

# QUARTERLY NEWSLETTER

March 2025

Exploring the Trends of  
Combined Cycle Power Plants



## Overview

Combined Cycle Power Plants (CCPP) are advanced energy generation systems that maximise the efficiency of power generation by utilising both gas and steam turbines. They are a cornerstone of utility-power generation and industrial-cogeneration due to their high fuel efficiency, reliability and operational flexibility.

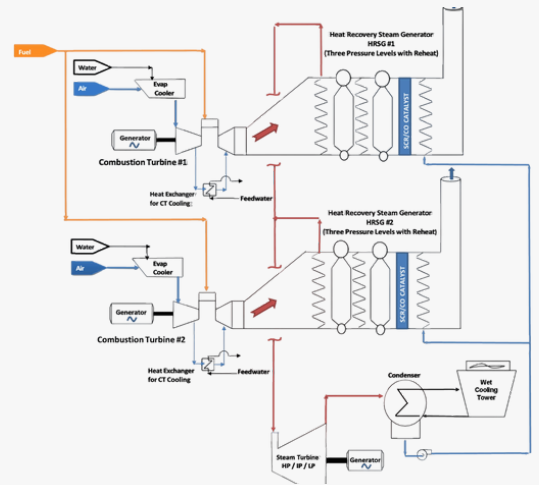


Figure 1 - Multi-shaft 2x2x1 CCPP

Source: Author © Sargent & Lundy, L.L.C.

Capital Cost Composition (1227MW 2x2x1 CC)

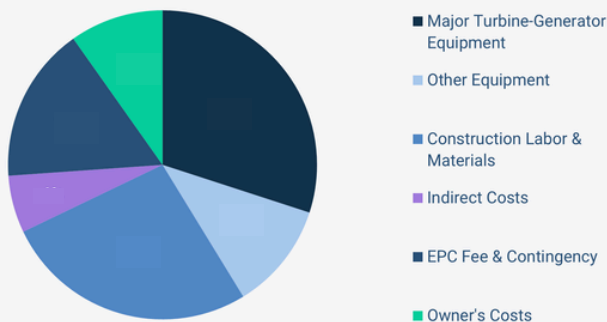


Figure 2 - Capital Cost Composition

Source: EIA, 2023

Despite the challenges faced in the past few years, including disruptions from Covid-19, geopolitical instability, and shipping backlogs, we have seen a trailing five-year compounded annual growth rate (CAGR) of 3.29% in benchmark new prices of combined-cycle power plants. The trailing five-year PPI data shows a modest five-year compounded annual growth rate (CAGR) of 3.89% for turbine and turbine generator sets.

Producer Price Index for Turbine & Turbine Generator Set

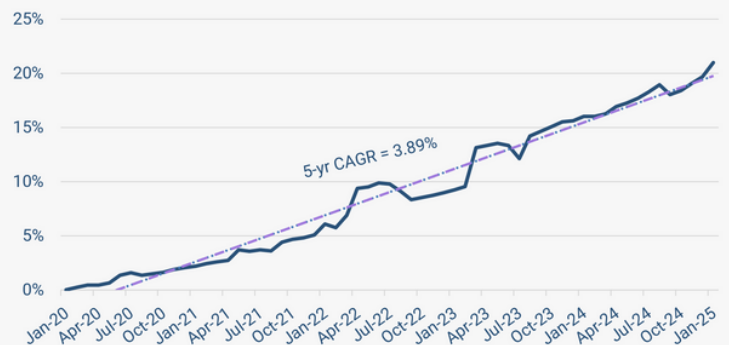


Figure 3 - Current Capital Expenditure Trend

Source: US Bureau of Labor Statistics

Combined Cycle Power Plant Benchmark Prices (500 - 600MW)

