

## Load Shedding in South Africa: What should Sozo do?

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### *Abstract*

As available power supply falls well short of demand, South Africans experience lengthy, daily power outages known as load shedding. The lack of power is disruptive to businesses and slows progress towards accomplishing organizational goals. Sozo Foundation, a non-profit organization seeking to educate and empower youth through training to achieve employment, frequently finds its operations disrupted when power fails. Sozo has several options: adjust to power outages and wait for the South African government to upgrade the power grid; obtain funding and purchase batteries or a generator; or purchase solar panels to produce solar energy sufficient to meet the needs of Sozo's operations and sell excess power into the network. What should Sozo do?

## **INTRODUCTION**

The Sozo Foundation is a non-profit organization focused on improving the lives of those living in the one square kilometer area of Vrygrond, an impoverished community in Cape Town, South Africa. Vrygrond has a high level of poverty, rampant drug and alcohol abuse, extensive gang activity, and prostitution, leading to many street children. Unemployment levels exceed 77%, and high school graduation is not common. Because many jobs in South Africa require a high school diploma, the cycle of poverty and abuse continues.

Enter the Sozo Foundation. Founded in 2010, this non-profit has as its mission to empower the youth of Vrygrond to “live with dignity, purpose, and hope by creating pathways to employment.”<sup>i</sup> Sozo helps students earn their GED’s and provides students with training for a trade such as coding, web development, baking, barista skills, and hair and makeup training to enable students to work for organizations or open their own businesses. Since 2011, over 891 youth’s lives have been impacted, with an 81% GED pass rate in 2021.<sup>ii</sup>

Because of an insufficient power supply in South Africa, the country practices load shedding, the process of regularly turning off the power in a region for a period of time. This practice makes it difficult for Sozo to serve its clientele since it needs power for the computers and equipment necessary to teach skills to the students. To create a long-term solution, Sozo is considering developing its own power supply through the use of batteries, generators and/or solar panels; it is trying to decide which alternative power supplies make the most sense.

## **SOZO FOUNDATION<sup>iii</sup>**

In 2010, spouses Anton and Elana Cuyler returned to Cape Town, South Africa to volunteer as youth workers. They formed a youth group in Vrygrond township, an overcrowded and under-resourced one square kilometer home to 45,000 residents<sup>iv</sup>. Given the community has no police force, high school or medical facilities, Vrygrond residents suffer from criminal activity, gangs, drug abuse and prostitution, and an under-educated, poverty-stricken, unemployed population.

Sozo, a Greek word meaning to keep safe, to rescue from danger or destruction, has four primary areas of focus: education, skills development, social enterprise, and entrepreneurship.<sup>v</sup> The education activities represent 40% of the Foundation’s work and resources; the skills development work is 35% of Sozo’s efforts; social enterprise represents 15% of the work and resources, with entrepreneurship comprising the final 10%.

In the area of skills development, community members can learn new trades or improve upon existing knowledge. The goal is to provide tools to generate an income and to help community members rise out of poverty. The education focus is helping Vrygrond youth earn a GED to help to secure a job to end the cycle of poverty. Social enterprise places youth in apprenticeships and on-the-job training in industry. And entrepreneurship helps young people start and run their own businesses.

Figure one is a graphic representation of the Sozo model. As Anton Cuyler notes,

*“The youth development model has evolved in the more than twelve years of community-based youth work and continues to innovate and evolve. In contrast, our impact goal has remained unchanged and simple; develop youth employability, leading to youth employment. Just as any healthy natural ecosystem has an inflow and outflow that enables life to exist and thrive, we also apply an inflow-outflow philosophy. We don’t “keep kids busy and off the streets” nor subscribe to a “settling mentality”. We offer a variety of inflow opportunities to youth who find themselves at various stages of life and in different states of mind and heart. Once a young person becomes part of the ecosystem, there are many opportunities for growth, development and movement. These interactions are where the ecosystem begins to take care of itself. We realise youth developmental states are uniquely different, and youth will exit the ecosystem at different stages. It remains core to our vision that every youth enters a pathway that leads to the biosphere of further education, training and, ultimately, youth employment. Our most essential nutrient within the ecosystem is our cultivated value of UNCONDITIONAL LOVE.”*

#### **A. Education**

South Africa’s math and science scores are rated the worst of the 148 countries surveyed.<sup>vi</sup> A poor educational system is not the only problem: poverty, lack of resources and unsafe spaces have led to over 50% of South Africans not completing high school, leading to a cycle of high unemployment, disillusionment about their future, gang culture and drug and alcohol abuse.<sup>vii</sup>

Sozo provides students with the resources to complete a self-paced, fully online GED program. Completion of the program provides students with access to employment where a high school diploma is a minimum requirement. It also provides students with the opportunity to enroll in college or technical school. Sozo also provides a GED bridging school program that prepares students for the GED program by closing the numeracy and literacy gaps over the course of a year to allow these students to be up to the GED standard when enrolling in the GED program. This helps greatly with the success rate for GED students.

