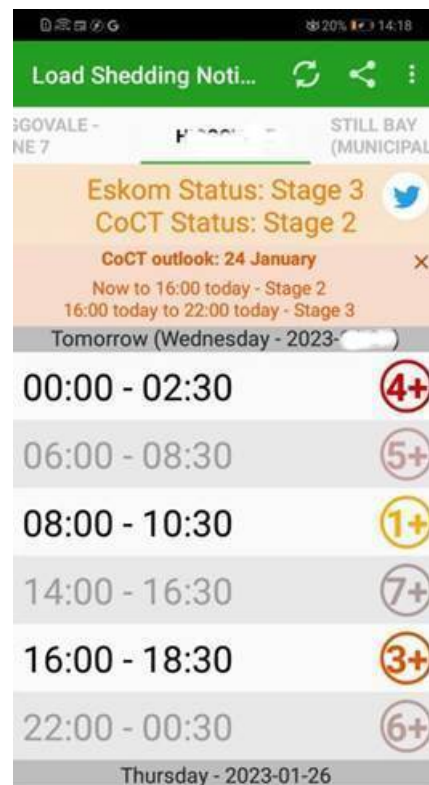




LEAN THINKING AND LOAD SHEDDING IN SOUTH AFRICA



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LEAN THINKING AND LOAD SHEDDING IN SOUTH AFRICA

By Carlo Scodanibbio – January 2023

From a few years already, a new wording is becoming more used and popular in South Africa: “**Load Shedding**”.

WHAT IS LOAD SHEDDING

Load shedding is a measure of last resort taken by Eskom (South Africa’s largest producer of electricity) when power demand begins to exceed possible supply. To avoid a nationwide blackout and total collapse of the power grid, Eskom rations the available supply between different districts according to a published schedule. (Source: Bing.com)

So, Load Shedding means that – at certain, pre-planned times of the day or the night – the Mains Power Supply is cut-off, or disconnected, for a duration of approximately 2 hours, to private, commercial and industrial dwellings; in pre-planned areas of the Country. This may happen once, twice, three times and even 4 times a day. According to a well-conceived schedule, that:

- Takes into consideration available supply and demand in any given area or district
- Accordingly, sets a plan to ration the available supply to each area or district
- In a spirit of justice or fairness, i.e. without penalizing any area or district - in rotation throughout the day

According to Scout Africa (<https://scoutafrica.net/load-shedding-in-south-africa/>):

“””

Load shedding is an energy utility’s method of reducing demand on the energy generation system by temporarily switching off the distribution of energy to certain geographical areas.

South Africa has experienced load shedding since 2007 because the country failed to build new power stations to keep up with economic growth and replace ageing generation plants.

Load shedding is aimed at removing load from the power system when there is an imbalance between the electricity available and the demand for electricity. If we did not shed load, then the whole national power system would switch off and no one would have electricity.

Why is shedding load necessary? Shedding load is required when the demand for electricity approaches supply, creating the potential for a dangerous imbalance. It’s a way to help reduce power demand by turning power off to some customers to help prevent longer, larger outages.

The planned schedules ensure that available capacity is shared fairly and each consumer gets power at one time or another.

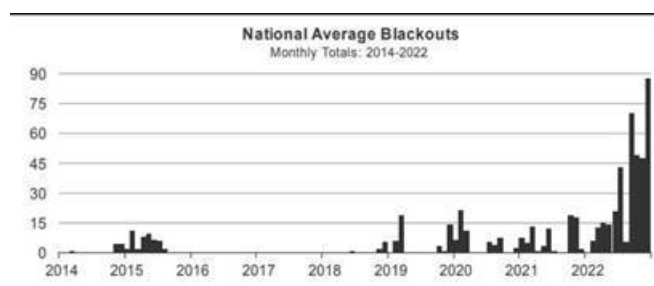
South Africa experienced over 150 days of load shedding in 2022, up from 75 in 2021 and 54 in 2020.

Analysis by Eskom Research, also shows that, besides 2021, there were more power cuts in September than had been experienced in any other entire year since load-shedding started in 2007.

