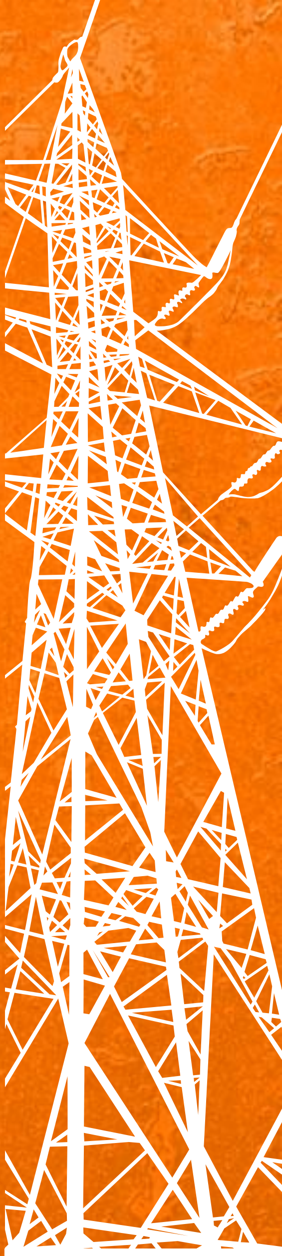
IRP 2010 Draft 2, Public Hearings

November 2010



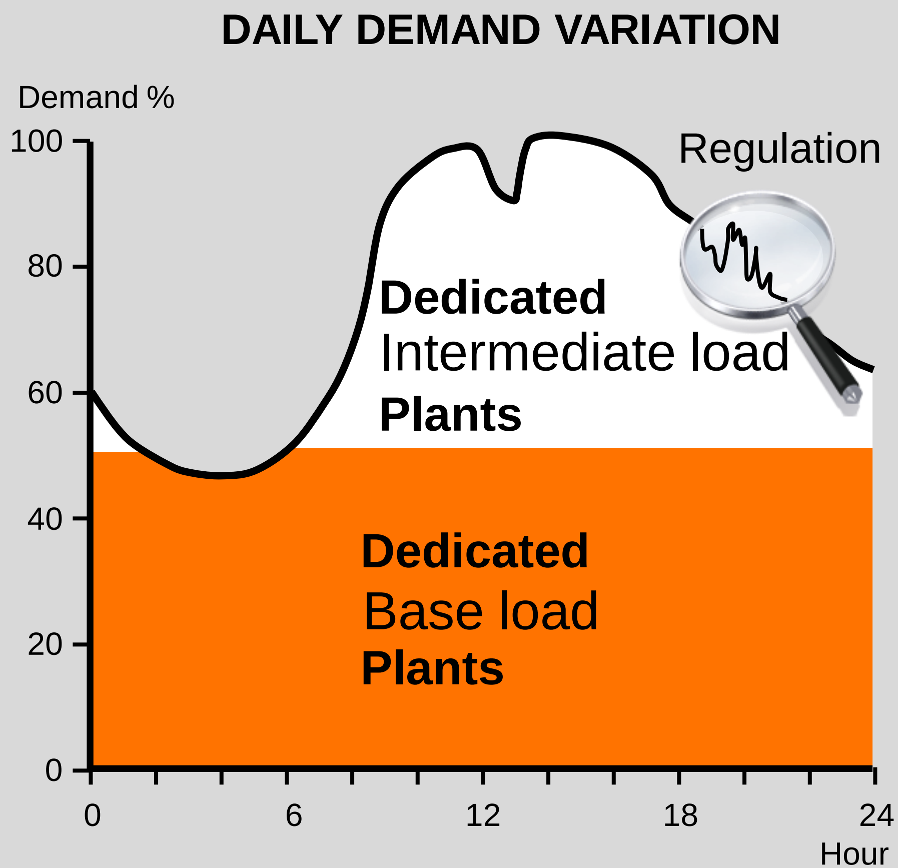
Change happens – Stay in control

Arnaud Gouet

General Manager , Power Plants Southern Africa

Why is flexibility so important for the system?