In addition to the GED, Sozo offers life skills courses, after-school tutoring and mentoring, and personal development courses. All students of Sozo’s programs have direct access to psycho-social-intervention support which is a crucial component of Sozo’s model. This dedicated team of professional social workers also develops internal resilience and mental health self-regulation skills to support the students to deal with, and process, trauma. Sozo believes students cannot learn when they are hungry, so nutritional meals are provided. And students cannot aspire to that which they do not know, so students are exposed to career opportunities through career-inspiring initiatives.

## **B. Skills Development**

Youth unemployment is among the highest in the world, with a rate of 68% as of 2019.<sup>viii</sup> To prepare the youth of Vrygrond for employment, Sozo Foundation works on the following:

- **Life Skills**

Life Skills, also referred to as ‘employability skills’, are those that are completely transferable between industries and occupations. Lack of life skills are often the reason employees lose jobs. Sozo teaches the students skills of goal setting, financial management, sexual and emotional health, timekeeping and communication. The sessions also address themes of resilience, teamwork, and leadership.

- **Vocational Skills Schools**

The six months of vocational skills courses are vital to entry level access to the job market for students. The majority of students have been out of the educational system for many years. Sozo provides them with an employable skill through in-depth training, as well as peer to peer learning. Skills range from barista and baking skills to hairdressing and beautician skills, construction and coding (which allows students to earn certification through Amazon Web Services.)

- **Job Shadowing**

Sozo provides real marketplace experience for students. This is often the first time students have been in a real job environment. Sozo built a network of partnerships for job shadowing opportunities with local businesses and companies. Often these businesses offer students jobs upon graduation.

- **Job Readiness**

Students are assisted with developing an up-to-date resume with which to apply for jobs. Students engage in job searching, interview preparation and practice. Sozo works with a variety of community partners and businesses to help implement this phase.

## **C. Social Enterprise**

Of the 6.7 million unemployed youth in South Africa as of 2019, 75% have no work experience.<sup>ix</sup> Sozo has three social enterprises to provide students with work experience.

- The Wild Goose Artisan Bakery and Artisan Baking School is a social enterprise seeking to train and support unemployed young people. Proceeds from the bakery are used to support the training of future bakers.

- The Dancing Goat Roastery provides mobile coffee events with trained baristas and a mobile coffee cart to serve espresso-based and other hot drinks at various venues for events.
- The Kingdom Builders is a social enterprise maintenance and construction crew that seeks to train and employ young people through its apprenticeship program.

#### **D. Genesis Incubation Hub**

In 2023 Sozo officially launched a new incubation hub for 16 youth-owned micro-businesses to create local employment through one-on-one mentorship and coaching. Sozo provides hub space for internet access, business training and workshops to increase the likelihood of success and growth of these businesses.

#### **LOAD SHEDDING**

Load shedding distributes demand for electrical power across multiple power sources and is used to relieve stress on the power supply when demand for electricity is greater than supply. To prevent the power grid from overloading, load shedding rotates power outages by reducing consumption until capacity is available. During load shedding, customers without alternative sources of power (batteries, generators, solar) have no power.<sup>x</sup> In South Africa's case, the need for load shedding arises due to insufficient generation capacity at power plants.

Eskom, the monopoly power supplier in South Africa, was once considered state of the art. Now the power system, almost entirely comprised of aging coal-fired generators, is subject to poor management, corruption, and sabotage. Figure two shows South Africa's dependence upon coal.<sup>xi</sup> Some predict it may be 10-15 years before Eskom can build adequate new generation facilities to meet the needs of South Africans.