“””

According to BusinessTech (<https://businesstech.co.za/news/energy/658345/eskom-clarifies-permanent-load-shedding-for-south-africa/>), this has been the recent trend:

“””



“””

According to Generator King (<https://www.genking.co.za/news/the-economic-consequences-of-load-shedding-in-south-africa-and/>):

“””

An energy expert has estimated the cost of controlled blackouts in South Africa and highlighted the serious negative economic impact thereof. Stage 1 (see below) load shedding resulting in 10 hours of blackouts per day for 20 days a month results in losses of R20 billion per month. Using the same time parameters, Stage 2 (see below) load shedding costs the economy R40 billion per month and Stage 3 (see below) is estimated to cost the South African economy R80 billion per month. These costs, according to Yelland, to the productive economy are based on a cost of unserved energy of R100 per kWh. When one considers that the approximate GDP of South Africa in 2014 was R4 trillion approximately 1-2% of GDP could potentially be wiped out per month of load shedding.

“””

The above is the picture of Load Shedding in South Africa.

It's not within the scope of this Newsletter to analyze the causes (not planning in due time the provision of new power stations? Poor maintenance of the existing power system? Etc.) of this rather worrying situation and to describe its impact on industry, businesses, and the man in the street.

The scope of this Newsletter is to discover if – by applying Lean Thinking approaches – a solution to the problem may be found in the medium term.

To the purpose I need to describe some more features of the Load Shedding issue.

THE LOAD SHEDDING SCHEDULE – THE STAGES

According to Softbacktravel ([https://softbacktravel.com/what-is-load-shedding/#:~:text=Load%20shedding%20is%20a%20measure%20of%20last%20resort,between%20different%20districts%20according%20to%20a%20published%20schedule.\):](https://softbacktravel.com/what-is-load-shedding/#:~:text=Load%20shedding%20is%20a%20measure%20of%20last%20resort,between%20different%20districts%20according%20to%20a%20published%20schedule.):)

“””

As of 2020, there are a total of 8 Load Shedding stages. The higher the stage, the more frequently one would experience electricity cuts.

The stage is determined by Eskom and depends on the number of megawatts needed to balance the power grid.



Once a schedule has been agreed upon, Eskom and the municipalities implement the load shedding plan on a rotational basis.

Load shedding will then commence for 2 – 4 hours at a time, depending on the stage and also on the area. For example, in stage 8 power will be turned off throughout the day for a total of 12 hours.

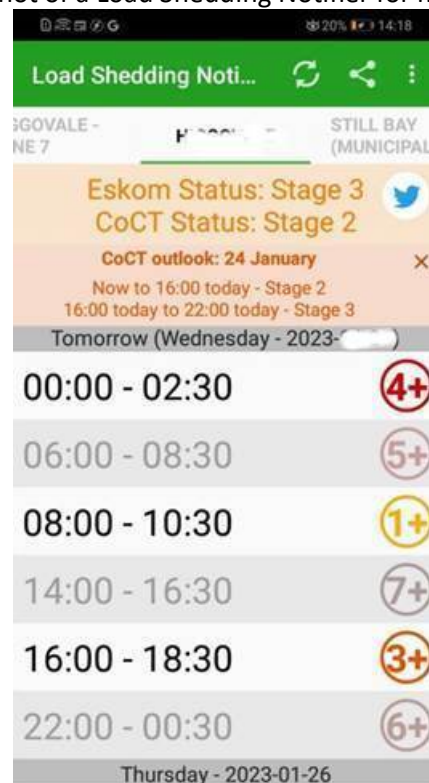
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Rather complex, isn't it?

Let me go into further details. Now, according to my interpretation of this complex schedule:

- Eskom and local Municipalities in each District, agree on a certain Stage for a certain day (or part of that day)
- And for each day of the months ahead, they provisionally assign a Stage to a certain interval of time (theoretically: 2,5 hours – in practice: +- 2 hours of power off) of each day.
- For instance, in the area of Cape Town in which I live, in a typical day of January 2023 the Stage Schedule might be as follows:
 - 00:00 – 02:30 Stage 4+
 - 06:00 – 08:30 Stage 5+
 - 08:00 – 10:30 Stage 1+
 - 14:00 – 16:30 Stage 7+
 - 16:00 – 18:30 Stage 3+
 - 22:00 – 00:30 Stage 6+
- Each Stage (except Stage1), includes lower Stages
- So, Stage 5 for instance, would include Stage 4, Stage 3, Stage 2 and Stage 1
- So, in the typical day above: if the Stage of the Day for my area is Stage 3, I would get no power between 08:00 and 10:30 (because Stage 1 is lower than Stage 3) – and between 16:00 and 18:30 (because it has been assigned Stage 3)
- But if in the typical day above the Stage for my area would be Stage 7 (or 8), I would get no power for 6 intervals of time that day, for a total of 12 practical hours out of 24 in the dark!