- Intermediate load
  - Normal daily load variations due to consumer needs
  - Increase of wind and solar power introduce uncertainty which leads to sudden, large load variations
- Good intermediate plant
  - Fast start & stop, and restart
  - High efficiency: part load and high load
  - Good performance in hot and cold conditions – demand peaks take place at extreme temperatures
  - Competitive in BASELOAD



WÄRTSILÄ

Wartsila in the USA

1000 MW of gas fired Wärtsilä power plants in the USA

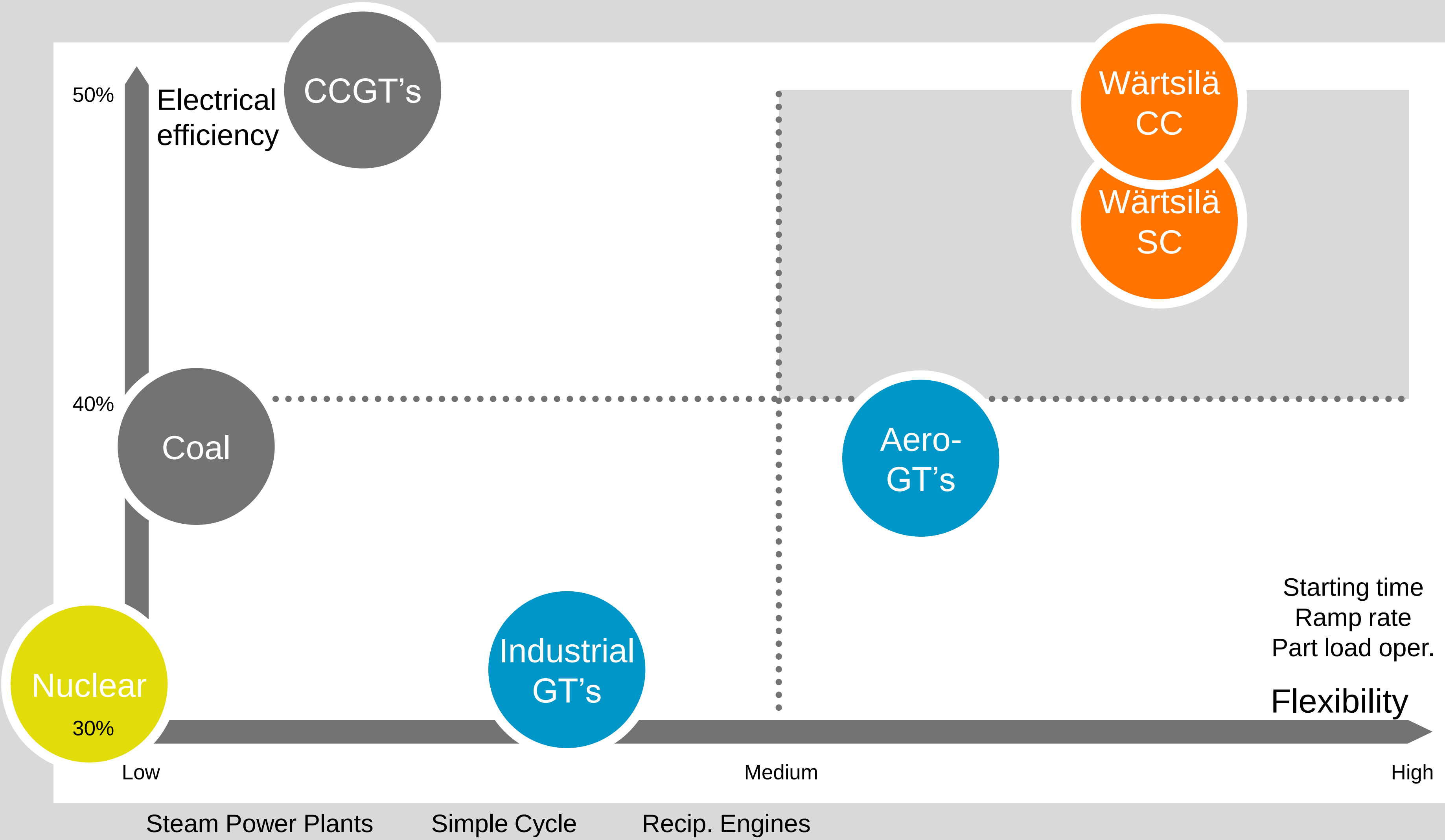
- Plant size range 50…200 MW
- Location in regional load centers
- Operation mode: Multitasking!
  - First to start when wind calms down
  - Base load on high tariff hours
  - Peaking in the morning and evening

