# LIMA Programme
## Grid Interruption

Date: 20/04/2023
Kirsty Hawkins

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NOT IF, BUT HOW

Image: Munich Re

# Agenda

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# Background

01

Image: Munich Re

# Background

## Historic Account of South Africa's Energy Landscape

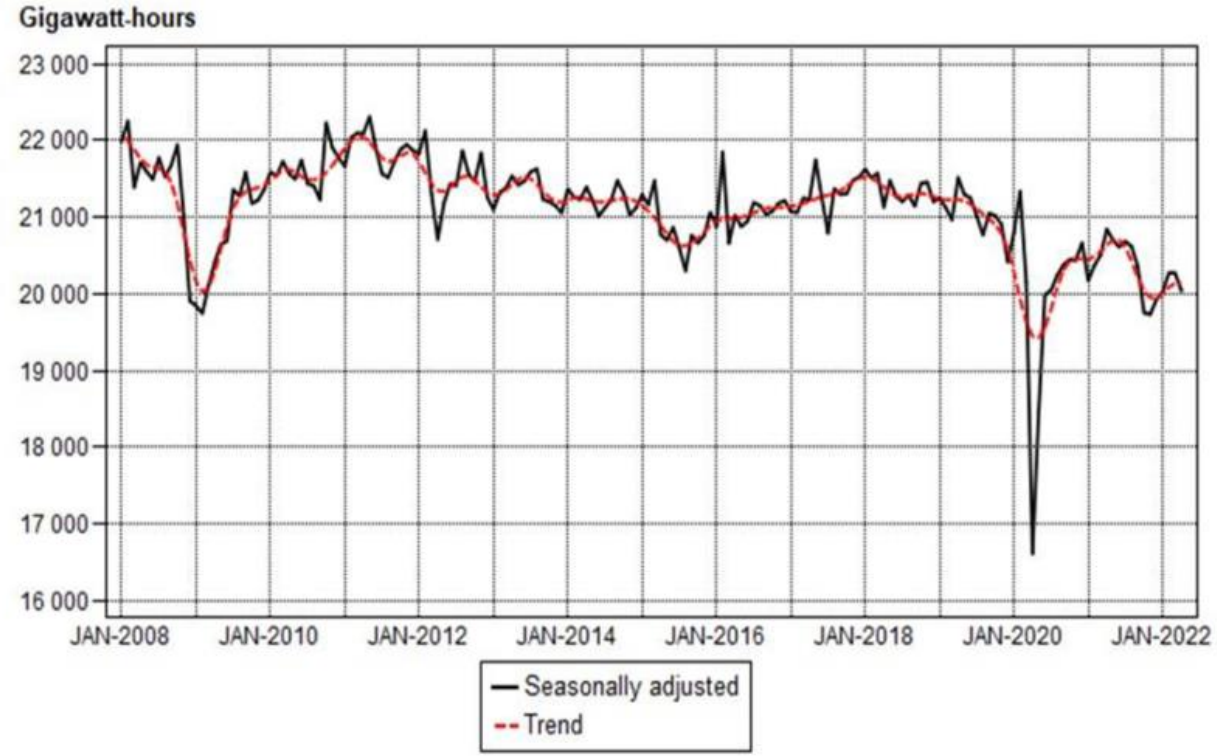
# The South African Electricity Landscape

02

Image: Munich Re

# The South African Electricity Landscape

## Electricity Generated in South Africa




Source: 2018, South Africa's Electricity Company In Crisis: What Are The Implications, Seeking Alpha, accessed 17 March 2023, < South Africa's Electricity Company In Crisis: What Are The Implications? | Seeking Alpha >

# The South African Electricity Landscape

## Volume of Electricity by Category (Gigawatt – hours)

| | Dec-21 | Jan-22 | Feb-22 | Mar-22 | Apr-22 [1] | Apr-22 year-on-year % change |
|---|---|---|---|---|---|---|
| **Total - all producers** | | | | | | |
| Generated | 19 111 | 19 582 | 18 494 | 20 240 | 19 338 | -3,8 |
| Inflow into South Africa | 1 104 | 1 099 | 835 | 871 | 906 | 14,7 |
| Consumed in power stations and auxiliary systems | 1 493 | 1 512 | 1 449 | 1 601 | 1 595 | -3,2 |
| Outflow from South Africa | 1 226 | 1 194 | 1 064 | 1 103 | 937 | -19,5 |
| Distributed in South Africa | 17 496 | 17 974 | 16 815 | 18 408 | 17 711 | -2,0 |
| **Eskom** | | | | | | |
| Generated | 16 852 | 17 484 | 16 723 | 18 261 | 17 370 | -4,4 |
| Inflow into South Africa | 1 104 | 1 099 | 835 | 871 | 906 | 14,7 |
| Consumed in power stations and auxiliary systems | 1 413 | 1 448 | 1 375 | 1 522 | 1 525 | -3,4 |
| Outflow from South Africa | 1 226 | 1 194 | 1 064 | 1 103 | 937 | -19,5 |
| Distributed in South Africa | 15 317 | 15 941 | 15 119 | 16 506 | 15 813 | -2,5 |

[1] Preliminary.