Because of the crisis state in South Africa, in 2021 President Cyril Ramaphosa announced the Electricity Regulation Act that will allow independent power producers to produce up to 100 MW of generated power.<sup>xii</sup> With the assistance of funds from Western nations, the monopoly of Eskom may be ending as South Africa takes advantage of its wind and solar resources to generate power. Load shedding, in February 2023, has reached stage six, meaning Eskom needs to remove demand for up to 6,000 megawatts from the national grid, leaving South Africans without alternative power sources in the dark for up to ten hours per day.<sup>xiii</sup>

The transition to renewable energy sources is not without its costs: many worry about the loss of jobs in coal mines from the move away from coal-fired power plants. However, others warn the entire power grid may collapse leaving the country in darkness. Sozo must determine whether it has the resources to fund alternative sources of power for its operations.

## ALTERNATIVE POWER SOURCES

South Africa has extreme weather: it is very hot in the summer months and extremely cold in winter months. The current way to maintain a comfortable environment in Sozo buildings is not terribly efficient: there are individual office air conditioners for summer and individual heaters in the winter. The monthly power bills for Sozo amount to 50,000 RND (or approximately \$2,500 per month). Eskom has been increasing the cost of power at least twice each year, and the size of the increases is not capped by regulators: in July, 2023 alone, power costs increased by 18%.

To house its operations, The Sozo Foundation works out of four different buildings located throughout Vrygrond. To power the buildings, the foundation has numerous choices:

- it can continue to use Eskom power exclusively, meaning that Sozo's operations will be subject to power outages during load shedding;
- It can install lithium batteries; the batteries provide backup power during load shedding and need to be recharged after each use. Recharging can occur through the use of solar power;
- It can install a diesel generator. The generator can be used during load shedding to maintain consistent power;
- It can install solar panels. The panels can generate power to be used to pull Sozo off of the Eskom grid to reduce the monthly power bill for Sozo; and
- It can purchase inverters to take the excess power created from the solar panels and sell that power into the network, thus creating a revenue source for Sozo.
- Sozo can also combine several of these power sources and create a new power source for its operations, and may be able to go off of the Eskom power grid altogether. For example, in order to no longer be dependent upon power from Eskom, Sozo would need generators, solar panels and inverters. This would enable Sozo to generate revenue in addition to saving costs.

The power needs in each building are as follows:

Education center: The Education Center needs battery power or a diesel generator since the computers are housed in this building. If using batteries instead of generators, Sozo could purchase 25 kw batteries (lithium) at a cost of 37,000 RND each; the Education Center would need battery power from five batteries per hour, and with double load shedding, the Foundation would need to quadruple the number of batteries at a total cost 750,000 RND per load shed. Batteries do not generate power to sell into the power grid since it takes a good deal of time to recharge the batteries at night, so no solar panels would be necessary.

The alternative power source, a diesel generator, would require the purchase of a 25 kva generator and peripherals to maintain consistent power during load shedding. This building

currently has solar panels that were installed last year, and has the correct inverters to store power and sell it into the grid. The generator cost is 170,000 RND<sup>xiv</sup>.

Skills center: The Skills Center load is 25 kw and would therefore need five x five kw batteries per hour of load shedding at a cost of 30,000 RND per battery. Sozo needs to prepare for 2.5 hours of load shedding in this building; therefore it would require 13 batteries at 5 kw each for a total cost of 390,000 RND.

If purchasing a generator, the skills center needs a 25 kva generator at a cost of 170,000 RND. The skills center building does not currently have solar panels. The Center would need a full solar system to save on power costs to lower the electricity bills and to generate power to resell into the grid. Sozo needs an additional 400,000 RND to purchase solar panels to generate power and sell into the network.

Entrepreneurship center: The load for the entrepreneurship center is 15 kw. This building would need 3 x 5 kw batteries per hour at a cost of 30,000 RND per hour. To prepare for 2.5 hours with no power during load shedding, the entrepreneurship center would need to spend 225,000 RND for battery power.

The entrepreneurship center currently has no alternative power sources. The cost for the generator for this building is 102,000 RND. If Sozo wants to also be able to sell power into the power grid, the entrepreneurship center additionally needs a 5 kw inverter, 15 kw backup batteries, and solar system with generation capacity. The solar system for this smaller building costs 300,000 RND. This Center uses less power and can therefore more easily manage with batteries as backups instead of generators.

Social Enterprise: The social enterprise center is similar in size to the entrepreneurship center and requires 15 kw of power. For battery power, this requires an investment of 225,000 RND. For generators, this building needs a 25 kv generator (125,000 RND) because of the power tools that are running and use a lot of power; the building also needs a solar system for 250,000 RND if Sozo wants to sell excess power into the grid.