Plains End, Colorado, USA

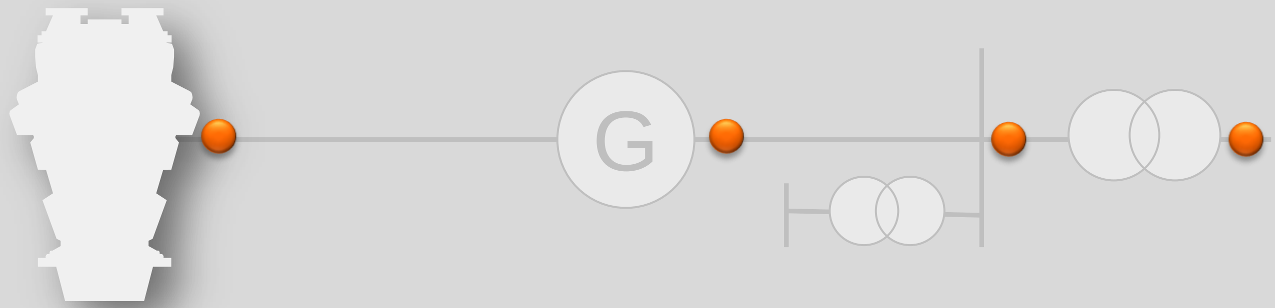
- Natural Gas, 113 MW, Intermediate/Peaking Plant based on spark ignition genset technology
- Located in Denver, Colorado area at 1875 Masl with performance guarantees based on ambient air temperature of 37 deg cel and the site elevation : 44 % efficeincy
- Has 20 X 18V34SG Gensets
- Commercial since May, 2002
- Provides superior ancillary services and other benefits
- No water Usage

18x 18V50DF, 300 MW Dual Fuel Power Plant Sangachal, Azeirbadjan

Operational flexibility vs. Energy efficiency



16x18V50SG SC and CC plant efficiency



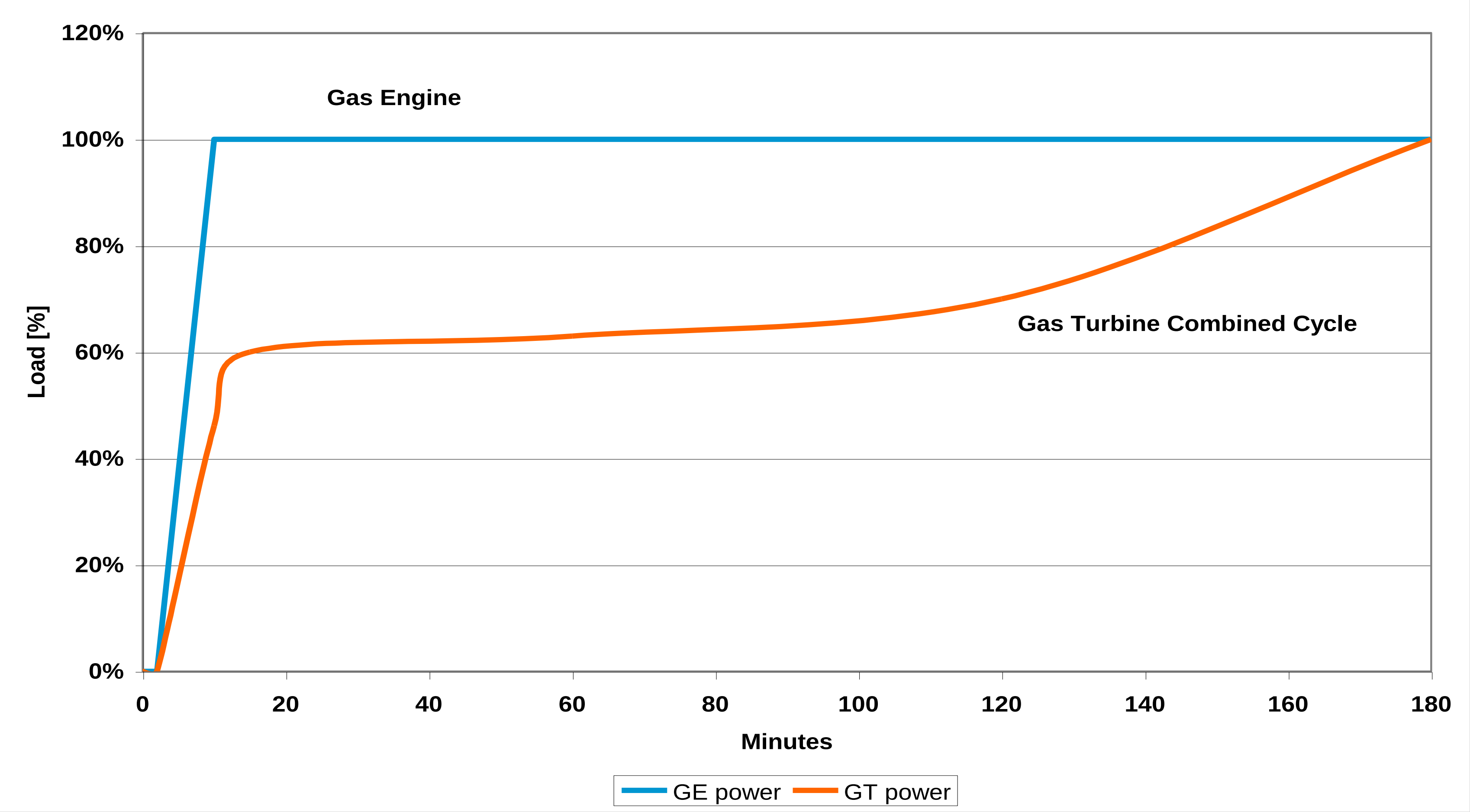
	Engine shaft 5% tolerance	Generator terminals 5% tolerance	Generator terminals 0% tolerance	Plant busbar MV-Side 0% tolerance - Aux cons.	Plant interconnect HV-Side 0% tolerance - Step up loss	
SCGE 0-40°C Air <200 masl MN >90	49,9% 7214 kJ/kWh	48,6% 7407 kJ/kWh pf = 0.8	46,2 % 7781 kJ/kWh pf = 0.8	46,1 % 7815 kJ/kWh Pf = 0.95	45,8 % 7854m kJ/kWh pf = 1.0	Simple Cycle Dry (Radiator cooled)