Source: Andile Sicetsha, 2019, Stats SA: Electricity generation and consumption on the downturn. Accessed 17 March 2023, < Stats SA: Electricity generation and consumption on the downturn (thesouthafrican.com)>

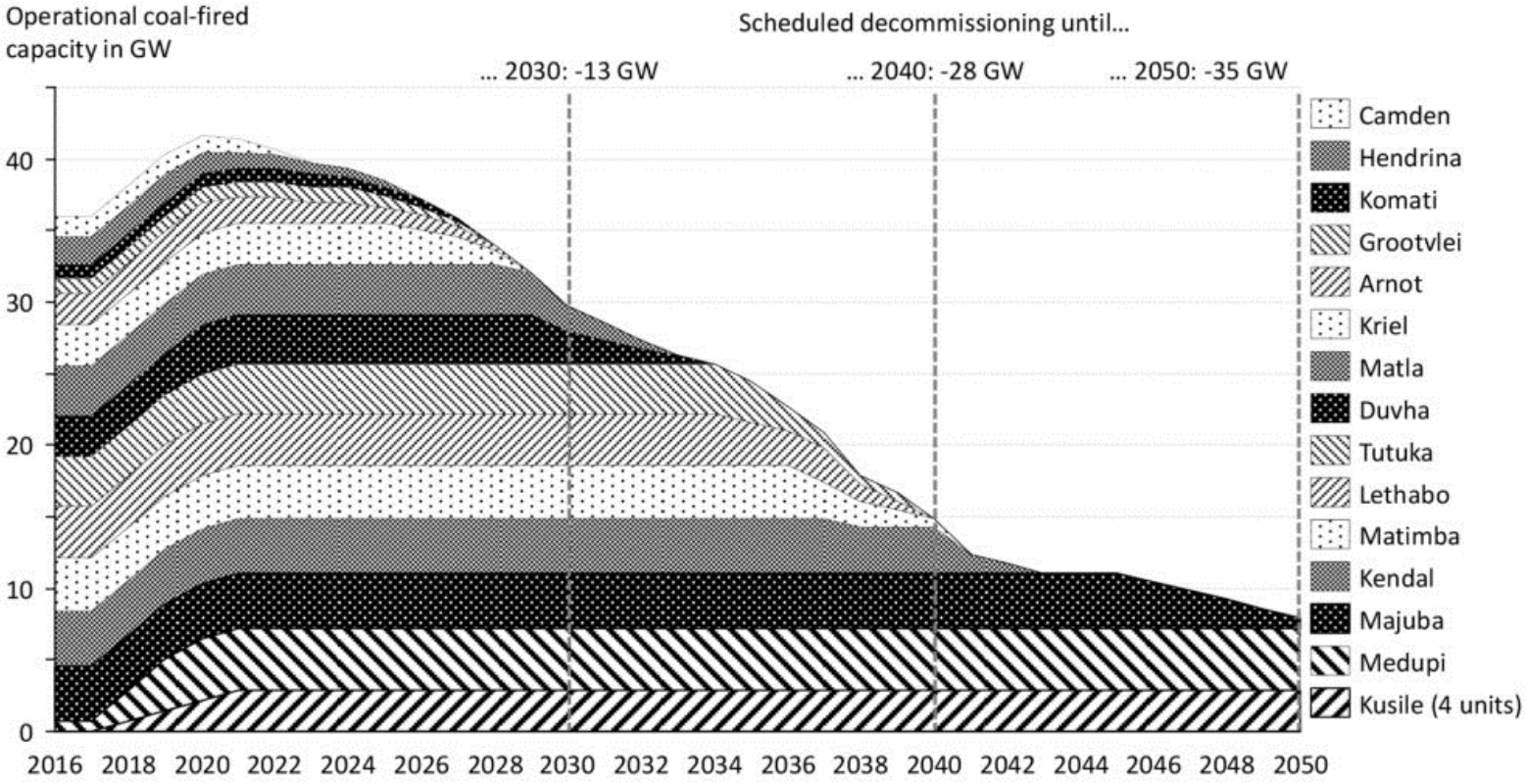
# The South African Electricity Landscape

## What the South African Grid Looks Like


Source: 2017,Map of Eskom South Africa Power Stations. Accessed 17 March 2023. < Map of Eskom South Africa Power Stations - 2023 | ZaR (zarecruitment.com)

