LIMA Programme Grid Interruption

Date: 20/04/2023 Kirsty Hawkins



NOT IF, BUT HOW

Agenda





Background

01

Background Historic Account of South Africa's Energy Landscape







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 >

Volume of Electricity by Category (Gigawatt – hours)



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)>

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Cape Agulhas

What the South African Grid Looks Like



6 Kriel 3 000 MW II Tutuka 3 654 MW 5 Koeberg 1 940 MW 12 Camden | 510 MW 13 Grootvlei 1 200 MW 14 Komati 940 MW e return-to-service (RTS) stations were mothballed in 1990 and are Peak demand stations 360 MW 15 Gariep 16 Vanderkloof 240 MW Pumped storage scheme 17 Drakensberg 1 000 MW 18 Palmiet 400 MW 19 Acacia 171 MW 20Port Rex 171 MW 2I Ankerlig | 338 MW 22 Gourikwa 746 MW Wind Facility 23 Klipheuwel Wind Facility 3 MW 4 788 MW 4 800 MW Pumped storage scheme 1 332 MW 25 Ingula 27 Sere Wind Facility 100 MW 28 Concentrating Solar Power (CSP) 100 MW

6 MW

LI MW

2 MW

7 Lethabo 3 708 MW 8 Majuba 4 110 MW

9 Matimba 3 990 MW

IO Matla 3 600 MW

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

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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)>



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> Lima Grid Interruption 19 April 2023 11

The South African Electricity Landscape Global Electricity Prices

Lebanon 0.002

	0.002	Trinidad & Tobago	0.052	<u>Thailand</u>	0.114	Gabon	0.201	Bermuda	0.395
Libya	0.004	Bangladesh	0.053	Moldova	0.117	Greece	0.201	Belgium	0.451
Zimbabwe	0.005	Paraguay	0.056	Ivory Coast	0.118	Slovakia	0.202	<u>Italy</u>	0.468
Iran	0.005	Russia	0.064	Dom. Republic	0.124	Australia	0.213	Austria	0.469
Ethiopia	0.006	Tunisia	0.068	Mozambique	0 127	Mali	0.214	UK	0.476
Sudan	0.009	India	0.073	Mauritius	0.128	Erance	0.217	<u>Germany</u> Donmark	0.528
Suriname	0.010	Turkey	0.077	Norway	0.131	Belize	0.217	Dennark	0.536
<u>Kyrgyzstan</u>	0.010	Georgia	0.077	Bulgaria	0.132	Singapore	0.222		
Iraq	0.013	China	0.079	Madagascar	0.135	Peru	0.226		
<u>Syria</u>	<mark>0</mark> .014	Vietnam	0.080	Colombia	0.138	Honduras	0.231		
<u>Bhutan</u>	0 <mark>.016</mark>	UAE	0.081	Iceland	0.141	Rwanda	0.235		
Angola	0.023	DR Congo	0.081	Maldives	0.143	Switzerland	0.236		
<u>Uzbekistan</u>	0.026	Cameroon	0.082	Malta	0.144	Finland	0.238		
<u>Oman</u>	0.026	Sierra Leone	0.082	Macao	0.151	Uruguay	0.241		Global "household" electricity
Egypt	0.027	Belarus	0.092	Cambodia	0.151	Luxembourg	0.243		Clobal Household cleatholy
Zambia	0.028	Taiwan	0.093	South Africa	0.153	El Salvador	0.244		prices USD/kWh
Kuwait	0.029	South Korea	0.093	Costa Rica	0.159	Japan	0.249		
Burma	0.029	Serbia	0.094	Israel	0.160	Bahamas	0.262		
Ghana	0.030	Lesotho	0.094	<u>Uganda</u>	0.162	Portugal	0.270		
Cuba	0.030	Indonesia	0.094	Hong Kong	0.163	Slovenia	0.271		
Argentina	0.032	Mexico	0.095	Senegal	0.168	Guatemala	0.271		
Qatar	0.032	Ecuador	0.096	Kenya	0.168	Cyprus	0.274		
Pakistan	0.034	Botswana	0.096	Nicaragua	0.173	Liechtenstein	0.281		
Laos	0.035	Swaziland	0.096	Venezuela	0.173	Sweden	0.287		
Algeria	0.039	Bosnia & Herz.	0.097	Romania	0.174	Latvia	0.299		
Algena	0.039	Tanzania	0.098	USA	0.175	Cape Verde	0.308		
Srilanka	0.043	<u>Jordan</u>	0.100	Panama	0.176	Estonia	0.324		
Kazakhstan	0.043	N. Macedonia	0.102	Chile	0.178	Barbados	0.330		
Nopal	0.044	<u>Armenia</u>	0.103	Poland	0.180	Jamaica	0.333		
Azorbaijan	0.044	Hungary	0.103	Aruba	0.185	Ireland	0.335		
Babrain	0.047	Malawi	0.107	Philippines	0.186	Netherlands	0.346		
Saudi Arabia	0.048	Albania	0.107	Togo	0.189	Lithuania	0.365		
Malaveia	0.048	Namibia	0.111	New Zealand	0.190	Cayman Islands	0.366		
Nideria	0.049	Canada	0.112	Brazil	0.196	Czech Republic	0.366		
nigena	0.049	Morocco	0.113	Burkina Faso	0.201	Spain	0.371		

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





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/> Lima Grid Interruption 19 April 2023 13



What Does Grid Interruption Look Like?



The South African Electricity Landscape Possible Remedies







Renewables



SASOL – Largest Green Hydrogen Project in Africa



Add capacity to the grid through generation & networks Incentives for small scale generation

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A Global Perspective on Experienced Grid Interruptions

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A Global Perspective on Experienced Grid Interruptions



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

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Grid Interruption and Insurance



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

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



	Affected policyholders	Affected coverages	Exposure	
Property	 Power providers Power plants Network providers Power grid, T&D lines, substations Companies/policyholders that lose power Industrial segment - occupancies like aluminium, glass or steel production Other industrial occupancies (e.g. automotive industry) Commercial segment Communication and computer systems Logistics E-Commerce segment 	 PD/BI, MB, All risk, Homeowners coverages Machinery breakdown, fires or explosions due to malfunctioning of control systems from voltage and frequency disturbance Uncontrolled restart during power restoration "Freezing" of production processes Pipe water freeze CBI coverages Supplier/customer extension coverages On standard basis with PD trigger Sub-limitations, time deductibles Service interruption coverages 	Coverages would be triggered by a physical damage to the policyholder or supplier/customer caused by grid Interruption	Accumulation potential
	 Homeowner segment Indirectly affected companies/policyholders Customers/Suppliers 	 Sub-limitations, time deductibles Exclusions/limitations for T&D lines Non-damage BI/CBI coverages – (not desired) Non-damage BI coverages (without PD trigger) Non-damage CBI (Service interruption) (without PD trigger) 	PD triggered grid Interruption 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

 In Strike, Riot, Civil commotion incidents following a Blackout scenario with longer duration further losses to property and Bl could occur.

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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





Top 5 Considerations If you have decided to include a Grid Interruption Exclusion



Thank you for your attention!

Date: 20/04/2023 Kirsty Hawkins



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