	Plant busbar MV-Side	Plant interconnect HV-Side	
CCGE 315MW 25°C Air <200 masl MN>90 RH 30%	50,2 % 7171 kJ/kWh Pf = 0.95	50.0 % 7200 kJ/kWh pf = 1.0	Combi Cycle Dry (Engines) Cooling tower (CC)

Typical values for 16x18V50SG with one pressure combined cycle plant solution with 15 bar/340°C steam
Engines with low noise radiator cooling (dry). CC with cooling tower.
Guarantee values are dependant on actual plant location, configuration and selected plant equipment

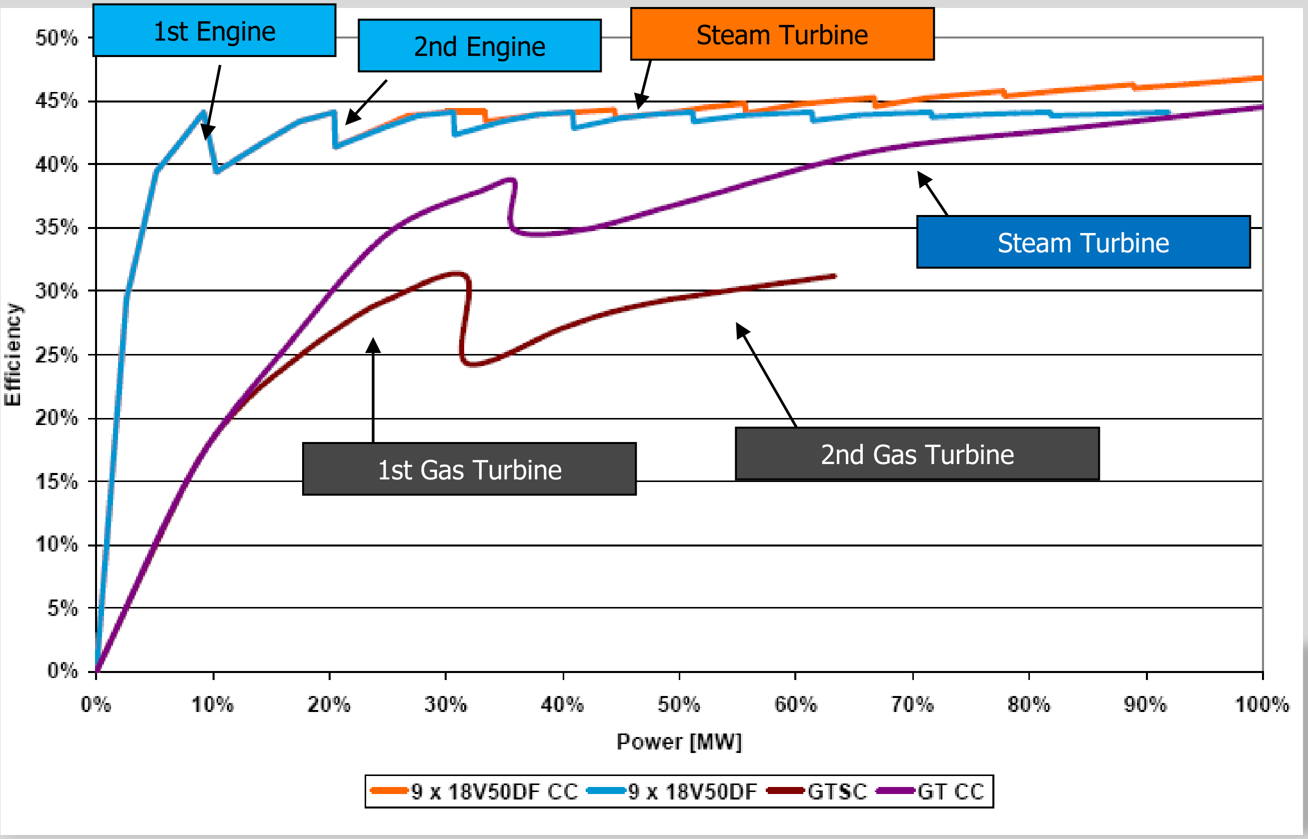
Start up and loading of a Gas Engine power plant compared to a GTCC

