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Halmstad Power Plant



2022-11-29
Stefan Kristiansson

Halmstad Power Plant

History

1971 Start of construction G11

1991 Start of construction G12

1995-2000 G11 Mothballed



Total 263MW electricity
Fuel capacity (Diesel oil) max 30.000m³

G11

Asea Stal GT120c

First Synchronization 1973 (Hanna)
Max power output 78MW
3 shafts

Power upgrade 1990
- Waterinjection
- Optimizing of turbines
- Major overhaul 2014

Consumption app. 27 m³/h



G12

Siemens SGT5-2000E (V9.1)

First Synchronization 1993 (Felicia)
Max power output 185MW (200MW)
Singel shaft

Twin fuel oil systems

- Diffusion (water injection)
- Premix (DLN)
- Power upgrade 2020

Consumption app. 52 m3/h



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G12 FELICIA

CMF++ Upgrade and Si3D+ Verification Campaign G12,
SGT5-2000E, Halmstad, Sweden, 2020

Milestones



2014 Major Overhaul. Life time limited for IC and Turbine blades stage 1

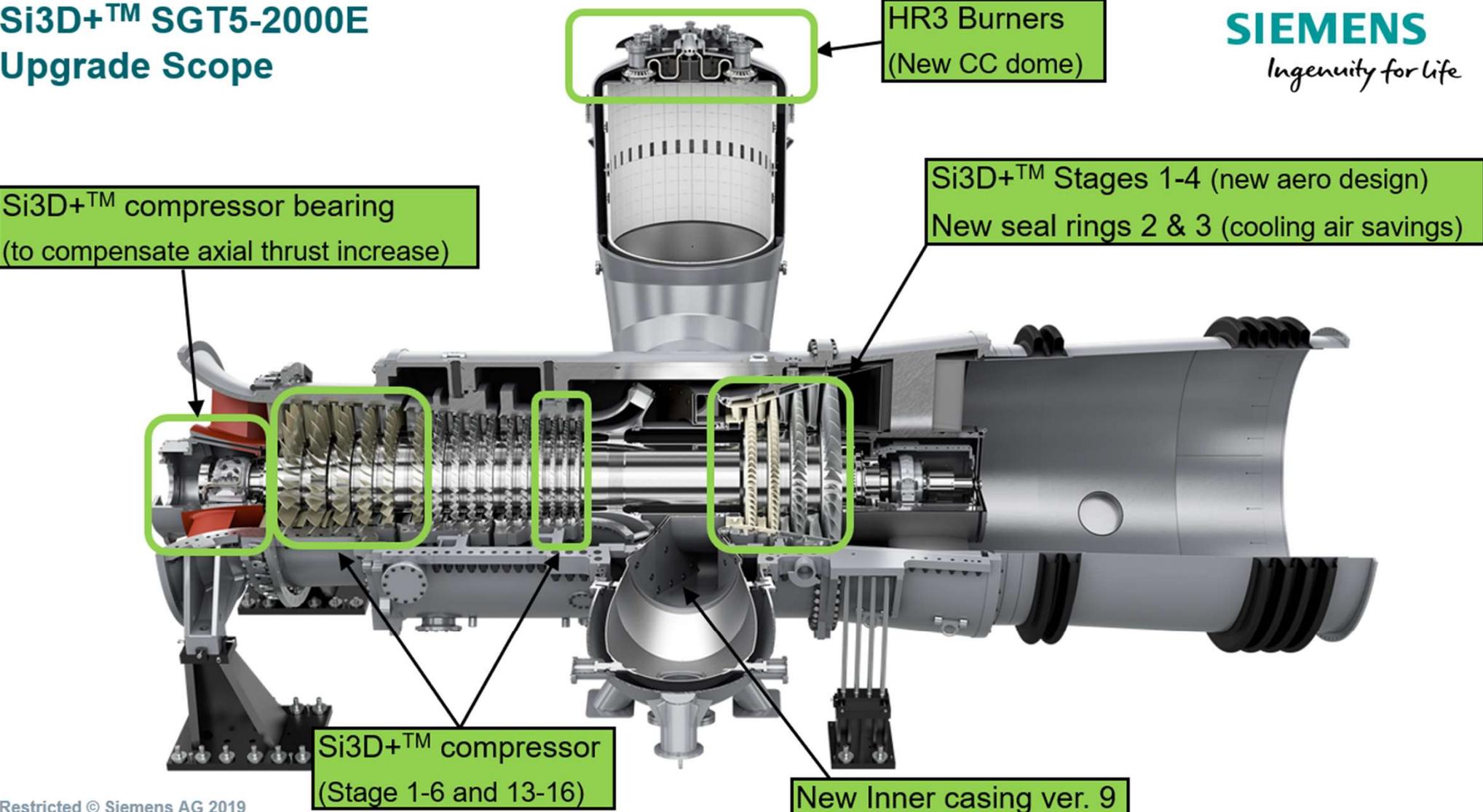
2015 Initial discussion with Siemens regarding the way forward

