

City Talk



THE REAL AND COMPLEX REASONS FOR POWER CUTS

The recent power outages in Texas remind us of how fortunate we are to live in Hong Kong.

Here, power outages are rare, even during the worst weather, as the reliability index of our utilities is over 99.99 percent.

However, sudden cold spells can cause problems for public utilities. Highways elsewhere can get blocked by snow and people often lose access to water and power.

The central part of China suffered a power loss for about two days in December, but the recent failure in Texas has much more drastic consequences.

Engineers design systems based on the prevailing climatic conditions and seldom cater to conditions that do not normally occur, like snow in south China or Texas, for economic reasons.

In the case of Texas, the power outage is ironic, as the state has plenty of oil and gas resources for power generation. In addition, as its transmission network system is – uniquely – not connected to those of other states, it cannot be affected by neighboring states.

I do not have complete information as to what caused the power failure, but I can make a few educated guesses.

First, overdependence on renewable energy could have reduced the reliability of the supply. Solar, wind and water power are weather-dependent and operate ineffectively in inclement weather.

The separation of ownership in power generation and transmission is also a disincentive in preparing for spare capacity in power generation, as power station companies must compete commercially to connect power to the transmission grid.

In most cases, fossil fuel generation takes second priority to renewable energy due to environmental preferences.

In the case of Texas, the percentage capacities are: natural gas comprises 46 percent, coal 18 percent, nuclear energy 11 percent, wind power 23 percent and



Nuts and bolts

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solar 2 percent. It appears that all of the generating equipment was affected in this instance.

More importantly, they probably ran with inadequate “spinning reserve” – a technical term in the power industry. Power generators take time (from 15 minutes to a few hours) to take up load.

Responsible power-generation companies run more machines than necessary to ensure that in the event of the breakdown of any one unit, the other machines can immediately pick up the load to prevent loss of supply.

The fact that generating machines come in different sizes means that the spinning reserve must be bigger than the largest unit in operation.

There are operational costs associated with this spinning reserve, and when generation and transmission organizations have different owners, this is often neglected.

So, when any running generation plant goes out of service, the remaining generation capacity cannot pick up the load. If the power system does not immediately shed part of its load, the whole generation system gets dragged down and a total blackout can occur.

This is why in cases of power failure due to adverse weather, power utilities must deliberately cut power to certain areas.

Unfortunately, the need to cut part of the power supply badly affects areas with the highest demand. Added to this is the interruption of water supplies, causing further grief for residents.

I shall try and explain further in my next article.

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