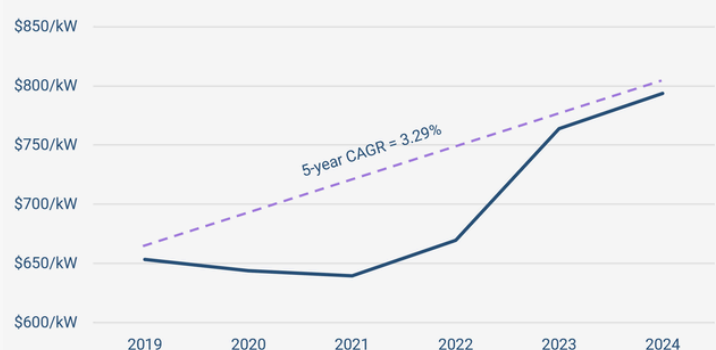


Figure 4 - Capital Expenditure Trend for Combined Cycle Power Plant

Source: Gas Turbine World GTW Handbook

## Leading Manufacturers of Gas Turbines

According to data researched by Global Energy Monitor, the top three leading gas turbine manufacturers – GE Vernova (previously GE Power), Siemens Energy and Mitsubishi Power dominate the global gas turbine market for gas-fired power plants under construction, with two-thirds of the market. GE Vernova leads the global market with almost 55 gigawatts (GW) of turbines under construction.

It is worth noting that Dongfang Electric, through its subsidiary Dongfang Turbine, has become a key player in China's growing gas turbine market. While its 11.3GW gas turbine capacity in construction is concentrated in Mainland China now, it is well positioned to capture greater market share from other major players of the industry in China, and possibly outside China.

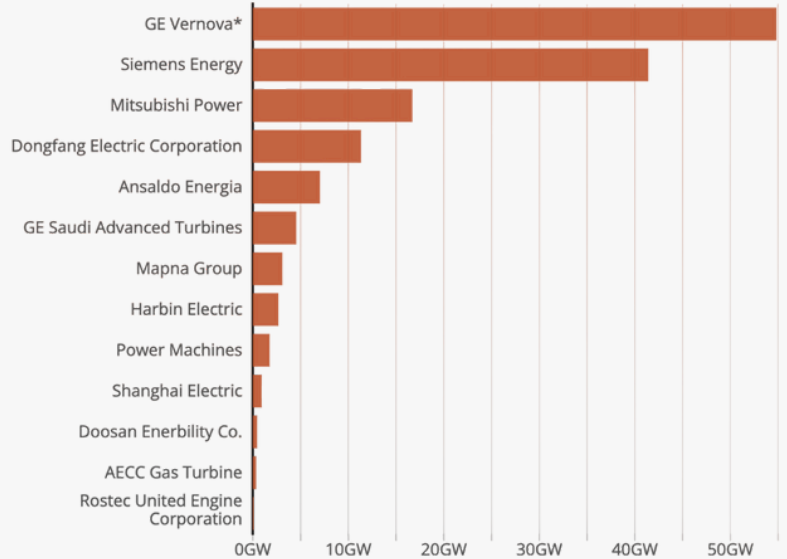


Figure 5 - Gas Turbine Capacity in Construction by Manufacturing Company, in Gigawatts (GW)

Source: Global Energy Monitor



## Green Developments for Gas-Fired Power Plants

### **Carbon Capture & Storage System**

Carbon capture system involves mixing captured plant flue gas with a specialised chemical, before CO<sub>2</sub> is separated out and transported to a storage location – typically underground.

According to a FEED study conducted by GE Vernova, the addition of carbon capture system to a combined-cycle power plant comes with significant economic and operational drawbacks.

- Adding carbon capture system to CCPP will roughly doubles plant footprint
- Capital cost of the carbon capture plant is typically as high as that of the power plant
- Cost of electricity generated will increase by at least 65% to achieve over 90% carbon capture.

### **“Hydrogen-ready” Gas-Fired Power Plants**

For many years, hydrogen is viewed as a potential green fuel for combined cycle power plants with zero carbon emission when combusted.

While several countries, including Singapore, have announced plans to build hydrogen-ready gas-fired power plants, experts argue that it is unlikely for hydrogen to be used in any utility project in the next decade, due to the following reasons:

- Hydrogen blending process is not economically feasible to substitute natural gas
- Hydrogen has potential to emit more nitrogen oxides (NO<sub>x</sub>) due to high combustion temperature, which would require costly controls emission control system
- Lack of infrastructures such as hydrogen supply, pipeline and storage.