Since the school shuts down for holidays, summer vacation, etc. this accounts for approximately nine weeks of shut down time per year; all power generated in buildings with solar systems during these shutdowns could sell that power into the grid. Also the Center closes at 5:00 pm each evening, and the sun can shine until 9:00 pm in Cape Town, Alton believes there will be excess power that can be generated and sold each evening.

The assumptions in developing the costs associated with these alternative power solutions are as follows:

- Load shedding will exist for ten more years as Eskom works to overcome its challenges to provide adequate power for the citizens of South Africa



- The useful life of batteries is ten years; generators also have a ten year life while solar panels have a 20 year life
- Although power costs increased by 18% in July, 2023, to be conservative, we presume power will increase in cost by 5% annually
- Revenue will increase by 3% per year
- Operating costs will increase by 3% annually
- If Sozo is able to generate its own power through the use of solar panels, it will save 33% of operating costs annually
- The market risk premium in South Africa in 2023 is 8.7%<sup>xv</sup>
- The cost of debt for short-term government bonds in South Africa is 8.57%<sup>xvi</sup>
- If Sozo is able to purchase solar panels, it is estimated it will have 1,704 hours of power to sell into the network in 2023; this volume of sales is anticipated to increase by 3% annually

### **The Cost of No Backup Power Supplies**

Alton quantified the cost of being without power during load shedding. As an example, he discussed the coding school.

*“There are licenses for 12 students, and to participate in the coding certificate program, it costs Sozo 360,000 RND annually. These aspiring web developers don’t have an alternative activity when the power is out. When Sozo is load shedding and cannot go online, students don’t come into the Center on those days since they cannot access the lessons. The lessons go on even if the students are not able to access the content. If the students cannot pass the exam, they cannot get certified. Currently, I estimate it takes students 33% more time to complete the certification since content cannot be delivered on time.”*

Overall, the costs for all programs are about one-third higher due to delays and waiting time caused by load shedding. Fixed costs, salaries, etc. all stay the same regardless of load shedding, but output is not increasing. Across all programs, approximately one-third of productivity time is lost due to power outages. Anton estimates the cost is 4 million RND per year.

More concerning to the colleagues at Sozo is the worry about students becoming disenchanted due to the delays in their education due to load shedding. For a student lost to the system, the cost of incarceration in South Africa is 300,000 RND per person per year.

Alton believes the investment in alternative power will pay back within the first 18 months; do you agree?<sup>xvii</sup>

