

Never mind a national grid failure, but what about the effect of continued severe load shedding on organisations?

23rd November 2023

Recording of this session can be find [here](#).

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MANAGING DIRECTOR

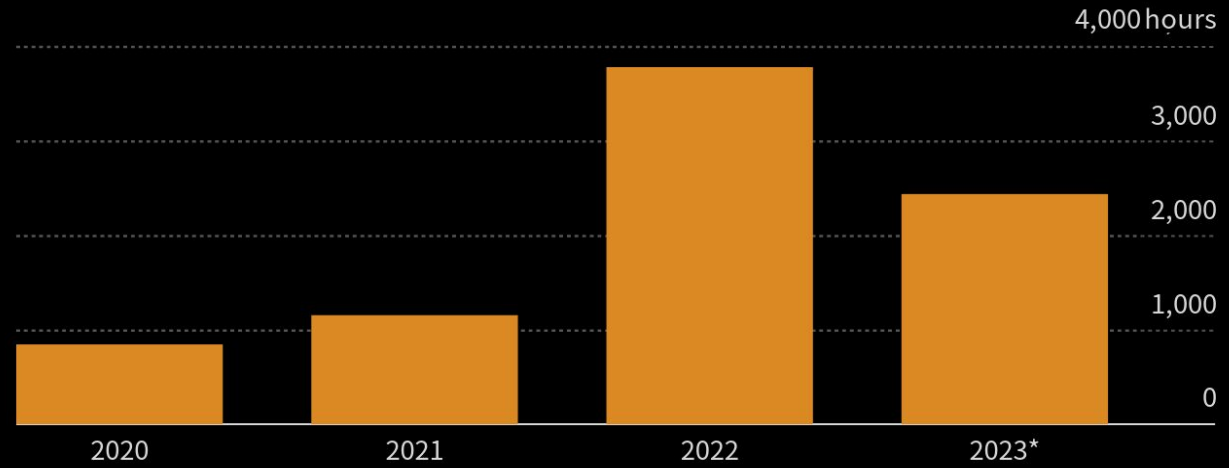
paxresilience.io

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South Africa's Power Cuts Have Gotten Significantly Worse

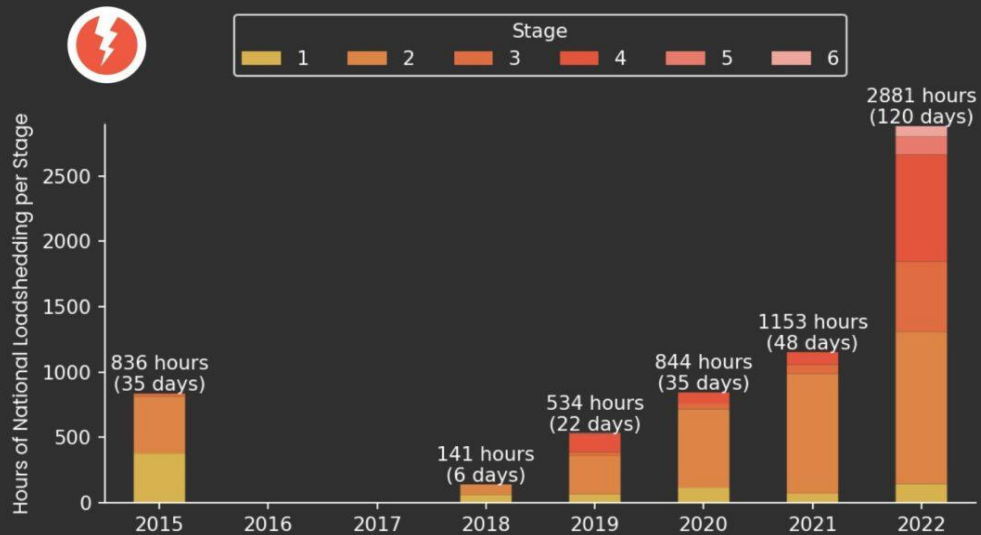
This year's outages have surpassed the cumulative totals of 2019 and 2020



