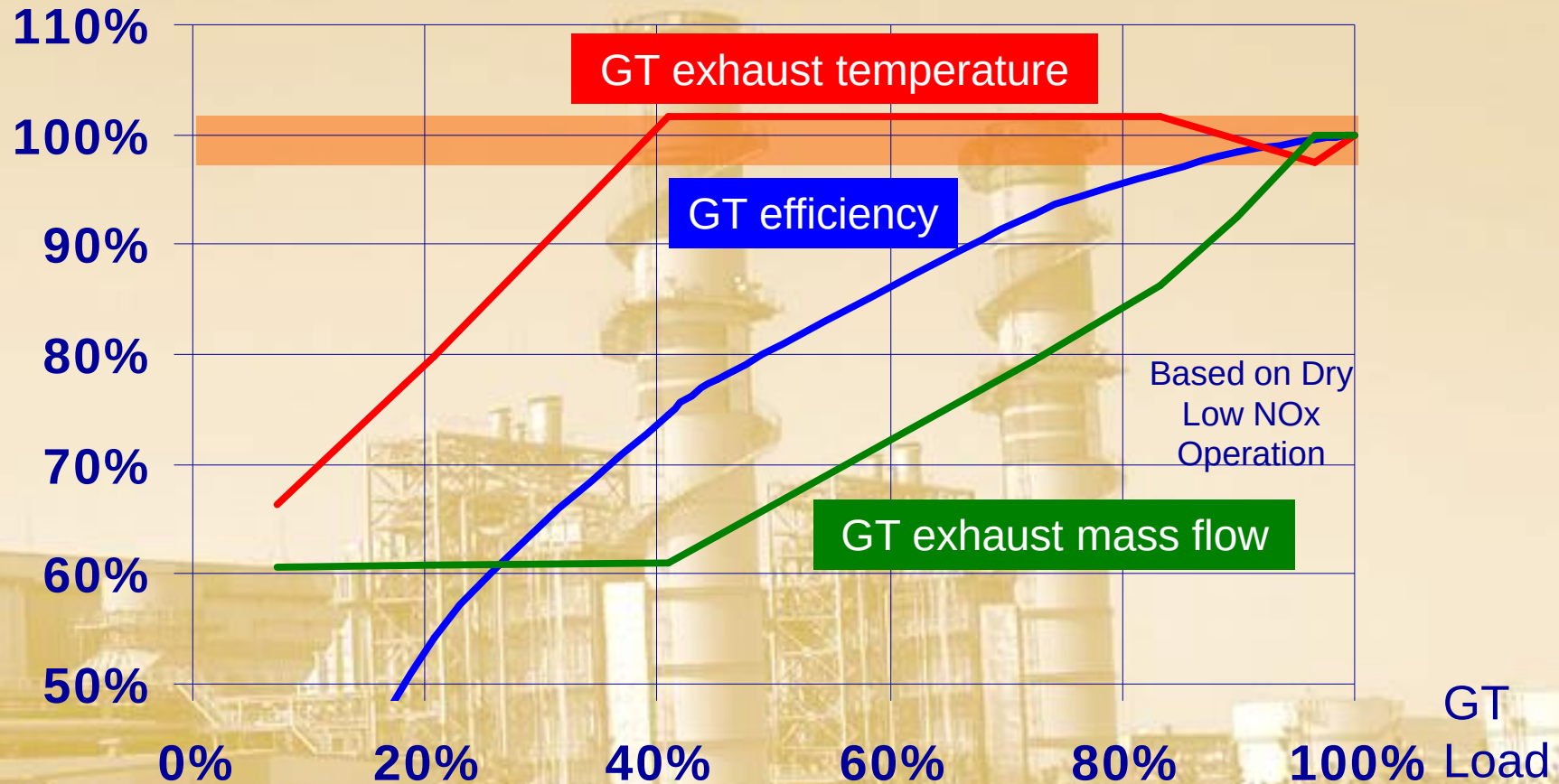


HRSG fired to 750°C



GT11N2 Performance Data

Part Load Characteristics

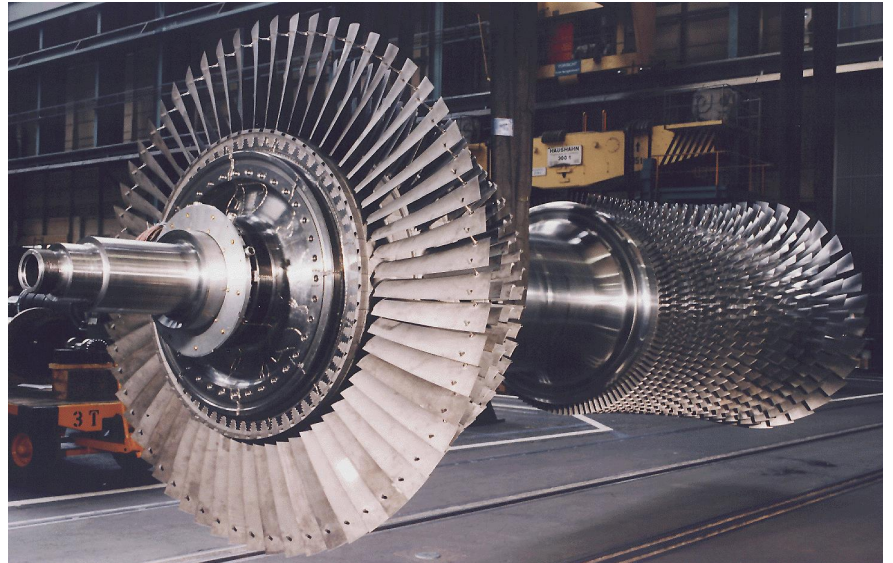
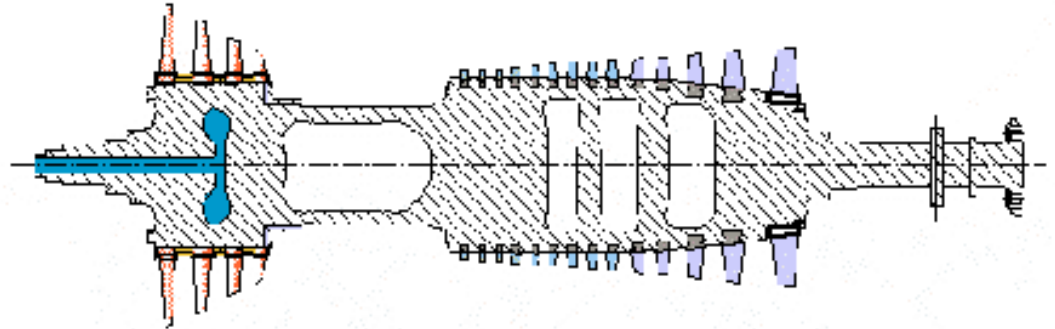


**Stable exhaust temperature across wide load band ⇒
A perfect fit for co-generation or industrial applications**

GT11N2

Technology - Rotor

- Monolithic, welded design
- Maintenance free
 - No disk re-stacking
 - No major overhauls
- No stress, corrosion, or disk misalignment from through bolts



**No major overhauls:
Increased availability and reduced maintenance**

GT11N2

Technology - Compressor

- Advanced 14 stage compressor, shared with ALSTOM GT24
- Variable Inlet Guide Vanes (3 rows)
 - high starting reliability
 - 40% air flow turndown capability
- Robust materials suitable for harsh site conditions, e.g.:
 - Airfoil stages 1-7 from corrosion resistant 16% chrome alloy
 - Precipitation hardened surfaces

