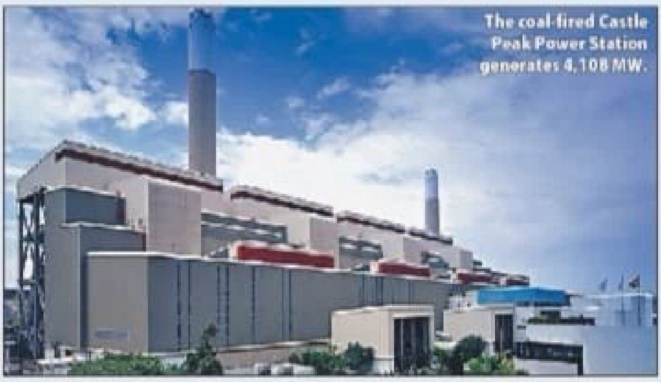
City Talk



The coal-fired Castle Peak Power Station generates 4,108 MW.

SPARE CAPACITY GIVES US MARGIN FOR ERROR

Our total power generation capacity is about 10,000 megawatts, but maximum demand has remained at about 7,000 MW for a few years.

Some wonder why we need this seemingly large margin for spare capacity. I can see at least four reasons.

The first is obvious: machines need time off for inspections, maintenance and repairs. In the past, maintenance could be done during the winter holidays, but with demand up, we can no longer afford such a luxury.

The second is that electricity cannot be stored in a large capacity. Power must be generated instantly to meet demand.

The third is slightly more complicated, having to do with ensuring top reliability.

Engineers must cater for loss of generating power due to units coming off the grid from unavoidable faults. When that happens, in a city like ours, we cannot afford to cut out supply to consumers.

Imagine a generation system consisting of a range of small to large units, say from 50 MW to 1,000 MW. In the event of a sudden loss in generation power of a 1,000 MW unit (a big loss equals to at least 15 percent of the total demand of 7,000 MW), we must be able to pick up the load with the other machines instantaneously.

This is called the "spinning reserve." In other words, we run the units at capacities much below their peak output, to cater for a margin at least as large as the largest unit to allow for it to come off the grid.

Running plants isn't like turning on and off a light switch. A conventional coal-fired steam plant will need more than two hours from start to attain a full load, as the various components need time to warm up to working temperatures.

A liquefied natural gas turbine plant can start and attain a full load in minutes, but then the waste heat boiler, as part of the total combined-cycle plant, will take at least an hour to produce useful power. Until then, it will not run at top efficiency, costing a lot more in running costs.

A nuclear plant will need days to attain a full load. Unfortunately, those units with large capacities tend to have a longer time-constant. Now you see why we need a large "spinning reserve."

The fourth has to do with long term uprating and replacement. In the past, I have explained we would like to increase the number of LNG plants to reduce air pollution and carbon emissions in line with the goal of achieving less than two degree Celsius global warming. A larger proportion of LNG plants will be the most practical way to achieve this.

In the foreseeable future, we hope to achieve a 25/45/25/5 percent ratio of coal/LNG/nuclear/renewable energy for a sustainable future. This can be achieved by retiring some coal-fired steam plants at the end of their life cycles, replacing them with LNG combined-cycle units, and increasing the number of waste to energy plants.

There are, again, many reasons why we cannot use LNG or nuclear plants to meet 100 percent of the demand. Availability of a reliable supply of fuel is a key reason, but the need to cater for changing demands in a daily cycle requires shutting off some units in the total mix of generators.

It is not technically feasible to turn off nuclear or steam plants within a daily loading cycle, so plants with a small time-constant, namely LNG combined-cycle units, will bear the duty of "on-off units" to meet the peaks and troughs of demand.

Like most sophisticated systems, the actual operation of a power station group is not as easy as turning them on and off momentarily. It involves a lot of engineering considerations to achieve reliable, economic and environmentally-friendly goals.

As we enjoy clean and reliable power at affordable prices, we must thank the engineers behind the scenes, who work diligently and effectively to achieve this seemingly simple but really complex task.

Veteran engineer Edmund Leung Kwong-ho casts an expert eye over Hong Kong's iconic infrastructure