Only 10 minutes from start command to full load



Partial Load Performance

Comparing the Efficiency of Simple Cycle and Combined Cycles for Reciprocating Engines and CCGT

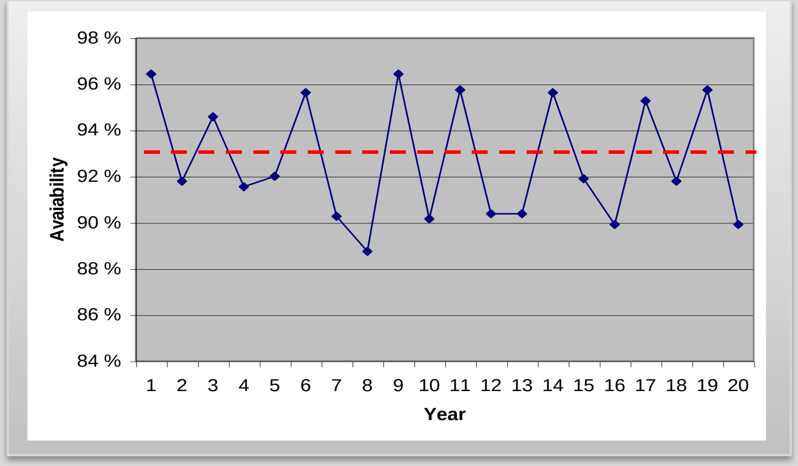


- **The multi unit engine power plant has very high part load efficiency.**

Reliability & Availability of Reciprocating Engines

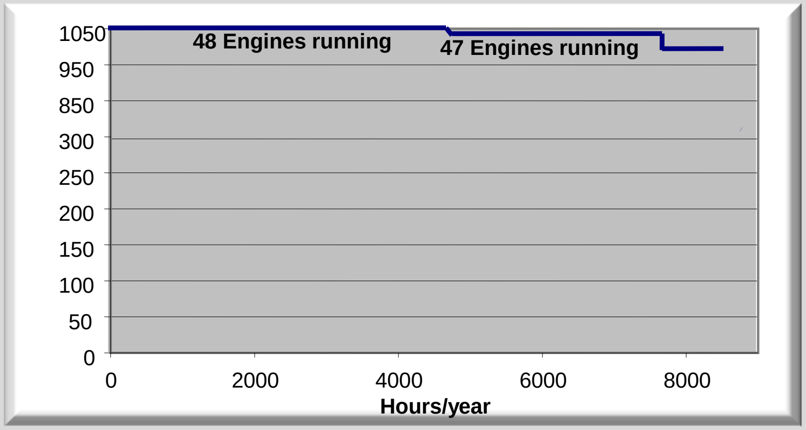
As the Wärtsilä power plant consists of 3 power plants with each 16 Gas/HFO engines, it is unlikely that its available output will go below 1000 MW.