Here it is, what follows is a screenshot of a Load Shedding Notifier for my area in a typical day:



Got the concept?

Now: how does the man in the street know about any day's schedule?

Either browsing the web: Eskom web site and others – or installing a fantastic App on his mobile phone!

There are 2 Apps that I know of (there may be others), and they can be downloaded from Google Play Store: one is called **EskomSePush** and the other **Load Shedding Notifier**. I use both. Both can be set to know in advance the Load Shedding Schedule for your area, and for all areas in South Africa! And you can share by WhatsApp your Schedule or any Schedule with friends, etc. Magnifique!

LEAN THINKING CONSIDERATIONS

My dear friends, think aloud with me (lean-think!):

The scheme illustrated above is a *super-star-galactica* plan!!

Just imagine how many people, over the years have been squeezing their brains and dedicating their best energies (and time) to: conceive, preliminary-design, modify, final-design, and put into action such a scheme. Inventing Stages and time slots, on the basis of past, actual and projected power demand, per province, district and area, and without penalizing any area! Both at Eskom and at all Municipalities in South Africa.

Dozens? Hundreds? Thousands?

And how many people are required, on a daily basis, to make the scheme work operationally, adjusting it in-real-time? We don't know....

(One note about adjustment in real time: yes, because today's Load Shedding Schedule may differ from what was appearing yesterday and even half an hour ago in the App schedule: this moment Stage may change all of a sudden... this happens, even at no notice, and you may find yourself without power at any unpredictable time!! *C'est la vie*, as they say in France....)

And how many people are taking care of switching power OFF and ON at hundreds (thousands?) of electrical sub-stations country-wide?

I have no idea. And I have no idea if the switching OFF/ON is done manually – by human beings – or electronically, via a computerized control system... and I don't even want to know...

However, in the first instance (manual switching OFF/ON) there must be hundreds of people who physically operate circuit breakers at electrical sub-stations. And since the interval between OFF and ON is approx. 2 hours, most probably they will need to be there on a full-time basis, waiting for instructions, and during load shedding doing absolutely nothing? I don't know, and I don't want to know....

OR, if the OFF/ON operations are controlled via a super-star-galactica computerized system, how many people have been and are involved to: design it, launch it, maintain it, adjust it, modify programs, etc. etc. ???

This goes beyond my wildest imagination....

And how many efforts, people and time have been dedicated to create the Load Shedding Apps, and to update them, and..... I don't know, and I don't want to know....

All I know is that there must be a tremendous amount of manpower dedicated to Load Shedding operations, **which is completely WASTED!**

Yes, WASTED, because under the Lean Thinking angle of view, whatever does not generate value to the client (all private, industrial and public users of electric power) it is pure, solid **WASTE**.

Even worse: not only there is no **VALUE** to clients generated by the Load Shedding concept, but clients are penalized, harassed, and very annoyed by it!!!

NOT LEAN – AT ALL!!

Even worse: since

- The OFF time is unpredictable: if it is scheduled at 10:00 am, power may be OFF at 10:00 – or at 10:02 – or at 10:05 – or at 10:12 – or at 10:15..... and, sometimes (very seldom) power does not even go off (a grace from Heaven....)
- The power back time is also unpredictable
- And, most detrimental (as described above), the power OFF time may come out at none or little notice!

And the poor man in the street must adapt, change lifestyle, plan and think ahead! He must decide what is the most convenient time to cook and have supper, for instance, if there is Load Shedding at his preferred supper time and he has no gas stove.... The same for breakfast, and lunch.... And he must be careful when taking a shower in the evening (or during any time of the day if his bathroom has no windows) to prepare a torch or an emergency light nearby, otherwise he won't even find his towel when getting out.... And what about charging laptops, tablets and mobile phones? A nightmare: you need your battery to be alive when you need it; on the other hand, you don't want to overcharge it, which may prove detrimental to the battery's life... even worse if your battery is half dead.... Oh Boy, oh boy, oh boy....
What do you call that, for the poor man in the street? **TERRORISING**, that's the right name!