2016 Quotation from Siemens

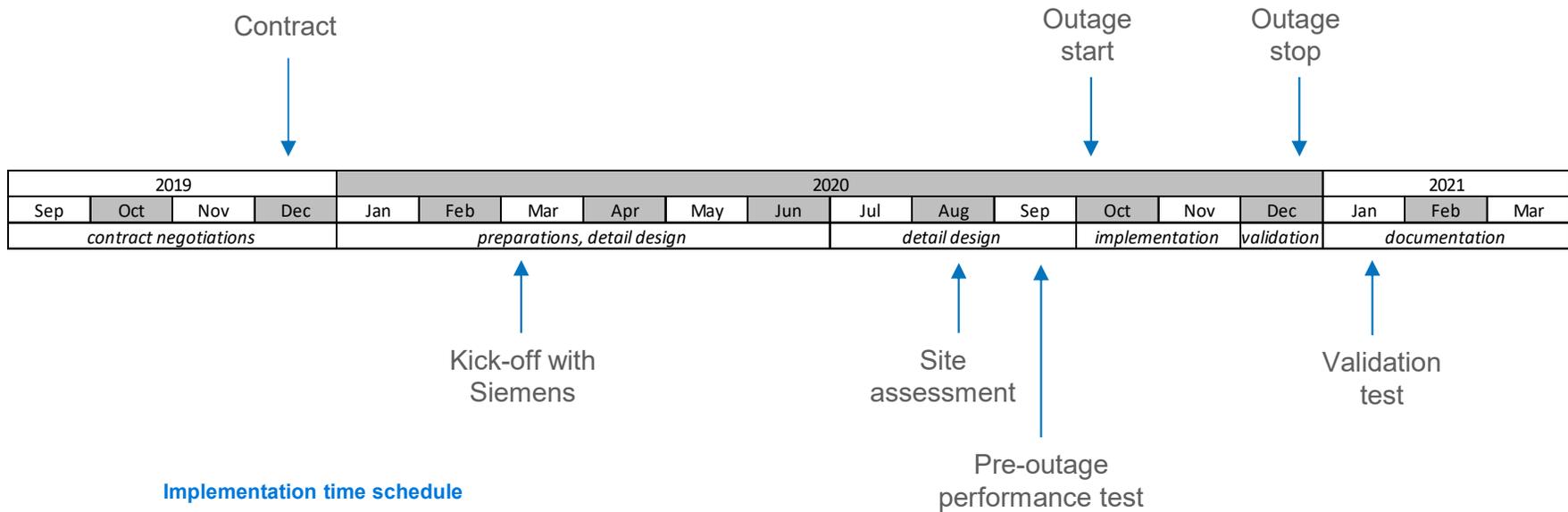
2019 February Offer from Siemens for a lead engine scope

2019 December Contract signing

Si3D+™ SGT5-2000E Upgrade Scope



G12 upgrade time schedule



Implementation time schedule

- Implementation by Siemens in 70 (53) days
- Two-shift, Monday – Saturday

Challenges

- Late site assessment and no pre-inspections due to Covid-19
- Short implementation period
- Electrical and I&C detail design was late and done by Siemens in parallel to mechanical site implementation
- Small site with limited space

Project pictures



New parts

PMX burners HR3



Inner casing



Turbine (stage 1)