# The South African Electricity Landscape

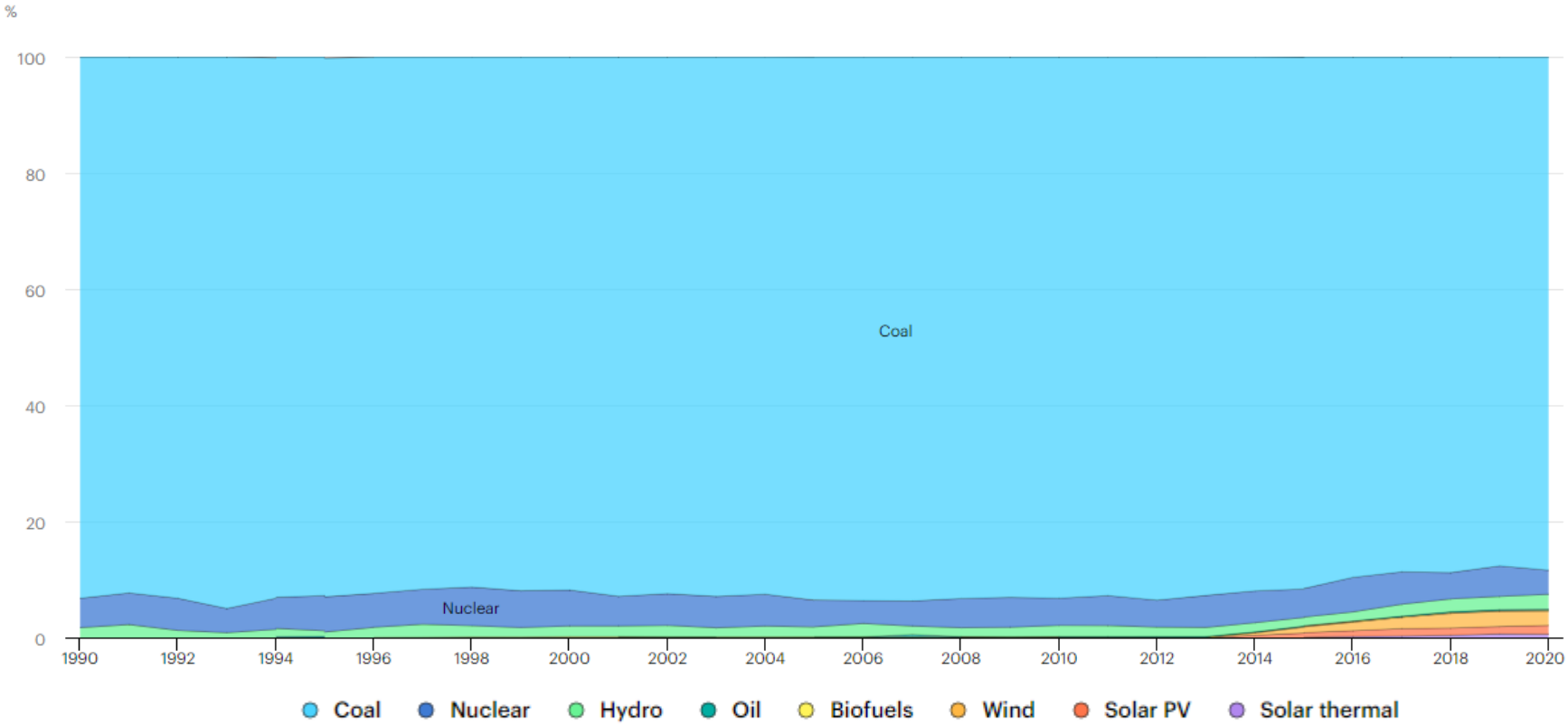
## Coal- Fired Power Plants




Source: Dr. Tobias Bischof-Niemz, 2018, Igniting Eskom Generation: Turning the deadweight into economic fuel. Accessed 17 March 2023.< Igniting Eskom Generation: Turning the deadweight into economic fuel – EE Publishers – Energy Governance South Africa (egsa.org.za)>