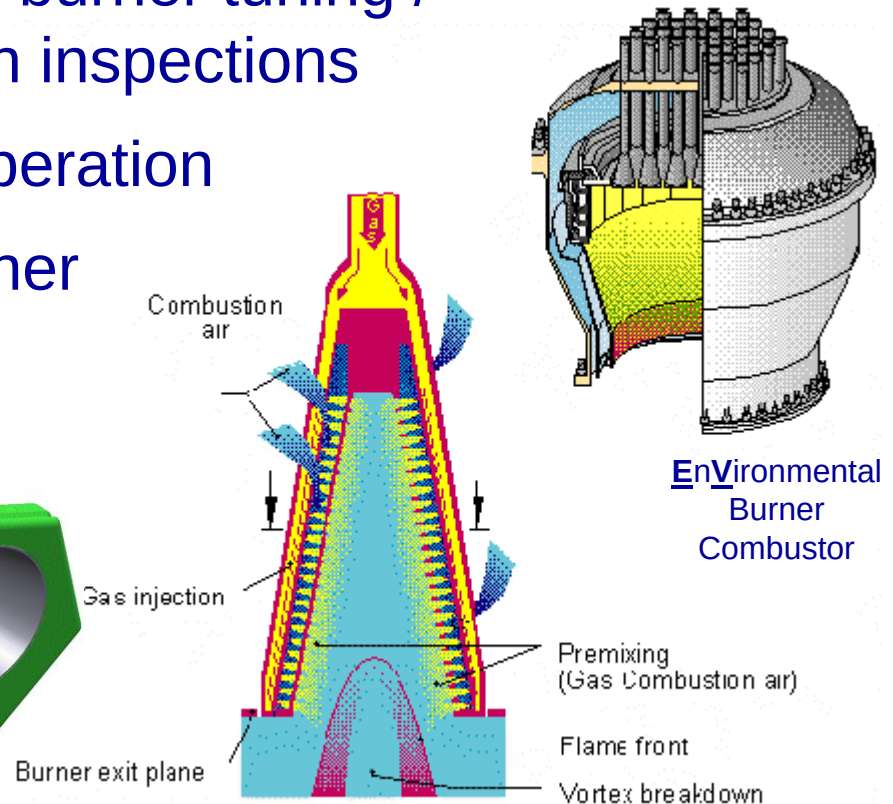
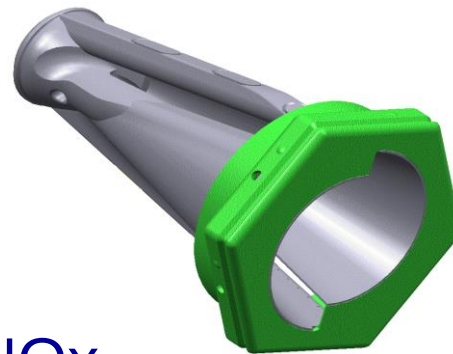


**ALSTOM 'family design' compressor
proven in over 95 gas turbines**

GT11N2

Technology - EV Combustor System

- Fixed geometry eliminates burner tuning / replacement at combustion inspections
- Unrestricted distillate oil operation
- 34 burners with single burner control for low part load emissions
- 25 / 42ppm NO_x
(Natural gas/ #2 Diesel oil)



EnVironmental
Burner
Combustor

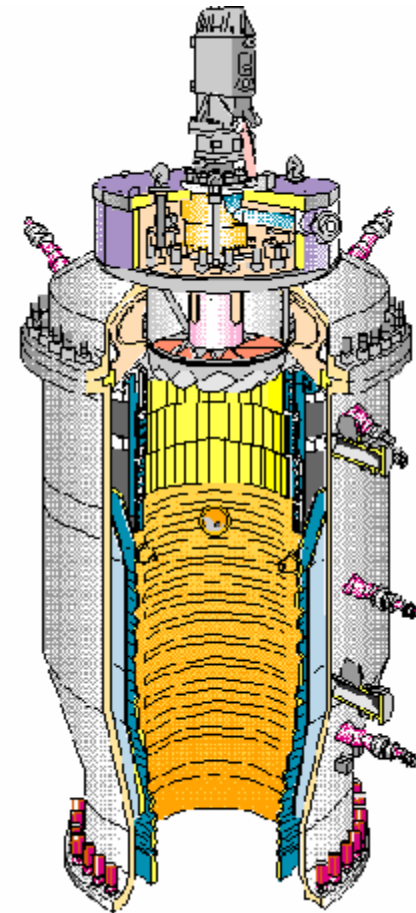
**EV Technology -
the cost effective way to low emissions**

GT11N2

Technology - SB Combustor System

- Cost effective for oil-only or predominantly oil operation.
- Oil-dry capability (at elevated NO_x)
- Substantial power augmentation for peaking applications
 - Fuel/water ratio of up to 2.2* or 22 kg/s
- Low emissions
 - 25 / 42 ppm NO_x (Natural gas / #2 Diesel oil)

