

POWER FAILURES – WHY THEY HAPPEN

Power failures on distribution lines have a variety of causes:

Short circuits are the most frequent cause of power failures. Permanent faults cause short circuits which persist until the fault has been removed. Transient faults occur when there is a temporary short circuit that is cleared when a circuit breaker (switch) is tripped. In this case automatic equipment usually restores the supply within seconds by reclosing the tripped circuit breaker.

Lightning is a frequent cause of power failures. The thinner power line conductors on the smaller power lines can be severed by lightning. Lightning strikes can also cause permanent damage to insulators or equipment connected to the power line, such as transformers, surge arresters or circuit breakers. These faults have to be located and repaired before power supplies can be restored. Even if lightning does not strike a line directly, the high voltage it induces in a nearby power line can damage equipment and cause failures. Weather might be clear in the end-users region, but a storm might have caused failure many kilometres away, affecting all those supplied by that particular line.

Vandalism is another major cause of power failures. Stones, metal implements and other objects thrown at pylons and lines or shots fired at insulators can cause damage.

Vehicles crashing into poles or similar accidents can damage lines and poles.

Trees or branches blown onto lines can cause short circuits which might be transient, occurring for instance only when the wind blows. Attempts are made to limit environmental damage, and not to cut down trees unless absolutely necessary. This, however, adds to the problem of keeping servitudes free of potentially hazardous trees. Though Eskom patrols the power line routes regularly, patrolmen are responsible for hundreds of kilometres of line in their district and might not always locate these potentially problematic trees.

Cable theft is also a major contributor to power failures. Aggressive awareness campaigns have been launched to inform the public of the negative effects of cable theft. Eskom works closely with communities to encourage them to report any illegal cable thefts.

Birds and veld fires can cause damage that leads to power failures.

Insulator pollution: Chief pollutants are wind-borne salt from the sea and bird droppings. These generally build up on the insulators during the dry seasons and cause faults when the insulators are wet. Eskom washes insulators on affected lines and in some cases uses a special type of insulator, or coats insulators with a special silicone grease.

Repair work: Supplies are sometimes interrupted on purpose to enable maintenance work to be performed on equipment. When such work is planned, Eskom takes all reasonable steps to warn the customers concerned beforehand. Eskom also makes extensive use of live-line maintenance techniques to reduce the number of planned power cuts.

Roadworkers sometimes dig up local supply cables, disrupting power in that particular area.

Overload: At times the demand for electricity increases to the point that the system becomes overloaded. Unless Eskom sheds load, that is, cuts off supply temporarily to certain users, there will be a complete blackout affecting all customers for a protracted period of time.

Load shedding plans, which can be implemented if an overload is foreseen or occurs slowly, are designed to spread the supply interruptions as equally as possible among all customers. Often, however, overloads happen without warning and action must be taken automatically. Prior agreements are arranged with large customers where large blocks of load can be shed rapidly to save the system. Automatic equipment installed throughout the country can sense a slowing down of the system, that is a drop in frequency, and can shed load in less than a second when necessary.

To ensure that power failures affect as few customers as possible, sectionalisers have been installed at strategic points on the power lines. Sectionalisers are automatic switches which “sense” that a fault has occurred on the line beyond them. They then automatically switch off the faulty section of the line. Customers on different branches of the line will be unaffected.

Eskom reviews and implements the latest technological advances developed both in South Africa and internationally to improve the reliability of supply.

Eskom also works closely with CSIR in research to improve the reliability of overhead networks.

Often, Eskom has no way of knowing that supplies have been interrupted until the customers report the outages. With the continued support of the public in cooperation with Eskom staff, service and efficiency will be constantly improved.

Produced by: Generation Communication
TD 0002 Revision 5 (October 2010)

For more information on Eskom related topics see the Eskom website (www.eskom.co.za).
Select the “Knowledge Centre” and “Facts and Figures”