Source: South African Reserve Bank

*Note: As of April 16

Bloomberg



2023 has already had the most load-shedding in history.
www.Businesstech.co.za



Eskom: 11 National Disaster Priority Risks

1. Severe Supply / Demand Constraint
2. Pandemic
3. National Blackout
4. National Industrial Action
5. Cyber-attack or catastrophic IT system failure
6. National drought or floods
7. Nuclear incident
8. Environmental and climate change incidents
9. Economic or financial collapse
10. Solar or geomagnetic storm
11. Terrorism or political instability

Eskom State of readiness

| | |
|------------------------------------|---|
| Eskom Disaster Plan: | In place, updated annually (<i>incl. 11 national disasters</i>) |
| Blackout: | This remains a low-likelihood, high-impact incident |
| Early warning: | Most likely none, though some conditions increase risk |
| Load shedding: | Stages 1-8 in place as risk reduction measures (Review underway) |
| Blackout restoration plan: | In place, exercised, risks monitored (Eskom Board level) |
| Restoration: | Deliberate, not focused on critical loads (focus is avoiding a 2 nd failure) |
| Eskom contingency planning: | In place, continually being improved. |
| Country plan: | Not in place. |

National Grid Failure in other countries



Pakistan
January 2021
Outage for 1 day
Generation Issue



Jordan
May 2021
Outage for 1 day
Tie-line trip



Puerto Rico
April 2022
Outage for 5 days
Fire



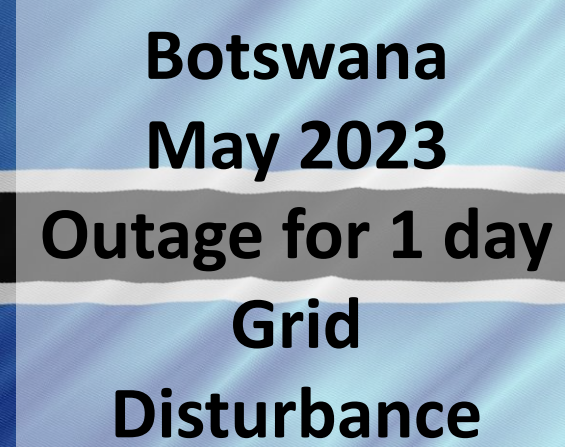
Bangladesh
October 2022
Outage for 1 day
Transmission overload



Pakistan
January 2023
Outage for 1 day
Transmission failure



Argentina
March 2023
Outage for 1 day
Fire



Botswana
May 2023
Outage for 1 day
Grid
Disturbance

National Grid Failure in South Africa



A central graphic featuring a lit candle, a "DANGER" sign, and a "HAZARDOUS TO HEALTH" warning. The candle is lit and has a flame. The "DANGER" sign is a red oval with white text. Below it is a black and white warning symbol consisting of a circle with a triangle and an exclamation point. To the right of the symbol is the text "HAZARDOUS TO HEALTH" in bold black letters.



Stages of load shedding

Stages 1 to 4

Stage 1 1,000MW reduction

| number of outages | Cycle / # of days | hours per outage | Total outage hours | Hours available in the cycle | Available power | Power is available for % of time |
|-------------------|-------------------|------------------|--------------------|------------------------------|-----------------|----------------------------------|
| 3 | 4 | 2 | 6 | 96 | 90 | 94% |
| 3 | 8 | 4 | 12 | 192 | 180 | 94% |

Stage 2 2,000MW reduction

| number of outages | Cycle / # of days | hours per outage | Total outage hours | Hours available in the cycle | Available power | Power is available for % of time |
|-------------------|-------------------|------------------|--------------------|------------------------------|-----------------|----------------------------------|
| 6 | 4 | 2 | 12 | 96 | 84 | 88% |
| 6 | 8 | 4 | 24 | 192 | 168 | 88% |

Stage 3 3,000MW reduction

| number of outages | Cycle / # of days | hours per outage | Total outage hours | Hours available in the cycle | Available power | Power is available for % of time |
|-------------------|-------------------|------------------|--------------------|------------------------------|-----------------|----------------------------------|
| 9 | 4 | 2 | 18 | 96 | 78 | 81% |
| 9 | 8 | 4 | 36 | 192 | 156 | 81% |