# The South African Electricity Landscape

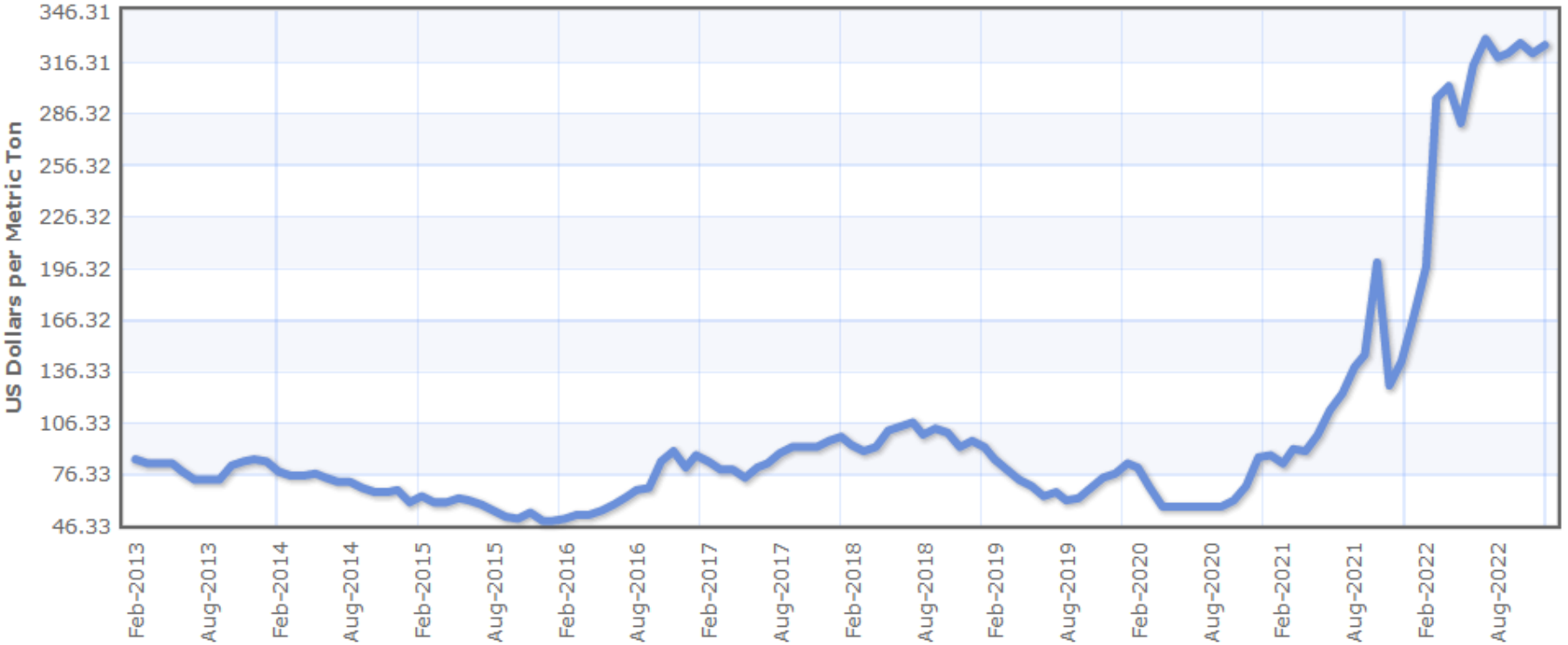
## South African Electricity Generation by Source




Source: https://www.iea.org/countries/south-africa

# The South African Electricity Landscape

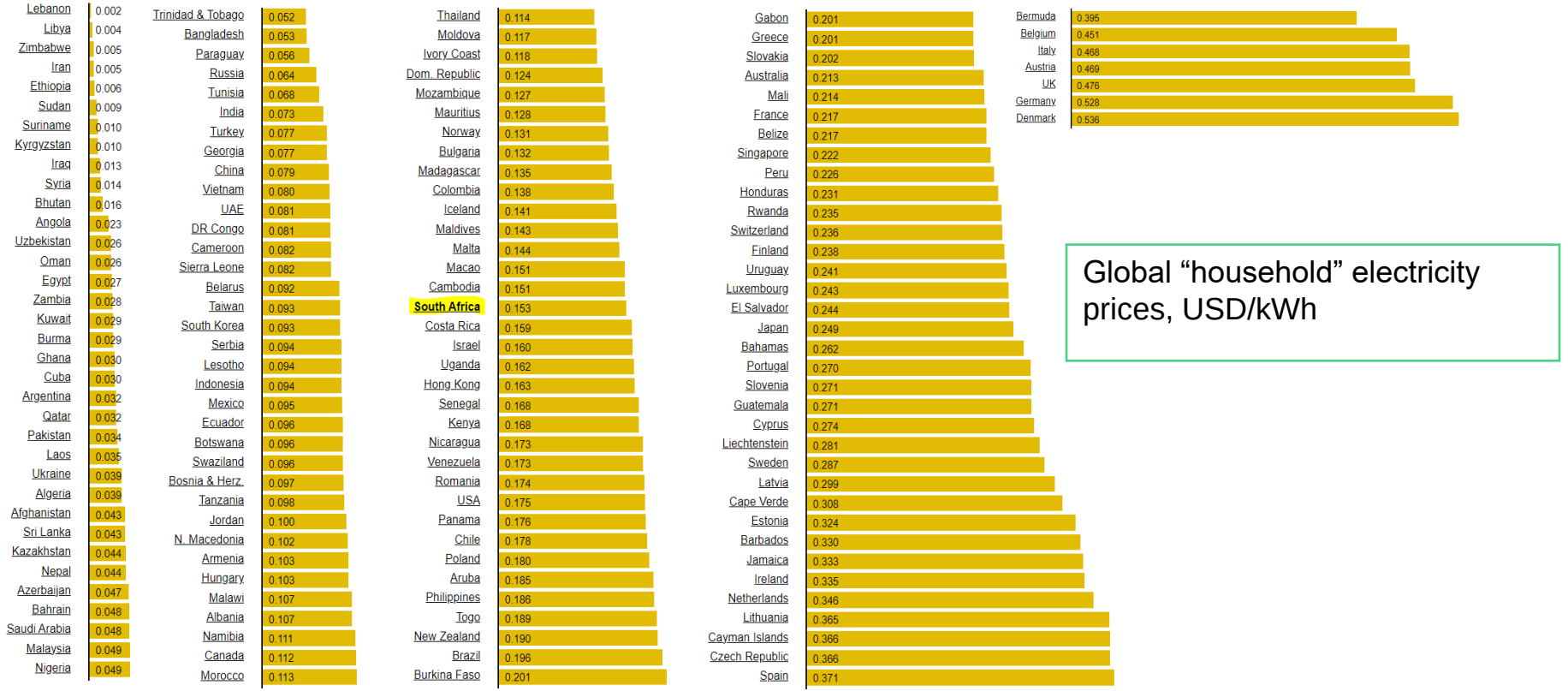
## South African Export Price of Coal




Source: Coal, South African Export Price. Accessed 23 March 2023, < Coal, South African export price - Monthly Price - Commodity Prices - Price Charts, Data, and News – IndexMundi>

