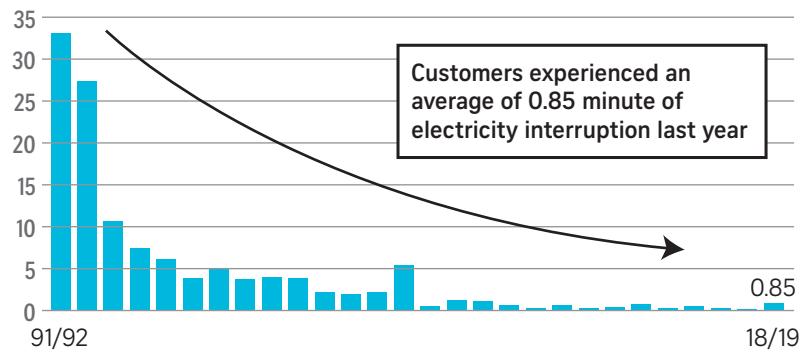


## Singapore's electricity network performance

System average interruption duration index – minutes per customer



Source: SP GROUP STRAITS TIMES GRAPHICS

# SP Group's mobile unit powers up when the power fails

Mobile generators are deployed in matter of minutes as stopgap measure during outages



(From left) Technical officer Mohamed Nasir Mohamed Ismail, 42, technician Muhammad Fhaizal Gasali, 37, and senior technician Nobrahim Abdul Rashid, 46, are part of SP Group's 20-strong team which operates in three-men groups around the clock. ST PHOTO: DESMOND WEE

Customers in Singapore experienced the lowest average of 0.19 of a minute of electricity interruption in 2017, compared with other major cities such as Tokyo and London. The next best-performing city was Osaka, Japan, with an average of five minutes of supply disruption.

### Choo Yun Ting

Ten minutes. That is how long Mr Mohamed Nasir Mohamed Ismail, a technical officer with SP Group's electricity operations, and his mobile generator unit team have to prepare before leaving their Pasir Panjang base when they are activated during a power failure.

The 20-strong team operates in three-man groups, each comprising a leader, an assistant and a driver, around the clock.

The driver of the 1MVA mobile generator, which is about three times as long as an average sedan car, has to work out the quickest and safest route to their destination – not an easy task, given that the trailers are not allowed to travel through tunnels.

But there are some fixed routes that Mr Nasir, 42, who has been working at SP Group for 21 years, and his teammates have familiarised themselves with, he told The Straits Times during a visit to the company's facility in Ayer Rajah.

For example, to get from the depot in Pasir Panjang to a site in Ang Mo Kio, they drive from Alexandra Road to Braddell Road before merging onto the Central Expressway.

"Human GPS (global positioning system)," Mr Nasir said, referring to how they decide on the best route to take with the large trailer.

The mobile generators are activated as a stopgap measure whenever a power failure is reported, while technical officers are dis-

## What happens when a power fault is reported?

The course of action taken to restore the electricity supply depends on the severity and impact of the fault, says energy provider SP Group. In cases where the cause is a cable fault within the power grid, outages can mostly be resolved through remote or manual switching processes. But in instances of more lengthy outages, mobile generators are deployed as a temporary measure to restore electricity supply.

### CAUSES OF POWER OUTAGES

- Network** Equipment failure, human error affecting the power grid network
- Third party** Damage to power cables, overground boxes by external parties
- Faults on consumer's side** Issues with electrical equipment on site
- Power supply** Issues with the source of power supply, such as with power-generating units

### ACTION TAKEN

#### 1 Remote switching

When a power fault is detected, this first course of action disconnects the affected equipment from the network and reconnects it to an alternative supply source. Remote switching is done at SP Group's distribution control centre, the nerve centre of Singapore's power grid, and is able to restore power supply in a matter of minutes.