Wärtsilä single gas engine availability over 20 years life



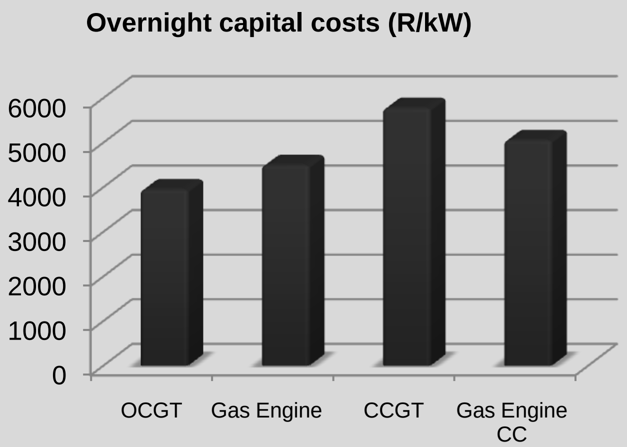
The red dashed line show the levelized 20-year average availability of 93 %.

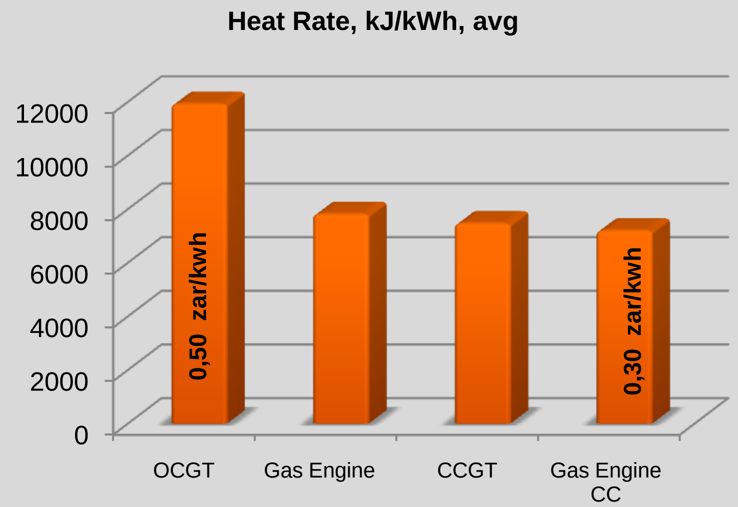
Wärtsilä Power Plant anticipated power production capability

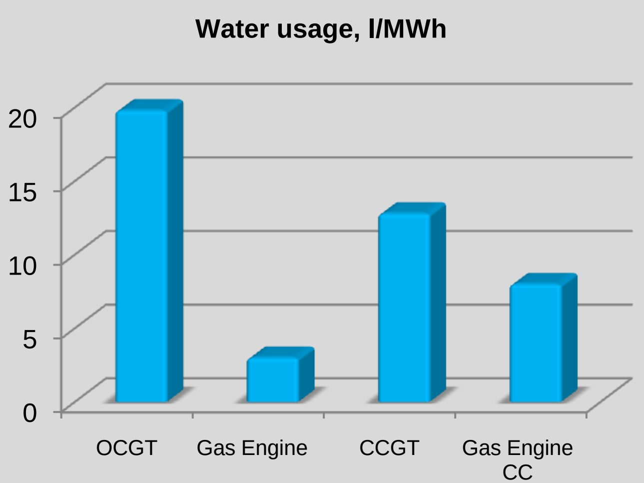


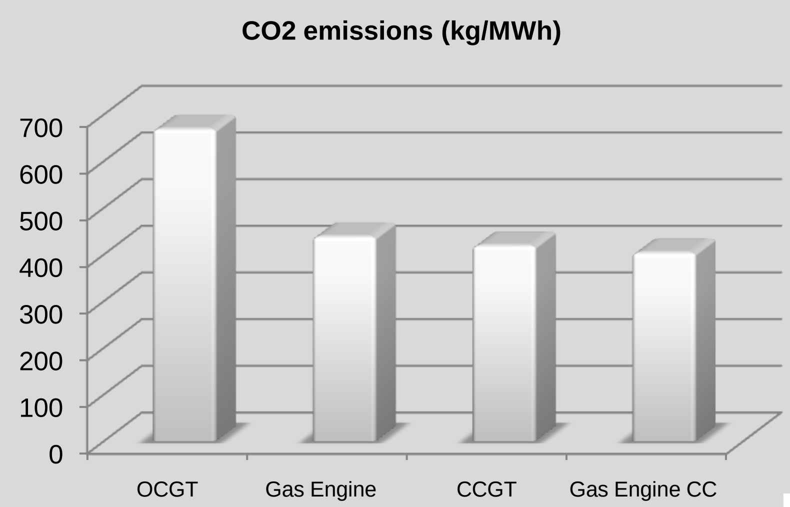
The available output of the Wärtsilä power plant is above 1030 MW during 7,500 h/a. Based on the above the overall plant availability will be appr. 95 %