# The South African Electricity Landscape

## Global Electricity Prices

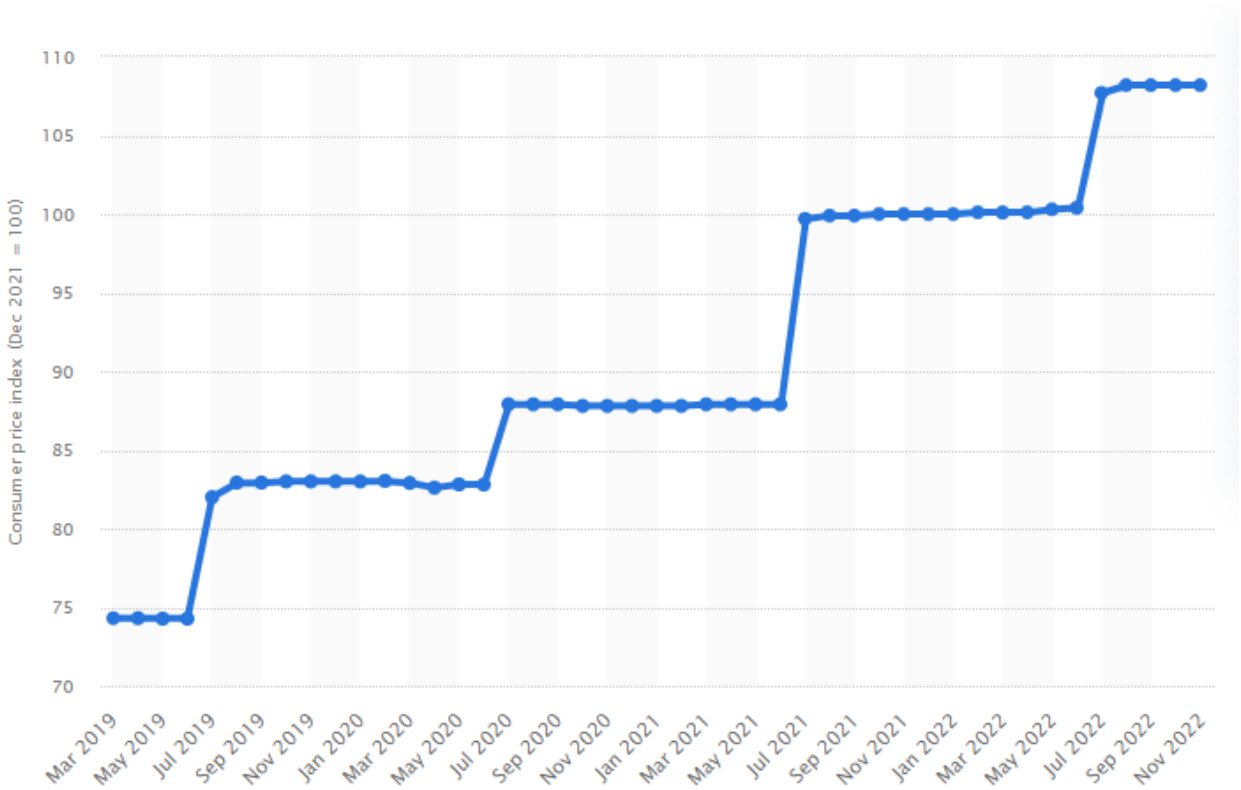



Global “household” electricity prices, USD/kWh

Source: South Africa electricity prices. Accessed 17 March 2023.< South Africa electricity prices, June 2022 | GlobalPetrolPrices.com>