Figure 1: The Sozo mission model

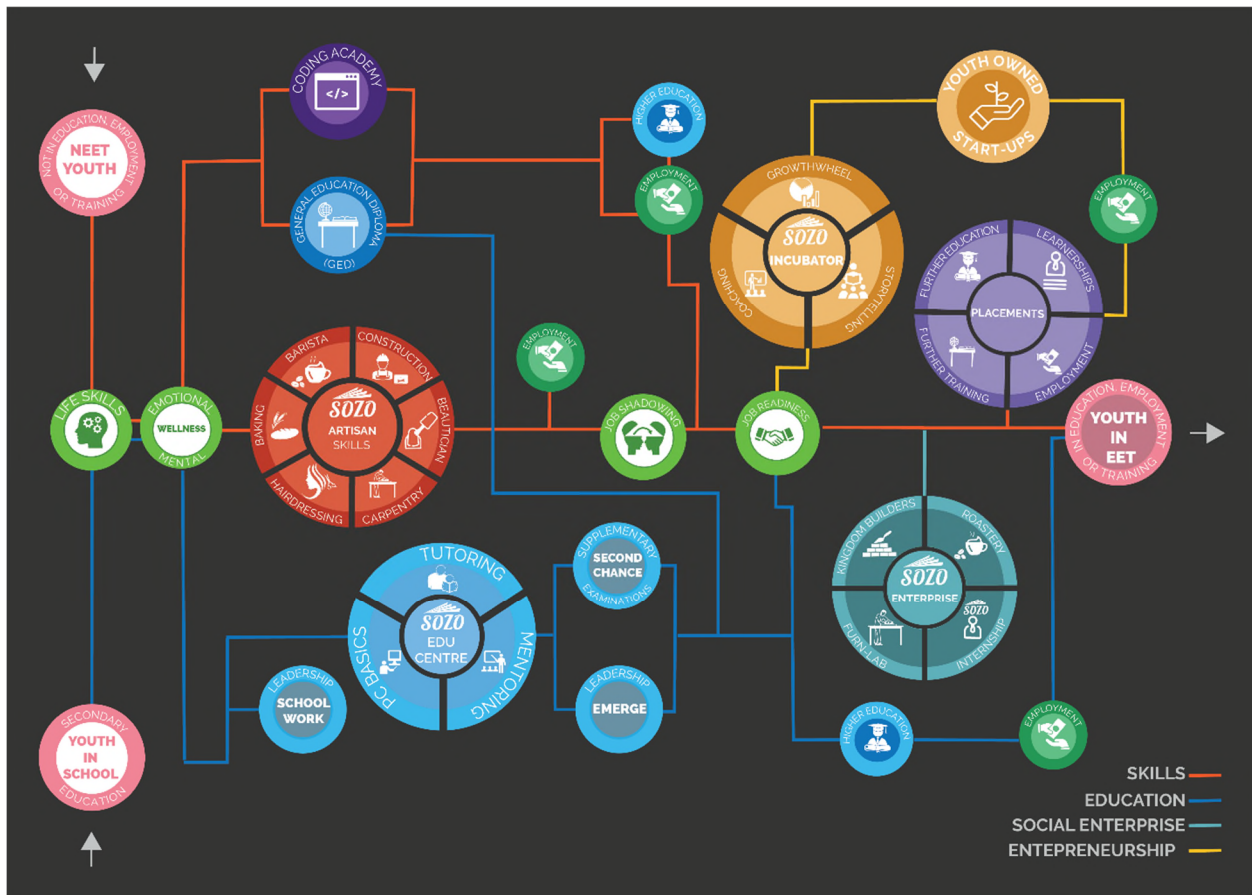


Figure 2 Sources of Power in South Africa

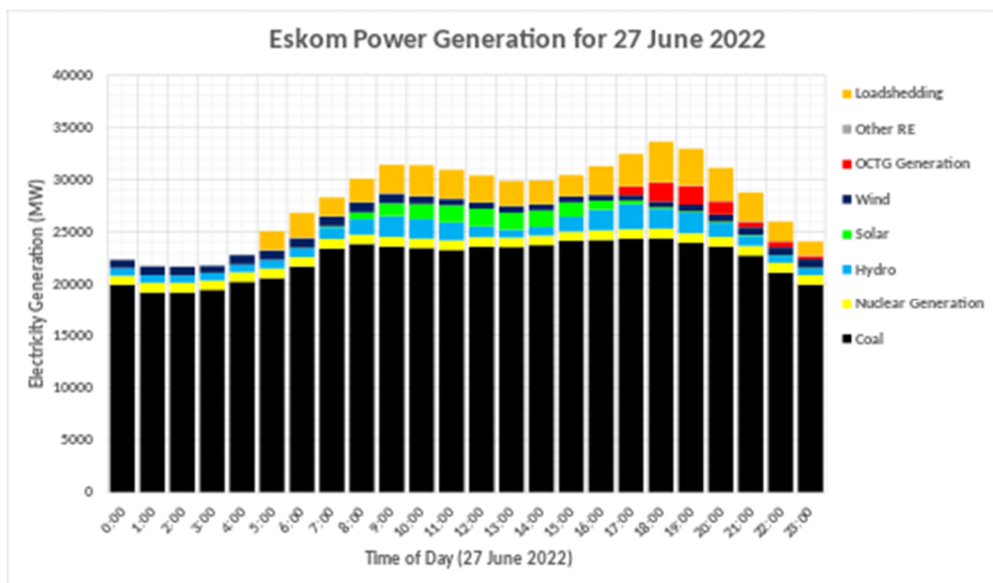
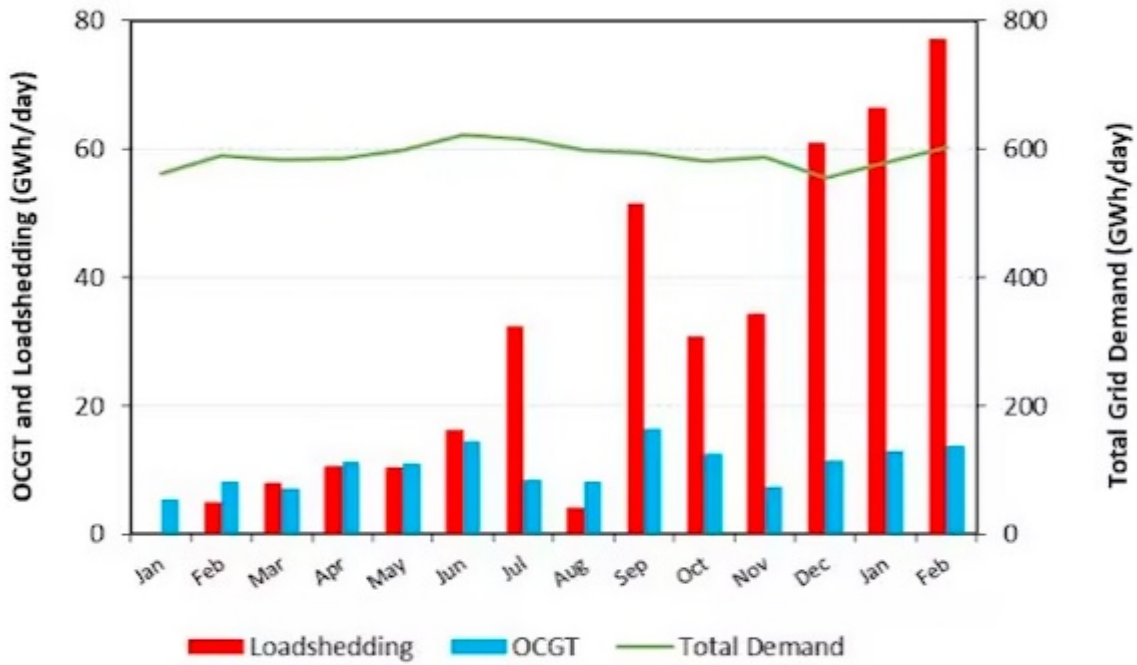


