

WORLD'S LARGEST THERMAL ENERGY STORAGE SYSTEM



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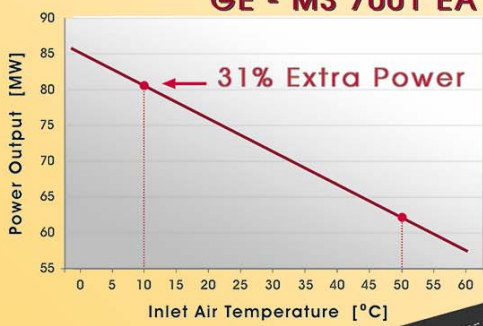
شركة بمكو العربية للمقاولات
ARABIAN BEMCO CONTRACTING CO. LTD.



Riyadh Power Plant 9 – PP9 –, in the Kingdom of Saudi Arabia houses the largest Thermal Energy Storage (TES) system in the world.

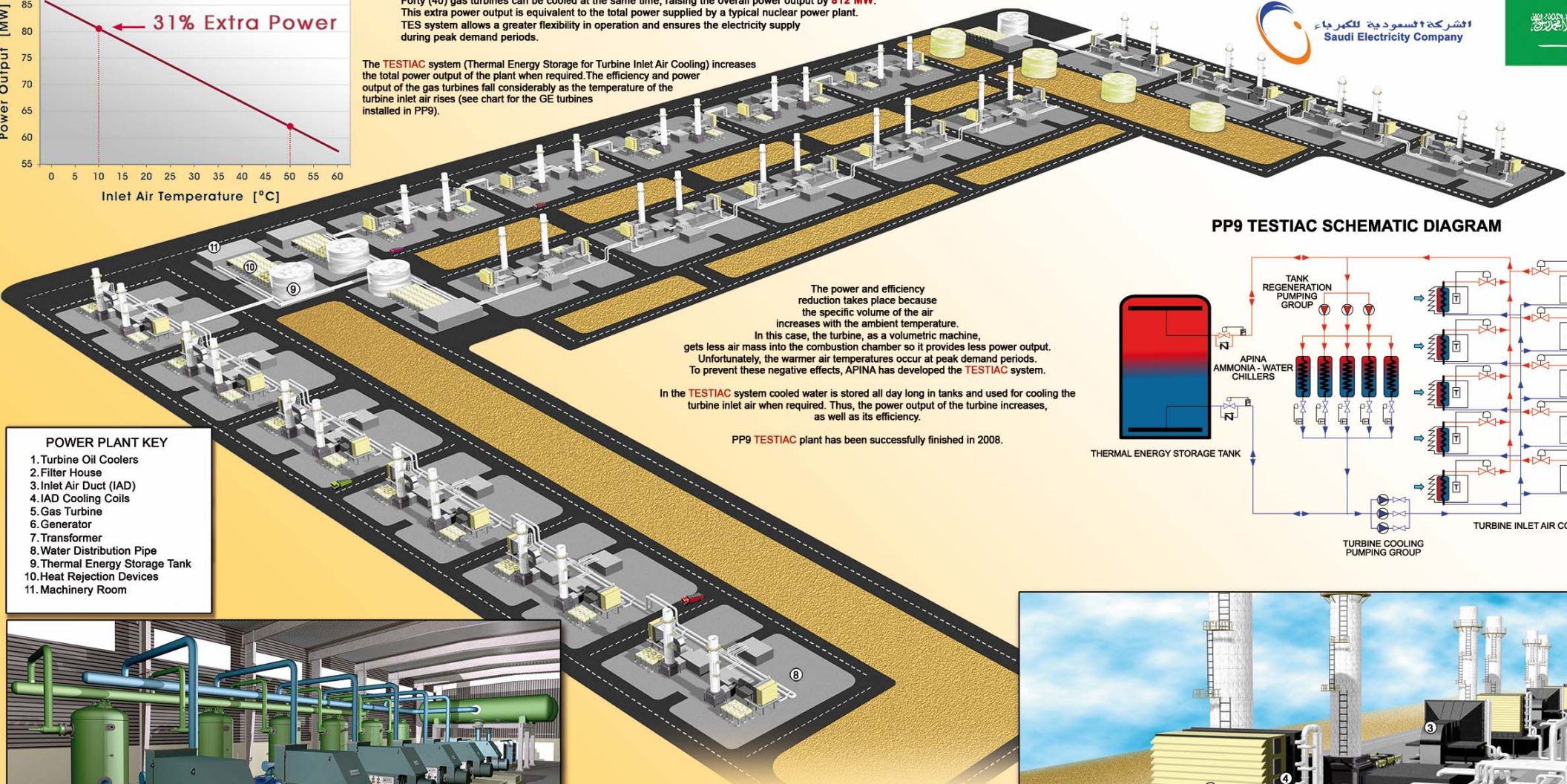
The plant is owned by Saudi Electricity Company and is based on state-of-the-art technology developed by APINA. Forty (40) gas turbines can be cooled at the same time, raising the overall power output by **812 MW**. This extra power output is equivalent to the total power supplied by a typical nuclear power plant. TES system allows a greater flexibility in operation and ensures the electricity supply during peak demand periods.