# The South African Electricity Landscape

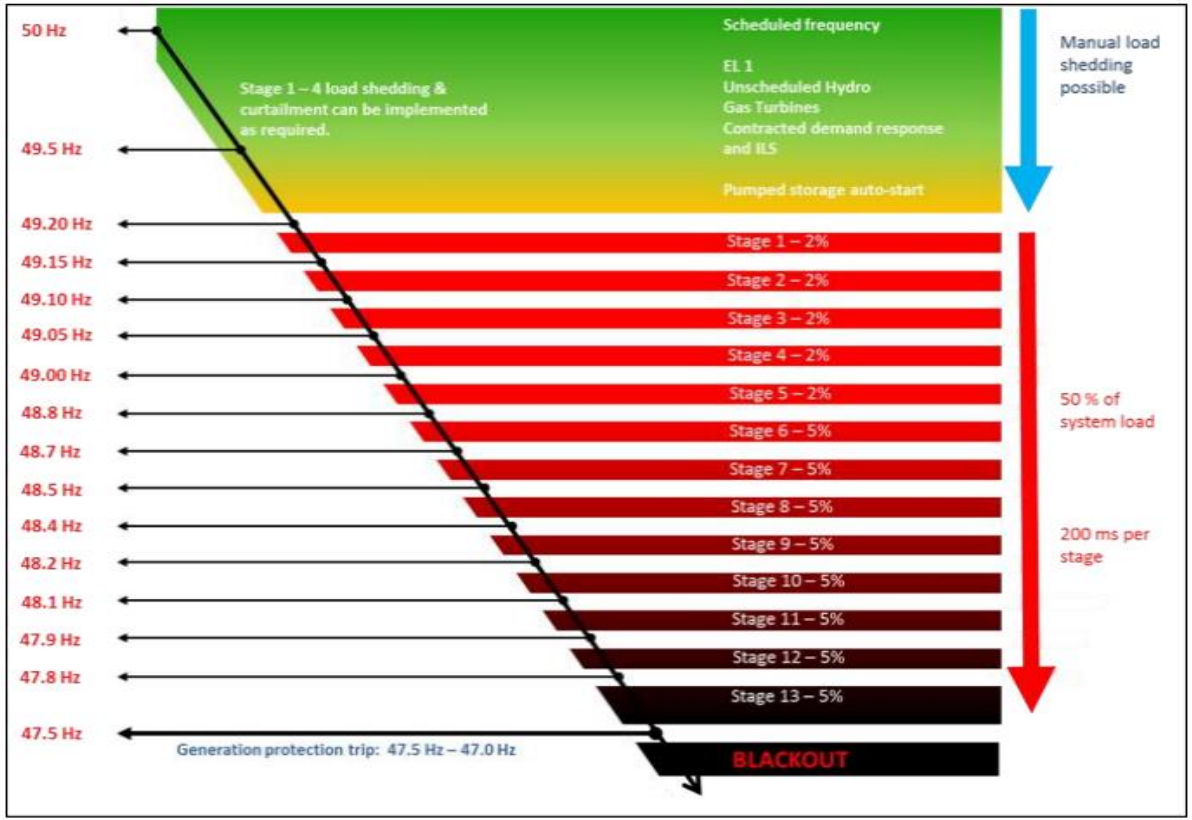
## Consumer price index (CPI) of electricity and other fuels in South Africa




Source: Statista, Accessed 11 April 2023< Consumer price index (CPI) of electricity and other fuels in South Africa from March 2019 to November 2022, November 2022 | https://www.statista.com/statistics/1121528/south-africa-monthly-cpi-electricity-and-other-fuels/>

# The South African Electricity Landscape

## What Does Grid Interruption Look Like?




Source: The South African Grid Code, System Operation Code, Version 10.0, August 2019

# The South African Electricity Landscape

## Possible Remedies

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Add capacity to the grid through generation & networks

Incentives for small scale generation

SASOL – Largest Green Hydrogen Project in Africa

Renewables

# A Global Perspective on Experienced Grid Interruptions

03

Image: Munich Re

# A Global Perspective on Experienced Grid Interruptions

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| Year | Area | People Impacted | Duration of Grid Interruption | Cause |
|---|---|---|---|---|
| 2023 | Pakistan | 220m | 12hrs | Voltage fluctuations due to generators producing too much power |
| 2021 | Texas Freeze | 390k | Several days | 3 severe storms caused grid Interruption after power sources were not winterized |
| 2015 | Pakistan | 140m | 1 day | Rebel attack |
| 2015 | Ukraine | 225k | 6hrs | Cyber attack via phishing emails |
| 2012 | India | 300m people affected on July 30 and 620m people on July 31 | 15hrs | Two grid Interruptions affect northern and eastern India - Circuit breakers on a high voltage line tripped, causing cascading grid interruption and shut down of major power stations |
| 2006 | Germany | Blackout in Germany, France, Belgium, Italy, Austria and Spain | 1hr | Planned shut down executed incorrectly - Safety measures trigger a cascading shut down |
| 2005 | Germany | Thousands of households without power | 2 weeks | Ice storm - Dozens of transmission towers collapse |
| 2003 | Italy | 56m | 12hrs | Tree flashover on power line caused increased demand on other lines and a shut down. This disrupted the power flow from France and Switzerland caused further cascading shut downs and a grid Interruption . |
| 2003 | USA | 55m | 2 days | Largest Blackout in the US - Caused by a software bug in a control room, hindering safety measures for overloaded transmission lines - 100 powerplants cut off from grid |
| 1999 | France | 3.5m homes | Several weeks | Winter storm - Thousands of transmission towers collapse, thousands of km of T&D lines are damaged |
| 1998 | Canada | 4m | Several weeks | Ice storm -Thousands of transmission towers collapse, thousands km of T&D lines are damaged |