Stage 4 4,000MW reduction

| number of outages | Cycle / # of days | hours per outage | Total outage hours | Hours available in the cycle | Available power | Power is available for % of time |
|-------------------|-------------------|------------------|--------------------|------------------------------|-----------------|----------------------------------|
| 12 | 4 | 2 | 24 | 96 | 72 | 75% |
| 12 | 8 | 4 | 48 | 192 | 144 | 75% |

Stages of load shedding

Stages 5 to 8

Stage 5

5,000MW reduction

| number of outages | Cycle / # of days | hours per outage | Total outage hours | Hours available in the cycle | Available power | Power is available for % of time |
|-------------------|-------------------|------------------|--------------------|------------------------------|-----------------|----------------------------------|
| 9 | 4 | 2 | 18 | 96 | 78 | |
| 3 | 4 | 4 | 12 | 96 | 84 | |
| 12 | 4 | | 30 | 96 | 66 | 69% |

Stage 6

6,000MW reduction

| number of outages | Cycle / # of days | hours per outage | Total outage hours | Hours available in the cycle | Available power | Power is available for % of time |
|-------------------|-------------------|------------------|--------------------|------------------------------|-----------------|----------------------------------|
| 6 | 4 | 2 | 12 | 96 | 84 | |
| 6 | 4 | 4 | 24 | 96 | 72 | |
| 12 | 4 | | 36 | 96 | 60 | 63% |

Stage 7

7,000MW reduction

| number of outages | Cycle / # of days | hours per outage | Total outage hours | Hours available in the cycle | Available power | Power is available for % of time |
|-------------------|-------------------|------------------|--------------------|------------------------------|-----------------|----------------------------------|
| 3 | 4 | 2 | 6 | 96 | 90 | |
| 9 | 4 | 4 | 36 | 96 | 60 | |
| 12 | 4 | | 42 | 96 | 54 | 56% |

Stage 8

8,000MW reduction

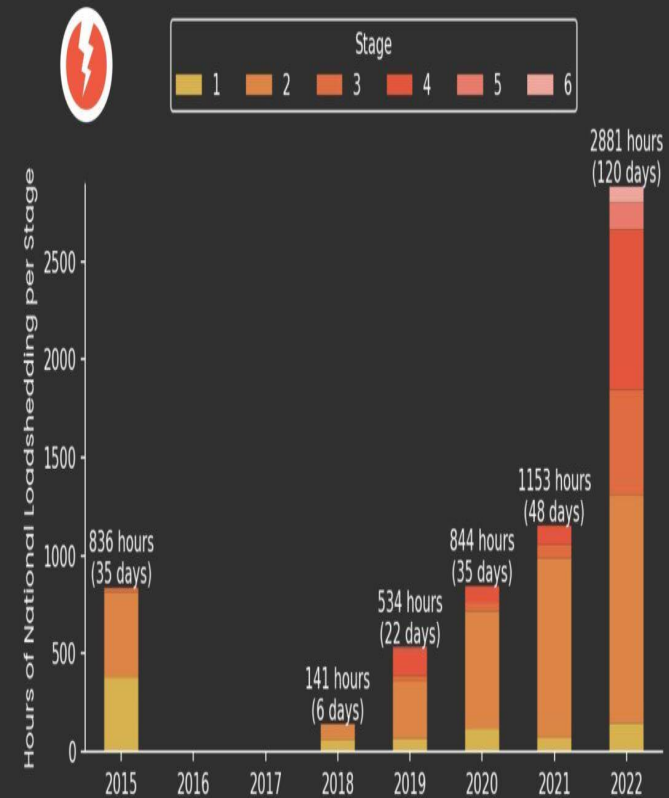
| number of outages | Cycle / # of days | hours per outage | Total outage hours | Hours available in the cycle | Available power | Power is available for % of time |
|-------------------|-------------------|------------------|--------------------|------------------------------|-----------------|----------------------------------|
| 12 | 4 | 4 | 48 | 96 | 48 | 50% |

