

Giants step on the gas in race to go green

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In the pursuit of carbon neutrality by 2050, many organizations here are stepping up efforts to reduce carbon emissions.

As power generation is a major source of carbon emissions, both CLP Power and Hongkong Electric are redoubling their efforts to replace coal plants with gas firing ones.

Readers will recall that the fuel mix for power generation for the whole of Hong Kong was 25 percent nuclear, 50 percent coal and 25 percent gas, with a target of renewable energy of 5 percent.

CLP Power, which supplies over 80 percent of the population, has stepped up its replacement efforts.

Its gas journey started at Penny's Bay with three 100 megawatt open cycle turbines back in the early 1990s.

They provide quick-start support to meet peak demand and in emergencies.

They were supplemented by eight 337.5 MW combined cycle gas turbines at Black Point station from the mid-1990s.

The former burns low sulfur diesel but the latter can burn both diesel and natural gas as back-up fuels. Natural gas is much cleaner than coal but costs more.

Fortunately, with the advent of technology, the heat energy recovered from the exhaust gas (around 640 degrees Celsius) can be used to produce steam to drive an additional steam turbine to produce extra energy, hence the term combined cycle gas turbine plant.

The advantage of such a plant is that it can operate at a higher efficiency rate than coal plants, offsetting higher fuel costs.

Another is that the process from a cold start to the production of full power takes only about 45 minutes, compared to three hours for coal-fired plants.

That makes gas generation an extremely versatile option as it offers the flexibility to turn the turbines on or off according to demand much more quickly than steam and nuclear plants, further narrowing the cost difference.

Refinements in technology have brought newer and larger plants with even better thermal efficiency.

The first new 550 MW gas firing generation unit in Black Point was put into service in 2020, and it will be followed by another 600 MW unit in 2024.

These new plants can achieve a thermal efficiency of over 60 percent, allowing them to be used even as base load machines at competitive operating costs.

They offer one the opportunity to isolate the steam plants from the gas turbine system when required, further shortening the crucial cold start to generating time to only a few minutes.

To give one a sense of their huge size, the 350 and 677 MW units at the Castle Peak station's coal fired steam plants, and even the large 984 MW steam plants at Daya Bay nuclear station were the largest commercially available at the time.

Once the new 600 MW unit at Black Point is firing, the total gas plant capacity will approach 4,000 MW, improving the fuel mix to 35 percent nuclear, 15 percent coal and almost 50 percent gas, and reducing emissions by at least 20 percent.

CLP is already planning offshore wind power plants in the waters of southeast Hong Kong. In the longer term, the use of hydrogen fuel is being investigated, and when mature, it can further supplement the fuel mix to add a renewable energy source with a zero-carbon source.

Electricity is an essential source of energy for commercial and domestic consumption. Strong efforts to reduce carbon emissions, without significant increases in tariff, must be the mid to long term goal to achieve carbon neutrality targets.

Veteran engineer Edmund Leung Kwong-ho casts an expert eye over features of modern life