Combined Thrust and Compressor bearing



0,4 kV Switchgear



Generator protection



New Fuel oil skids

Old G12



Pressure sustaining station

High pressure hydraulic

New G12



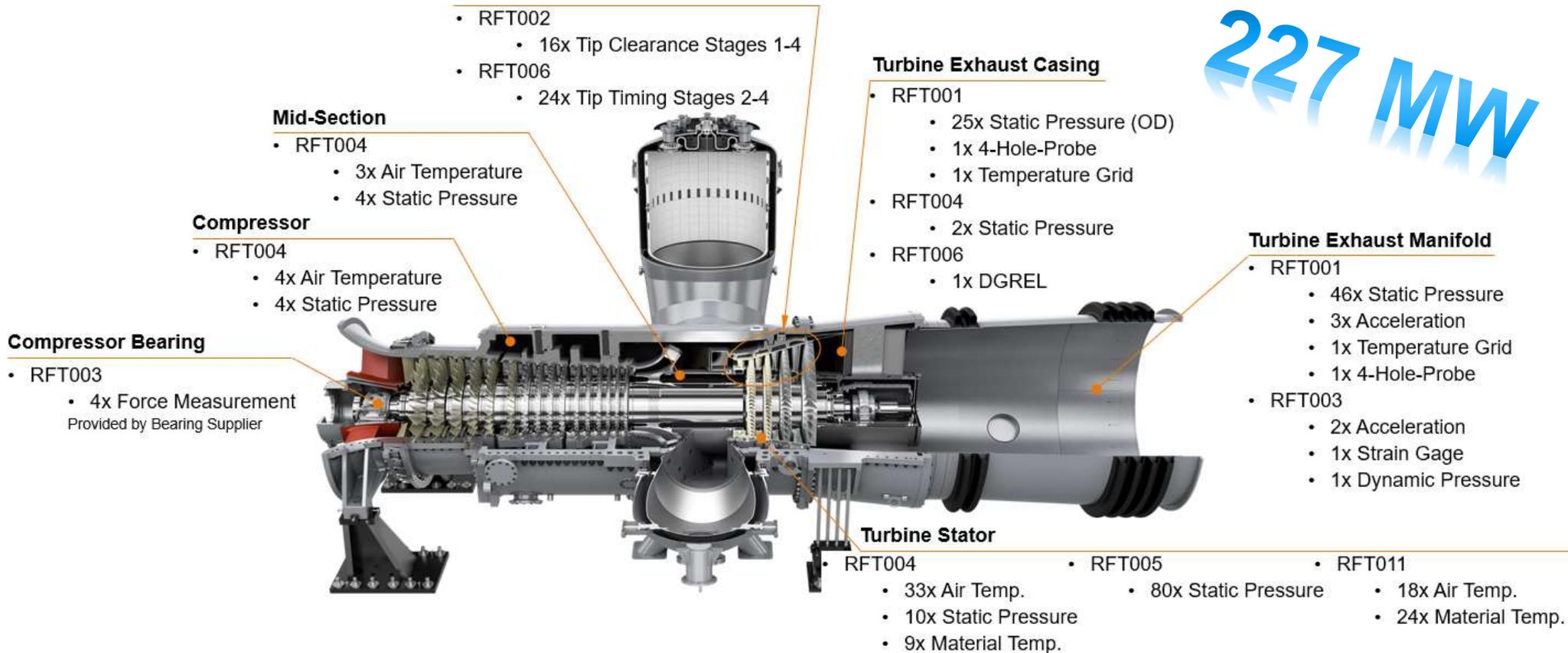
Fuel injection skid
(Incl. purge water)

Turbine validation test

14th January 2021

SIEMENS
Ingenuity for life

227 MW



Performance

Baseload Premix mode

V94.2/SGT5-2000E / Halmstad, GT12, Base Load, Fuel Oil Premix, dry operation		Measured Value ¹⁾	Corrected Value ²⁾	Reference Value (pre-outage)	Delta Value ³⁾	Guarantee	Delta vs. guarantee ³⁾
GT12 Gross Power Output	kW	186`648.5	195`382.7	154`561.1	40`821.6	37`500	+3`322
GT12 Gross Efficiency ⁴⁾	%	36.97	37.20	34.00	3.20%-pts.	2.75%-pts.	+0.45%-pts.

Contract

Power increase **37,5**MW
 Efficiency **+2,75** (expected no warranty)
 NOx emissions **<160**mg/Nm³
 Vibrations below **4,5**mm/s
 Noise level (together with G11) **40**dB(A)
 Start-up time to base load max **15** min

Result

Power increase **40,8**MW
 Efficiency **+3,2**
 NOx emissions **154**mg/Nm³
 Vibrations below **2,5**mm/s
 Noise level (together with G11) **38**dB(A)
 Start-up time to 200MW **13**min **30**sec (DFS 12min 40sec)

The lifetime extension reaches beyond 2035 (3000 starts). All major lifetime limited components replaced including major BoP parts and auxiliaries.