Enough is enough.... So, let's see if there might be any **LEAN** solution to this problem.

LEAN SOLUTIONS?

My dear Readers, I believe any technical or technological solution to this problem is beyond my capacity (although my background is Electro-Mechanical Engineering) and your capacity (even if you are a brilliant Scientist...). Surely, you may argue, the solution would have been to build more power stations in due time in due course.... But that's too late... and planning to build power stations now is simply pure and tardive speculation...

BUT, please think (LEAN-THINK) aloud with me, and let's recall the wider **LEAN Motto: Lean-Mean-Green.**

Some Considerations:

- They say (<https://energypost.eu/10000-sq-km-of-solar-in-the-sahara-could-provide-all-the-worlds-energy-needs/>): *"10,000 sq km of Solar (panels) in the Sahara could provide all the world's energy needs" – or, "All the world's power could be provided by a square 100km by 100km area in the Sahara."*
- But (<https://www.weforum.org/agenda/2020/01/solar-panels-sahara-desert-renewable-energy/>) *"Solar panels reflect less heat back into space compared to sand, which could change the region's climate - and make it rain more."*
- How many Sq Km of solar panels in the Karoo desert in South Africa could provide sufficient energy for the entire Country? I don't know, and I don't want to go into complex calculations (such as world's and South Africa's GWh or TWh per year....), nor you would like such calculation. Most important, we don't need it. But, for the sake of speculating, maybe 100 Sq Km would do? Or maybe 300? Never mind, it's not my intention to propose to install 10x10 Km of solar panels in the Karoo! It may be detrimental to local climate, and the investment required might be out of proportion for the South African economy...
- Instead, I would like to tell you a small story: I have been living (part-time) in and operating from the tiny island of Malta, in the Mediterranean Sea, south of Italy, for many years. One of the wisest decisions I have ever made was to install a solar water heater and photovoltaic solar panels on the roof of my property. Thanks to an *"incentive scheme"* set by the local MRA - Malta Resource Authority, part financed by the European Regional Development Fund. This is what happened over many years:
- With regard to the Solar Water Heater: after submitting the necessary application to the MRA, which was timely approved, I received a 25% grant amounting to 25% of the total installation cost. Then I had hot water for the entire dwelling for years, and had to switch on the electric geyser maybe 5-6 times in many years, only in winter. I guess my investment was repaid in a matter of 2 years....

- With regard to the Photovoltaic Panels: the MRA Scheme was launched in 2010 (and is still active today – see <https://www.rews.org.mt/#/en/sdgr/463-2021-renewable-energy-sources-scheme-active>), and soon thereafter I made my application, which was timely approved. The MRA Grant amounted to 50% of the total installation cost (panels, stands for panels, inverter, batteries, connections, etc.). Very good, and it was timely refunded into my account after the installation was completed. With 8 solar panels on my roof, I had plenty energy for my house. But that was not all. The MRA Scheme catered for private solar systems to be connected to the “grid” (the public electrical network) and “feed-in” into the grid, selling all excess-generated power to the local Electricity producer, called Enemalta (the equivalent of Excom in South Africa)!!!! Listen to this: you have solar panels on your roof – you use the power generated by your panels during day and night (thanks to inverter and back-up batteries) – if the power generated by your panels is not sufficient, automatically you “buy” power from the “grid” and you pay 16 cents of a Euro per KWh (per Unit) – but if the power generated by your panels is in excess of your instant consumption, automatically you “sell” excess-power to the “grid” and you are paid by Enemalta 25 cents of a Euro per KWh (per Unit)!!!! **HAHAHAHAHA!!!! THAT’S A GOOD SCHEME!!!!**
- In my case in Malta: since the water and electricity Bill is one, issued by ARMS (Automated Revenue Management System) on behalf of Enemalta (electric bill) and WSC (Water Services Corporation, for the water bill) – and since with 8 solar panels I had a lot of excess power to be fed into the “grid”, over the years I have not been paying a single cent for water and electricity!!!! My ARMS account was always in credit, and actually – when eventually I sold my Malta property recently - my final credit (100s of Euro) was paid back timely to me by ARMS!!!!