The **TESTIAC** system (Thermal Energy Storage for Turbine Inlet Air Cooling) increases the total power output of the plant when required. The efficiency and power output of the gas turbines fall considerably as the temperature of the turbine inlet air rises (see chart for the GE turbines installed in PP9).

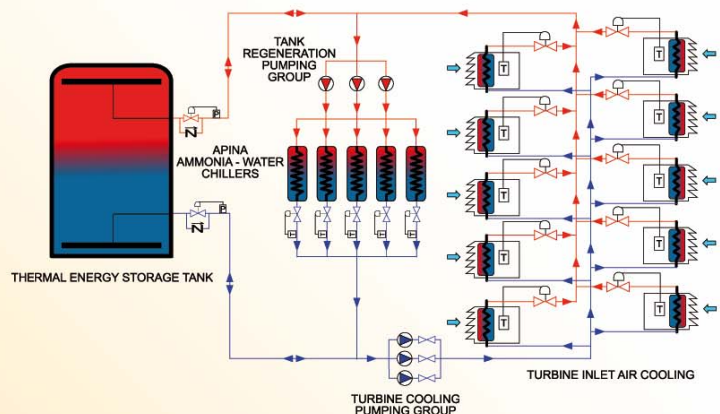


Power Output [MW]

Inlet Air Temperature [°C]



PP9 TESTIAC SCHEMATIC DIAGRAM



The power and efficiency reduction takes place because the specific volume of the air increases with the ambient temperature. In this case, the turbine, as a volumetric machine, gets less air mass into the combustion chamber so it provides less power output. Unfortunately, the warmer air temperatures occur at peak demand periods. To prevent these negative effects, APINA has developed the **TESTIAC** system.

In the **TESTIAC** system cooled water is stored all day long in tanks and used for cooling the turbine inlet air when required. Thus, the power output of the turbine increases, as well as its efficiency.

PP9 **TESTIAC** plant has been successfully finished in 2008.

- POWER PLANT KEY**
1. Turbine Oil Coolers
 2. Filter House
 3. Inlet Air Duct (IAD)
 4. IAD Cooling Coils
 5. Gas Turbine
 6. Generator
 7. Transformer
 8. Water Distribution Pipe
 9. Thermal Energy Storage Tank
 10. Heat Rejection Devices
 11. Machinery Room



Main TESTIAC Technical Parameters:

- Ambient Temperature: 50°C
- Inlet Air Temperature After Cooling: 10°C
- Gas Turbine Model: GE MS7001EA
- Number of turbines cooled by TESTIAC: 40
- Number of Thermal Energy Storage Blocks: 4
- Number of APINA Chillers: 20
- Total Cooling Load: 128,000 Ton·h (refrigeration)
- Total Refrigeration Capacity stored: 710,000 Ton·h (refrigeration)
- Electric Power Generation – EXTRA CAPACITY: 812 MW