# Grid Interruption and Insurance

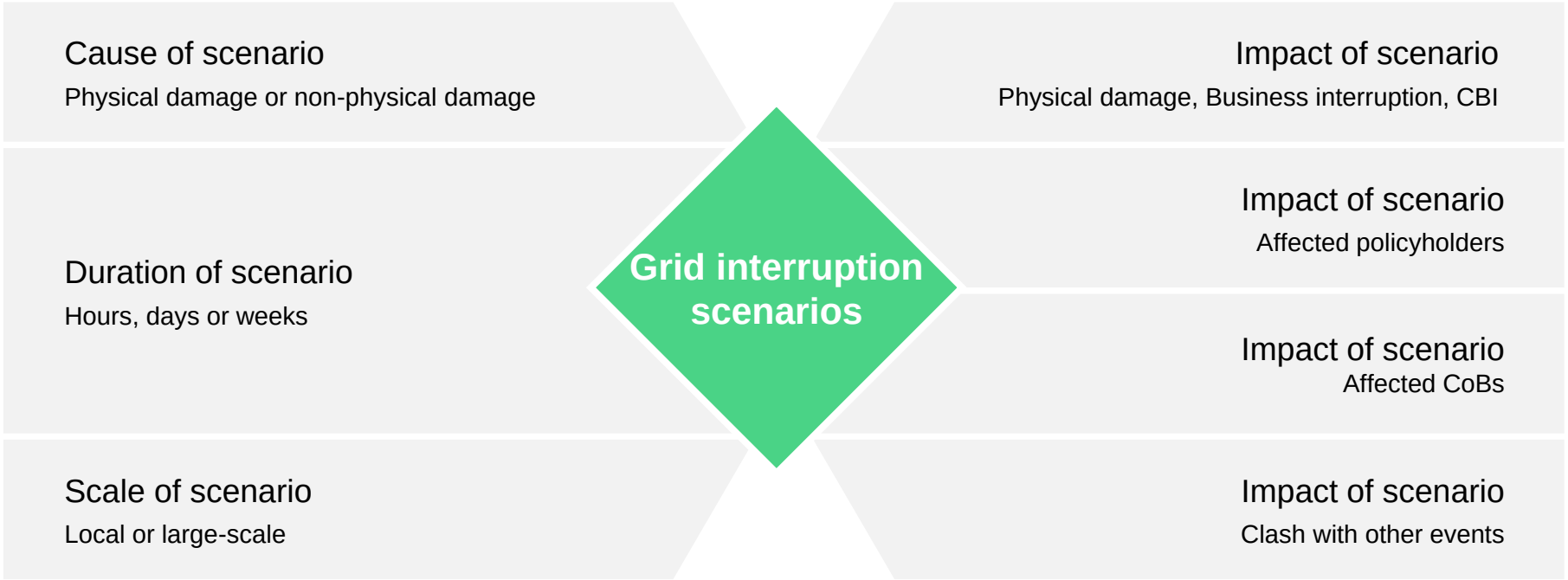
04

Image: Munich Re

# Grid Interruption & Insurance

## Overview of the dimensions of grid interruption scenarios

Focus on property coverages



# Grid Interruption & Insurance

## Overview of different types of grid interruption scenarios

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### Non-physical damage triggered grid interruption

**Grid Interruption**

Planned grid interruptions as risk mitigation measure to avoid a largescale grid interruption or due to order of authorities.

**Grid Interruption due to Network instability**

Safety measures initiate cascading cut off process.

Grid Interruption **due to Cyber event**

A hacker attack causes a system failure and breakdown of one or more electricity providers.

**Grid Interruption due to non-damage accident**

A Grid interruption occurs due to intentional or unintentional operating error.

**Grid interruption scenarios**

### Physical damage triggered grid interruption

**Grid Interruption due to NatCat event**

Grid interruption occurs due to physical damage to T&D lines caused by a storm event.

**Cyber induced but PD triggered Grid Interruption**

Cyber event leads to fires at several generators and causes a Grid Interruption .

**Grid Interruption due to accident**

Grid Interruption occurs due to physical damage caused by a fire or explosion in a power plant or transformer station.