* = Reference LHV = 42'000 kJ/kg

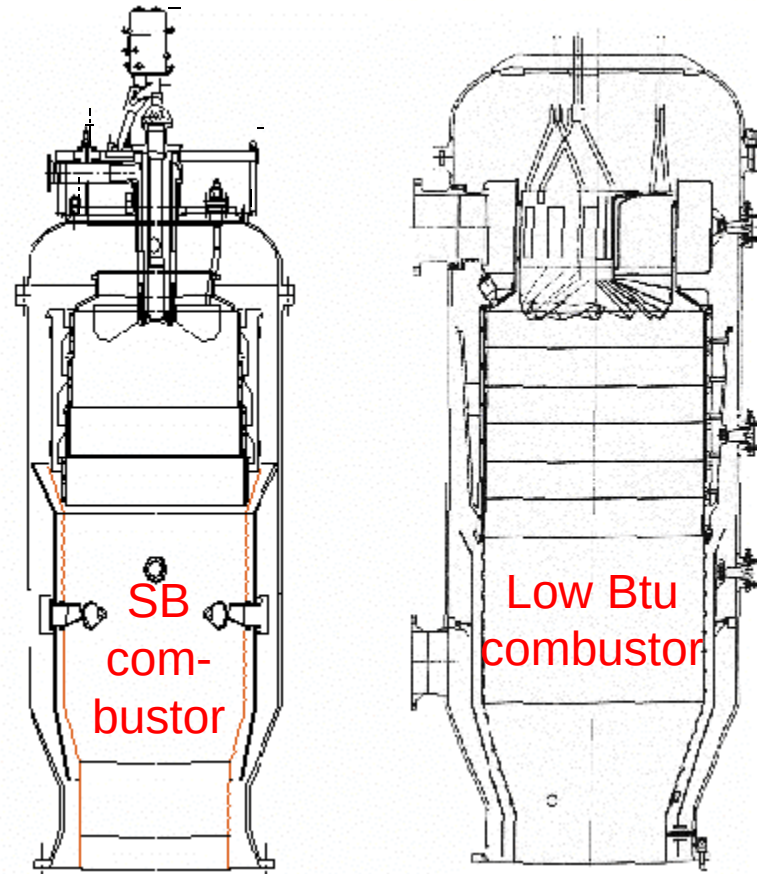


GT11N2 SB:
Up to 140 MW of low specific cost peaking power

GT11N2

Technology - LBtu Combustor System

- Increased combustor volume secures complete combustion of Low Btu fuels
- Fuel LHV as low as 2,000 to 4000 kJ/kg
- Stable combustion down to 30% load without secondary fuel
- Single digit NO_x demonstrated (full load operation)