Figure 3 Load Shedding in South Africa<sup>xviii</sup>



David Richard Walwyn

Figure 4 Sozo Foundation Income Statement, 2022

**The Sozo Foundation Trust**

Formerly The Nceda Trust  
 (Registration number: IT 1524/2002)  
 Annual Financial Statements for the year ended 28 February 2022

**Statement of Comprehensive Income**

Figures in Rand	Note(s)	2022	2021
Revenue	9	11,693,896	8,963,117
Other income	10	643,695	451,220
Operating expenses		(11,226,615)	(8,329,512)
<b>Operating surplus</b>		<b>1,110,976</b>	<b>1,084,825</b>
Investment revenue	11	130,391	108,024
Capital expenditure	12	(916,198)	(374,295)
<b>Surplus for the year</b>		<b>325,169</b>	<b>818,554</b>

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- ii <https://thesozofoundation.org.za/>
- ii <https://thesozofoundation.org.za/educentre/>
- iii See the Sozo Foundation homepage for much of this content <https://thesozofoundation.org.za/>
- iv Note: “youth” is defined as individuals between the ages of 18-30.
- v <https://www.biblestudytools.com/lexicons/greek/nas/sozo.html>
- vi World Economic Forum, 2014. Global Competitiveness Report for 2014–2015
- vii Department of Basic Education, Republic of South Africa, 2015
- viii Expanded youth unemployment rate. Statistics South Africa Labour Force Survey 2019
- ix Harambee 2019 “Youth is defined as 18-30.
- x <https://www.techtarget.com/searchdatacenter/definition/load-shedding>
- xi <https://www.bbc.com/news/world-africa-65671718>
- xii <https://mg.co.za/news/2021-06-10-ramaphosa-unveils-policy-amendments-to-help-struggling-eskom/>
- xiii <https://www.reuters.com/world/africa/south-africas-eskom-ramps-up-power-cuts-stage-6-2023-02-20/>
- xiv Presume one South African Rand is equal to \$.05 US.
- xv <https://www.statista.com/statistics/664880/average-market-risk-premium-south-africa/>
- xvi <https://www.ceicdata.com/en/indicator/south-africa/short-term-government-bond-yield>
- xvii Presume excess power can be sold back at half of its retail price; presume Sozo will be able to generate enough excess power to sell the equivalent of 10% of its current monthly power bill back to Eskom.
- xviii <https://www.esi-africa.com/industry-sectors/generation/why-south-africas-new-electricity-minister-should-listen-to-what-the-former-utility-ceo-said/>