Stages of load shedding and availability of power

Load shedding Stage

| Load shedding Stage | Power is available for % of time |
|---------------------|----------------------------------|
| Stage 1 | 94% |
| Stage 2 | 88% |
| Stage 3 | 81% |
| Stage 4 | 75% |
| Stage 5 | 69% |
| Stage 6 | 63% |
| Stage 7 | 56% |
| Stage 8 | 50% |

Power is available for % of time

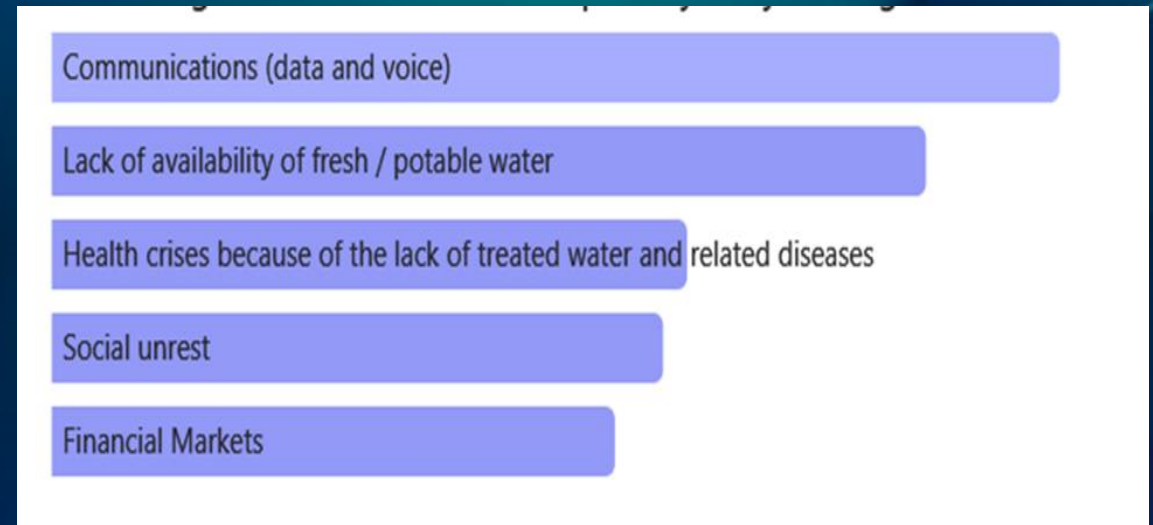


Survey Time

**Scenario: Stage 8 load shedding for a period of one week
Please rank the risk categories below in order of priority
for your organisation;**

- 1. Communications (data and voice)**
- 2. Lack of availability of fresh/potable water**
- 3. Health Crises because of the lack of treated water and related diseases**
- 4. Financial Markets**
- 5. Social unrest**

Response from the attendees:



Scenario: National Grid Failure

Power may be restored between 3 and 17 days

Please choose one of the options below in terms of how long before Eskom power is restored, that it is catastrophic for the organisation;

Response from the attendees indicating percentages of organisations that would experience catastrophic impacts after the time periods as reflected below:

| | |
|----------|-----|
| 3 days | 16% |
| 10 days | 45% |
| 15 days | 10% |
| >17 Days | 29% |

Response from the attendees:



During the past 12 months, what was impacted the most during load shedding / load curtailment?

Communications (data and voice)

Table reflecting availability of power per cycle, scenarios and potential impacts

| Potential Impact | 75% Availability Stage 4 | 63% Availability Stage 6 | 50% Availability Stage 8 | NGF |
|---|---|--|--|---|
| A breakdown in communications and the use of related services such as the internet. | Mostly, continuous connectivity is available which is intermittently impacted by sporadic interruption of power supply. | Frequent breaks in connectivity as numerous towers malfunction because of not having enough time to recharge from power outages and increased opportunistic theft and vandalism. | Connectivity is infrequent with better reliability in metropolitan areas, significant increase in opportunistic theft and vandalism. | 4 to 8 hours to total shutdown of telecommunication towers. |