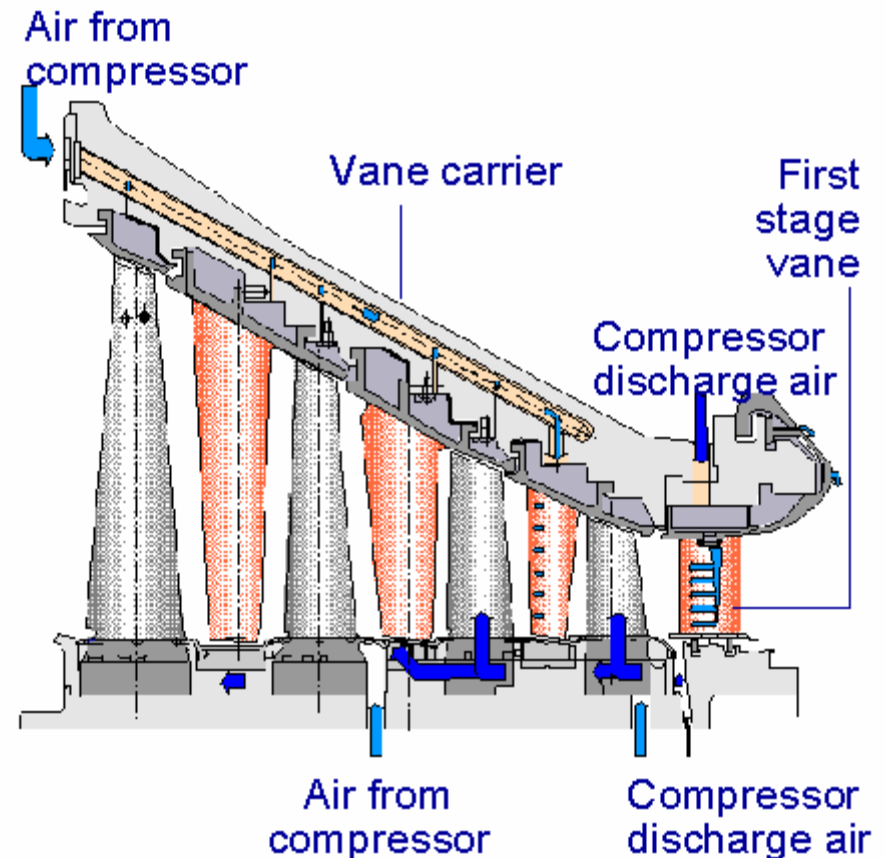


GT11N2 LBtu: Converting low value fuels to electricity with up to 47% efficiency

GT11N2

Technology - 4 Stage Turbine

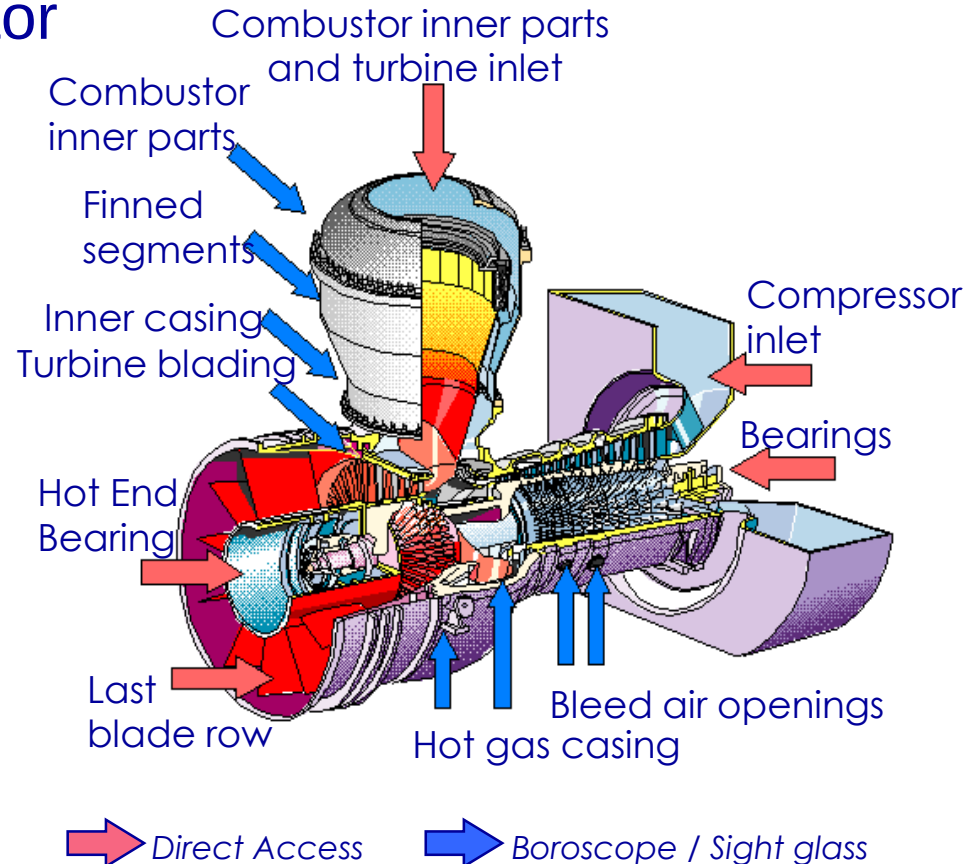
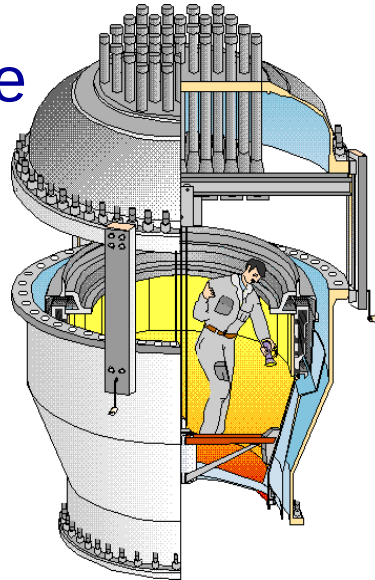
- High efficiency three pressure cooling system
- All INCONEL 738 airfoils:
 - Increased parts life
 - Competitive parts cost
 - Fully refurbishable - low fallout



GT11N2

Technology - Inspections

- Direct inspection of combustor and 1st turbine stage:
 - convenient access
 - thorough inspection
- Comprehensive set of boroscope access points