#### 2 Manual switching

Manual switching requires officers on site to conduct the connecting/disconnecting process at the substation connected to where the fault has been reported. It is conducted when remote switching is unable to restore power supply. Power faults in low-voltage networks, such as damage to overground boxes that are used to transmit electricity to customers, are usually resolved through manual switching.



#### 3 Mobile generators

These generators are deployed when power faults are reported and are used as a temporary solution while the network issues are being resolved. The type of generator deployed varies depending on the area affected by the outage. For example, a 1MVA generator (right) is able to power four Housing Board blocks for up to eight hours.



Approximately 100 households in one HDB block.



The 500 kVA generator (left) can restore electricity supply to two HDB blocks for up to eight hours.



#### 4 Cable jointing

Cable jointing is conducted when remote switching and manual switching are unable to resolve the power fault and the mobile generators cannot access the substation where the fault has occurred. This process requires longer time than remote switching or manual switching.



### BY THE NUMBERS

- Power restoration within one hour (past five years)** 90%
- Power restoration within two hours (past five years)** 99%
- Number of substations** More than 11,000
- Length of cables that make up Singapore's electricity grid** 27,000km
- Number of mobile and portable generators** (Eight 1MVA, two 800kVA, four 500kVA, four 50kVA, four 20kVA, 12 6.5kVA)

Source: SP GROUP PHOTOS: DESMOND WEE & SP GROUP STRAITS TIMES GRAPHICS

patched to the site to conduct manual switching to an alternative power supply, SP Group said.

In two recent incidents of power failure, which occurred on Jan 26 and Feb 14 in Bright Hill and Carlton Hotel, respectively, the 1MVA mobile generators were activated but not used.

Both incidents involved equipment failure that caused fires in substations.

Last September, more than 140,000 residential and commercial customers across Singapore were affected by a blackout. It was later traced to the tripping of power-generating units of Sembcorp Cogen and Senoko Energy.

However, in that incident, mobile generators were not activated.

This was because the outage was caused by issues with the power-generating units, and the mobile generators available would not have been sufficient to restore supply to affected areas, said SP Group's director of electricity operations, Mr Cedric Lee, 43.

"The fastest way to resolve the issue was to conduct remote switching once the generators were back up," he added.

Senior Minister of State for Trade and Industry Koh Poh Koon, in a Facebook post on Feb 16 after a visit to SP Group's Kim Chuan substation following the Carlton Hotel incident, had written about some of the regular maintenance measures undertaken by SP Group to ensure the reliability of Singapore's power supply.

Mr Lee said one of those measures is the online condition-monitoring system that the energy provider uses for its high-voltage 400kV and 230kV switchgears.

The system, introduced in 2005, monitors the network around the clock and allows for equipment to be calibrated online.

In comparison, physical monitoring, which is conducted every six to nine months, measures only the voltage and equipment condition at the point in time when the checks are being conducted.

The energy provider also uses a remote control system for the 6.6kV distribution network, which allows for power faults to be isolated remotely to restore supply.

The system, which has been rolled out to 90 per cent of 4,450 substations, was introduced in 2014 and is slated for completion next year.

"But in any power grid, any network, there is no 100 per cent," Mr Lee said, adding that system faults are inevitable.

Based on the system average interruption duration index – a reliability indicator for electric power utilities – in 2017, Singapore's power system is ranked among the best in the world.

Customers in Singapore experienced the lowest average of 0.19 of a minute of electricity interruption in 2017, compared with other major cities such as Tokyo and London. The next best-performing city was Osaka, Japan, with an average of five minutes of supply disruption.

For Mr Nasir and his colleagues, ensuring the reliability of the power grid means that they are effectively on 24-hour standby, even after their eight-hour shifts have ended for the day, and some family outings have inevitably been interrupted over the years.

On several occasions, Mr Nasir has received calls asking him to report back for work just as he was about to go out for dinner with his children.

"It was frustrating initially (to be on standby), but it is worth it," he said, referring to coming to the aid of people affected by a power failure. "It's a satisfaction we get, seeing their frustrated faces turn to happy faces."

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