# Grid Interruption & Insurance

## Main Exposures

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| | Affected policyholders | Affected coverages | Exposure |
|---|---|---|---|
| Property | ▪ Power providers<br>  ▪ Power plants<br>▪ Network providers<br>  ▪ Power grid, T&D lines, substations<br>▪ Companies/policyholders that lose power<br>  ▪ Industrial segment - occupancies like aluminium, glass or steel production<br>  ▪ Other industrial occupancies (e.g. automotive industry)<br>  ▪ Commercial segment<br>  ▪ Communication and computer systems<br>  ▪ Logistics<br>  ▪ E-Commerce segment<br>  ▪ Homeowner segment<br>▪ Indirectly affected companies/policyholders<br>  ▪ Customers/Suppliers | **PD/BI, MB, All risk, Homeowners coverages**<br>▪ Machinery breakdown, fires or explosions due to malfunctioning of control systems from voltage and frequency disturbance<br>▪ Uncontrolled restart during power restoration<br>▪ “Freezing” of production processes<br>▪ Pipe water freeze<br>**CBI coverages**<br>▪ Supplier/customer extension coverages<br>  ▪ On standard basis with PD trigger<br>  ▪ Sub-limitations, time deductibles<br>▪ Service interruption coverages<br>  ▪ On standard basis with PD trigger<br>  ▪ Sub-limitations, time deductibles<br>  ▪ Exclusions/limitations for T&D lines<br>**Non-damage BI/CBI coverages –** (not desired)<br>▪ Non-damage BI coverages (without PD trigger)<br>▪ Non-damage CBI (Service interruption) (without PD trigger) | **Coverages would be triggered by a physical damage to the policyholder or supplier/customer caused by grid Interruption**<br>**Service interruption coverage would respond in case of a PD triggered grid Interruption**<br>**Service interruption coverage would respond also in case of a Non-PD triggered grid Interruption** |
| Linked to property | ▪ Commercial risks like retails, supermarkets, shopping malls, key traffic infrastructure, governmental entities, property in city centres | **PD/BI, All risk coverages**<br>▪ In Strike, Riot, Civil commotion incidents following a Blackout scenario with longer duration further losses to property and BI could occur. | |

**Accumulation potential**

# Grid Interruption & Insurance

## Insurability

### Definition of an Insurable Event

- Insurable events are
  - non-ruinous
  - sudden and unforeseen
  - with a probability and magnitude that can be calculated and thus a premium too can be determined.

### Potential Impact

- Conservative Estimate
  - SA GDP in 2021 was USD 419.02 bn, therefore USD1.148 bn per day –> ZAR 20.832 bn
  - Accumulation potential is enormous

### Traditional Areas of Coverage

- Standard Utilities Extensions
- Extended Utilities Clause
- Extended Premises Extensions

### Conclusion

- Large potential impact
- Traditional wordings provide cover, is it the intention to cover grid interruption?
- Each insurer must establish for themselves if they believe wide spread grid interruption is insurable.

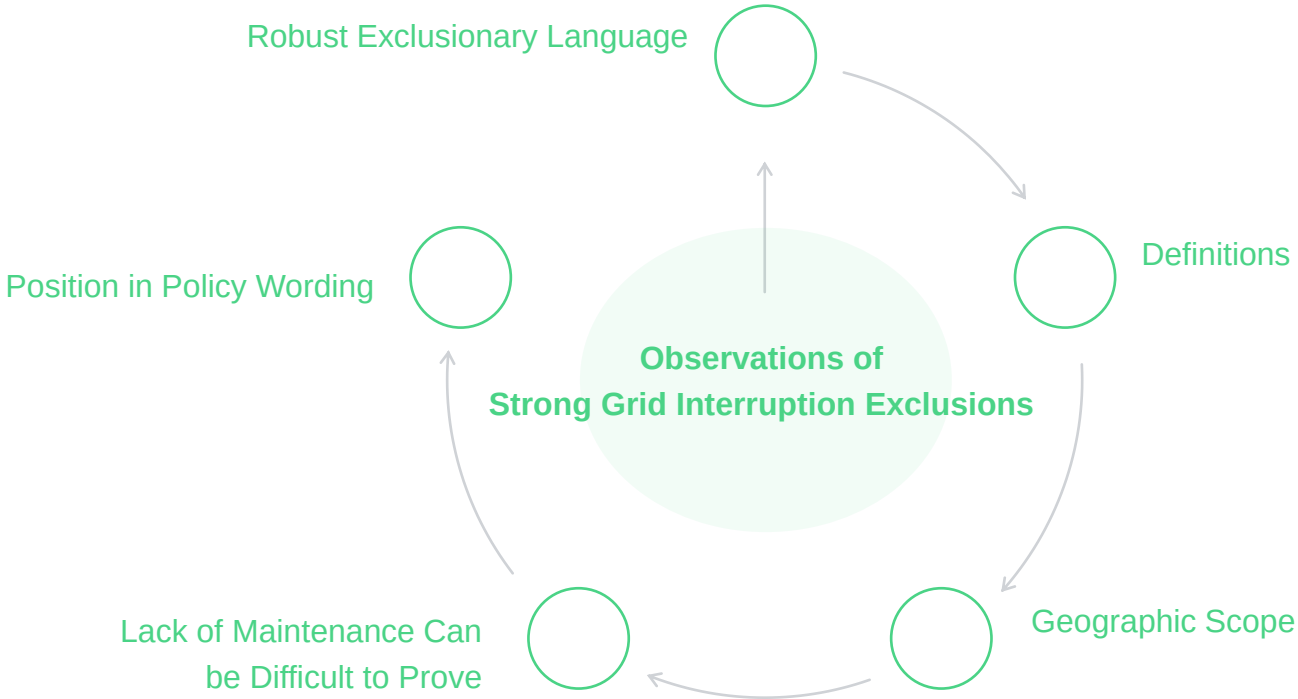
# Considerations

05

Image: Munich Re

# Top 5 Considerations

## If you have decided to include a Grid Interruption Exclusion



# Thank you for your attention!

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