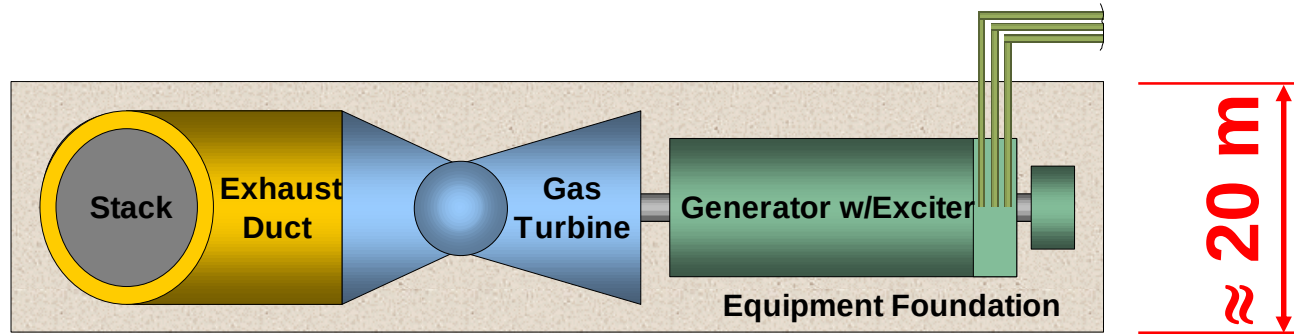


Improved access - short inspection duration

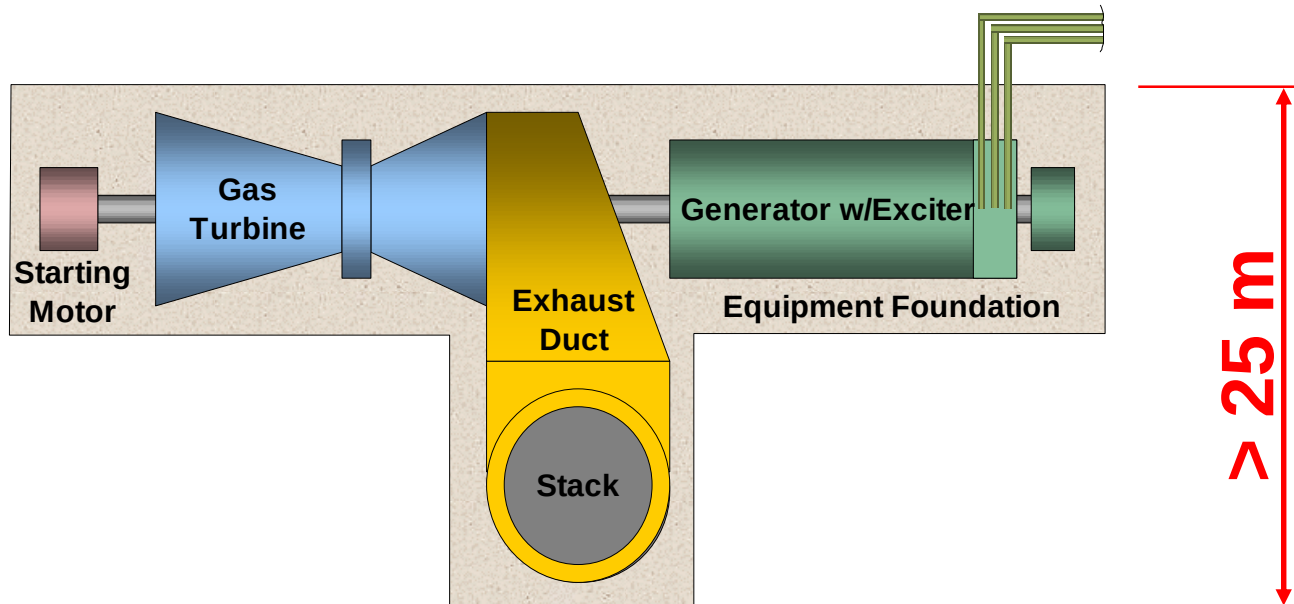
GT11N2 Configuration & Scope:

GT Footprint

GT11N2



**Hot End
Drive
GT**



**GT11N2 with cold end generator drive:
Compact footprint, effective multi-unit arrangement**