Lack of availability of fresh/potable water

Table reflecting availability of power per cycle, scenarios and potential impacts

| Potential Impact | 75% Availability Stage 4 | 63% Availability Stage 6 | 50% Availability Stage 8 | NGF |
|--|---|---|---|--|
| Emergence and continuance, in some areas, of the unavailability of fresh/potable water | Provision of water by municipalities is as normal with the usual outages. | Lack of reliable power results in reservoirs not filling quick enough resulting in the rationing of water supply. | Prolonged water outages occur, and water shortages are experienced. Although rationing rules are in place, water is simply not available. Significant increase in opportunistic theft and vandalism. | Severe water outages occur, communities need to look at alternative sources with water rationing. Organised crime syndicates targeting infrastructure. |

Health Crises because of the lack of treated water and related diseases

Table reflecting availability of power per cycle, scenarios and potential impacts

| Potential Impact | 75% Availability Stage 4 | 63% Availability Stage 6 | 50% Availability Stage 8 | NGF |
|---|---|--|---|--|
| Health and safety crises because of the lack of water and related diseases exacerbated by the breakdown of municipal services, for example sewage management. | The existing state is an imminent or arguably existing crisis with common outbreaks of diseases being recorded. | Municipalities are not coping with sewage processing. Water sources are negatively impacted, and cases of water-borne diseases are reported. | Inability to process sewage quickly enough as electricity supply from local municipalities and own back-up capacity are just not enough or in place. Water sources are contaminated with sewage overflow. | Waste processing has collapsed. Water sources are contaminated, and sewage systems are overflowing into open spaces. Organised crime syndicates targeting infrastructure |

Social Unrest

Table reflecting availability of power per cycle, scenarios and potential impacts

| Potential Impact | 75% Availability Stage 4 | 63% Availability Stage 6 | 50% Availability Stage 8 | NGF |
|--|---|---|---|---|
| Accelerated increase in social unrest and criminality. | The existing protests that are common currently ramp up as service delivery deteriorates. | With an increase in health crises due to the failure to reliably provide municipal services political parties take the opportunity to score political points. | While communities and business come together for support during this time certain groups of people and individuals take advantage of the situation. | The environment makes it difficult to maintain law and order. Widespread looting and violence escalate. |

Financial Markets

Table reflecting availability of power per cycle, scenarios and potential impacts

| Potential Impact | 75% Availability Stage 4 | 63% Availability Stage 6 | 50% Availability Stage 8 | NGF |
|--|---|--|--|---|
| Access to general banking, cash and specialised financial market services for example SWIFT. | The financial sector, retailers and most businesses have built enough resilience into their systems to continue 'business as usual' at this stage | For the larger corporates, 'business as usual' continues with slight blips of downtime that are manageable. Medium size businesses and more affected. Lay-offs occur and small businesses are at risk of closing | South Africa Inc. starts to cut back on their operating hours to align with hours that they have power. Physical and cyber security becomes a greater concern. Access to banking is now a challenge and people accessing their cash. | With very little or no communication businesses close indefinitely, physical and cyber security are of utmost concern and some businesses will not remain sustainable even post the NGF |

Risk categories to consider;

People (Safety & Security)

Infrastructure (buildings, remote working etc.)

Provision of utilities such as water

Health Crises as a result of failure of provision of potable water

Communications

Operations (manual work arounds)

Technology (including Safe haven – keeping data outside of the country)

Cyber Security

Supply chain (what about your third party's supply chain?)

Financial Markets

Societal Behaviour (e.g. Social unrest)