Why Should Engines be added as an alternative to GTs

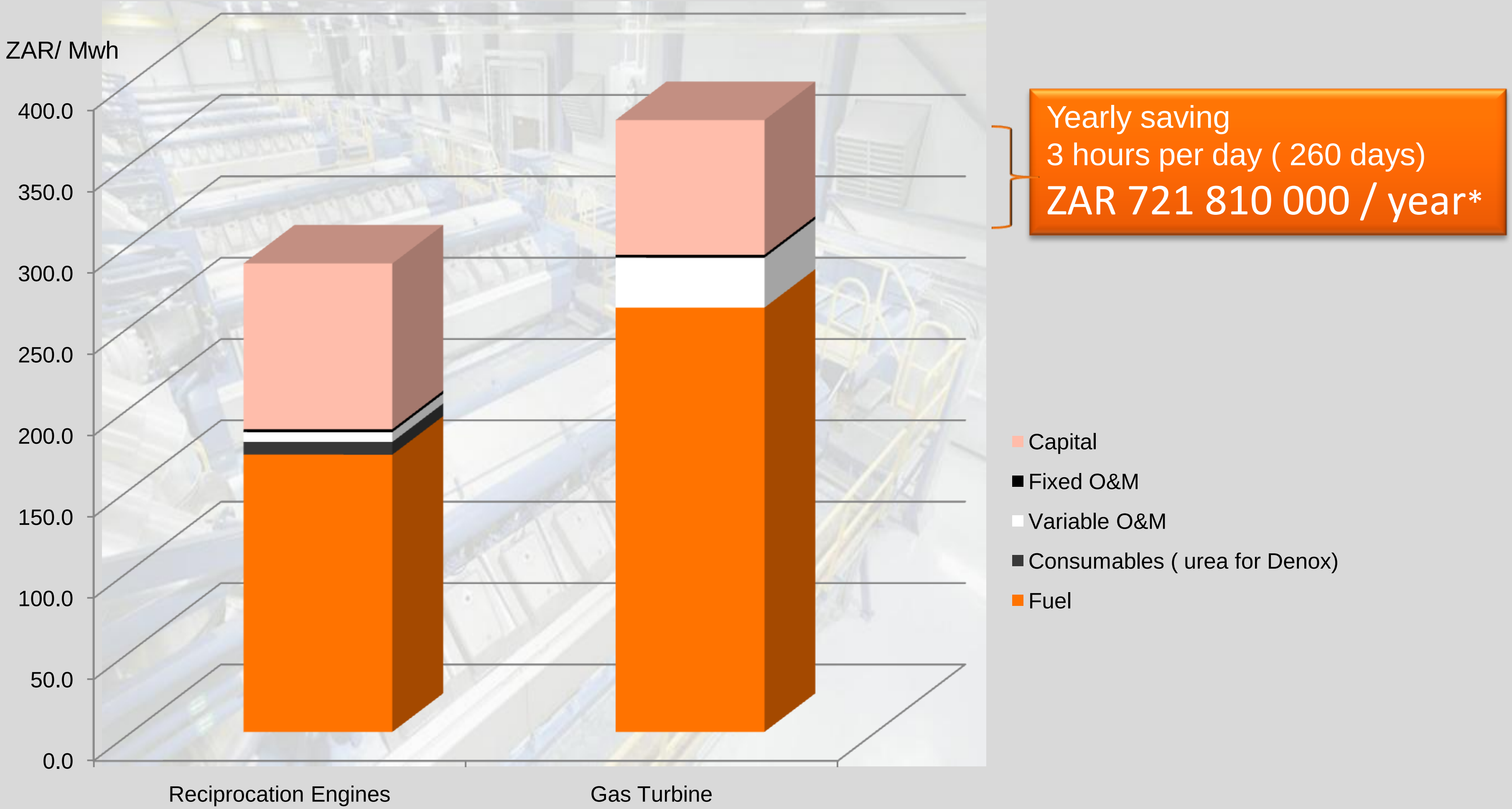






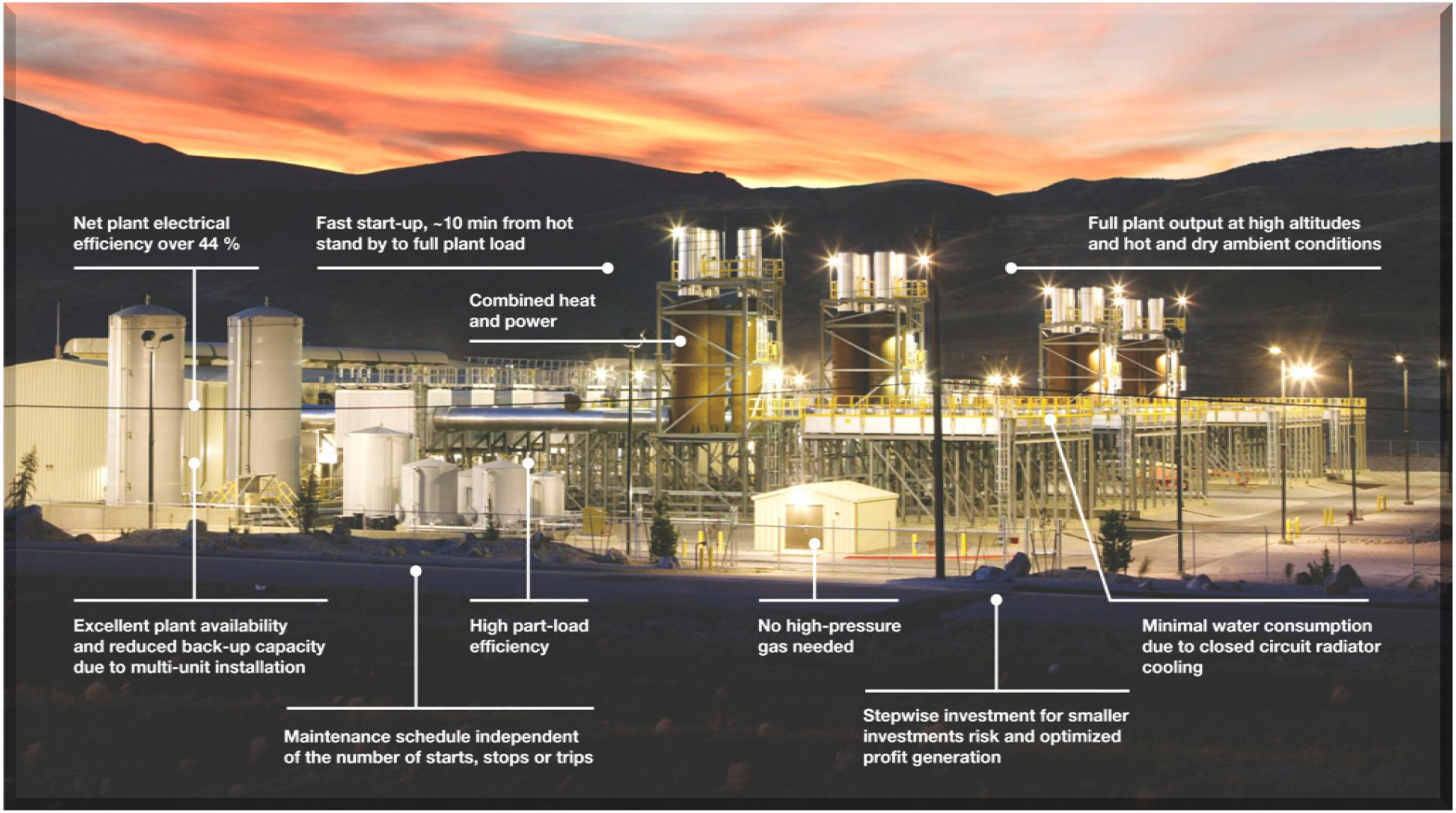


Diesel Peaker Plant Comparison



*Diesel at zar 6/l.

Conclusion : Do not limit IRP to GTs , include ENGINES



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