Diesel availability

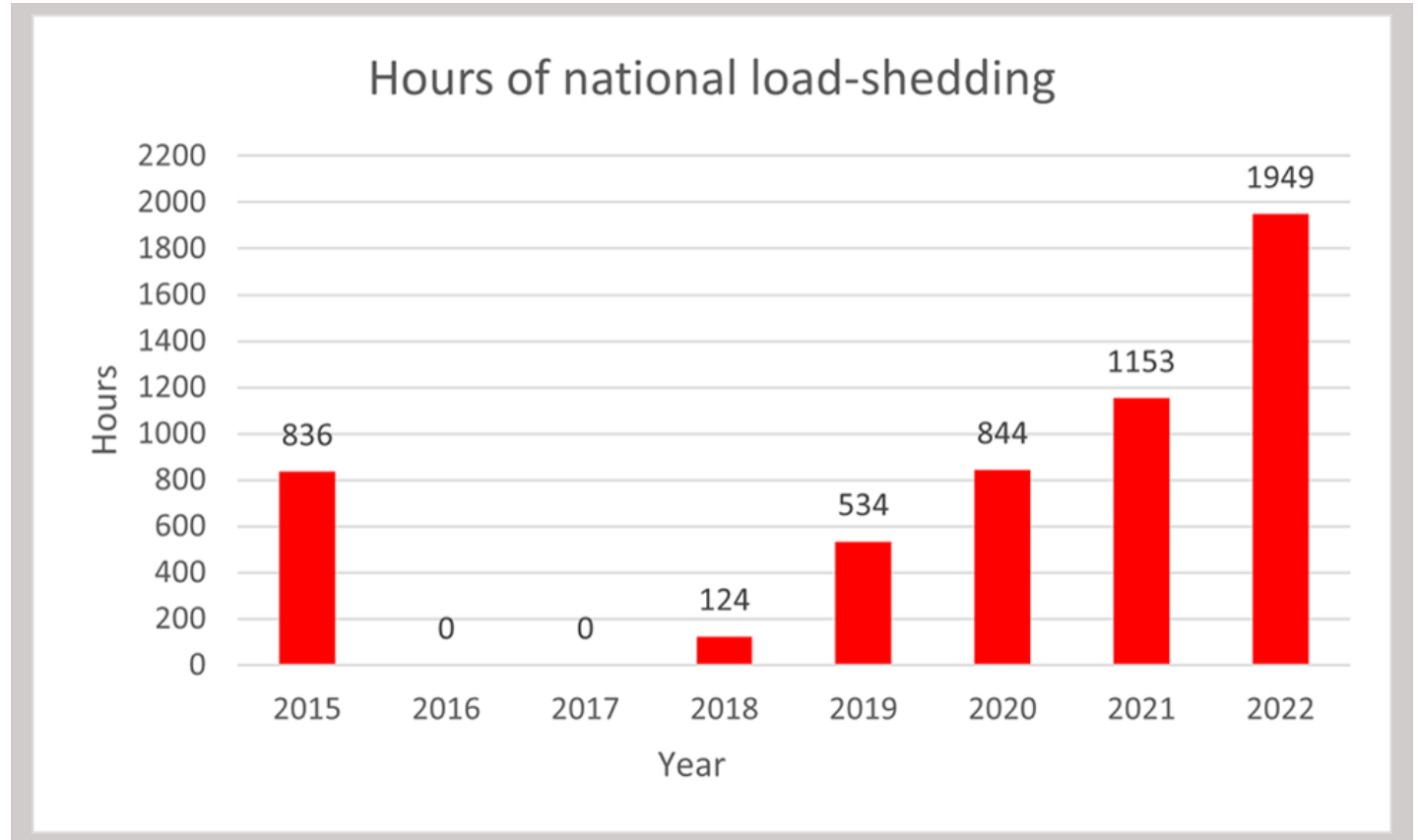
Consider the cost of lost business per day;

- R1m to R10m
- R10m to R50m
- R50m to R100m
- +R100m

Not only lost revenue, costs associated with operating during disruption

How much are you willing to spend on resilience?

Business continuity
normalised into
business as usual –
so how has
business continuity
changed?



Take Aways

Severe load shedding impacts similar to NGF

People (Safety & Security)

Infrastructure (buildings, remote working etc.)

Provision of utilities such as water

Health Crises as a result of failure of provision of potable water

Communications

Operations (manual work arounds)

Technology (including Safe haven – keeping data outside of the country)

Cyber Security

Supply chain (what about your third party's supply chain?)

Financial Markets

Societal Behaviour (e.g. Social unrest)

Diesel availability

Consider NGF scenarios for

- Business Risks
- Business Continuity Plans
- Opportunities

Ultimately increase

- Resilience
- Agility
- Flexibility to pounce on opportunities

THANK YOU

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Creating peace of mind by building Resilience