YEAHAHAHHHH!!! THAT’S A “SCHEME”!!!!!!!!!!!!!!

Think (lean-think) aloud again with me:

- “Malta enjoys around 3,000 hours of sunshine per year (also one of the highest in Europe), from an average of above 5 hours of sunshine per day in December to an average of above 12 hours of sunshine per day in July.” (Bing.com)
- “Most areas in South Africa average more than 2 500 hours of sunshine per year, and average solar-radiation levels range between 4.5 and 6.5kWh/m² in one day. South Africa sees on average between 1543 – 2264 kWh/m² a year. Simplified, this translates to 4.1 – 6.3 peak sun hours a day, with the Northern Cape experiencing the higher end of that spectrum and Kwazulu-Natal seeing the lower end. Having at least 4 hours of peak sunlight is best for solar panels.” (SAfacts - <https://safacts.co.za/average-sunlight-hours-in-south-africa/#:~:text=Average%20Sunlight%20Hours%20In%20South%20Africa%20Most%20areas,year%20around.%20Average%20Sunlight%20Hours%20In%20South%20Africa>)
- So, compared to Malta, there is still well enough sunshine in South Africa to go for solar power.
- “Malta has four electricity plants operational and the total combined nominal installed capacity is 537.8 MW. The Malta–Sicily Interconnector, which has been in operation since April 2015, allows for an electricity link between the Maltese Islands and the Italian electricity market has bidirectional flow capacity of 200 MW.” (Bing.com). No new Power Station has been built – that I know of – in the past 15 or 20 years. Which means that – over the years – Malta has been self-sufficient with the installed energy capacity; possibly (or most probably) thanks to solar installations along with the MRA Scheme!!!!
- Would a similar Scheme work in South Africa and cater – in the medium term – for reduction or even elimination of Load Shedding???
- Presently, South Africa has a Tax Incentives Scheme (rather complex) that caters for tax reduction upon installation of a solar system, under very strict conditions.... But only for Business Taxpayers.....

- And there is a tweet (only a tweet....) in which SA President announced the possibility of a “feed-in” scheme (something similar to the Maltese one....). When? No-one knows...

My dear friends and readers, it's not up to me to give technical/financially-viable solutions. Beyond my capabilities....

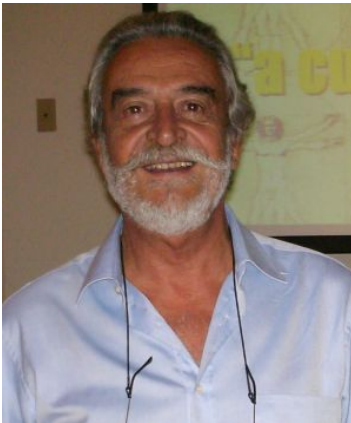
But let's lean-think aloud once more:

- The main secret to reduce and finally end load shedding is possibly: solar – with an appealing cash grant – with an attractive feed-in scheme, as appealing as possible – open to everyone (including pensioners who don't pay taxes, for instance)....
- If such a scheme would come out soon, crisp and clear, the majority of SA business and private entities would go along with it, I am pretty confident about....
- The massive investment required to install enough solar energy as fast as possible – possibly excessive for the troubled SA economy – would be shared between the public and the private/business sector....
- In a matter of 2 years things could progress extensively
- In a matter of 5 years the load shedding issue might be memories of the past....
- And should there be excess power generated by solar installations if the Scheme would become very popular, what would happen?? No problem: just switch off some generators in Power Stations here and there, isn't it?

In this way, finally, all presently wasted resources would then be dedicated to the real Lean target: generate VALUE for their Client – instead of penalizing and harassing them.....

All the best my friends, keep well, and have a wonderful, Lean year 2023! (Lean-Mean-Green!!)

LEAN THINKING AND LOAD SHEDDING IN SOUTH AFRICA



Carlo Scodanibbio, born in Macerata (Italy) in 1944, holds an Italian doctor degree in Electrical Engineering (Politecnico di Milano - 1970).

He has over 50 years of experience in Plant Engineering, Project Engineering and Project Management, as well as Industrial Engineering and Operations Management.

Free-lance Consultant since 1979, he has worked in a wide spectrum of companies and industries in many countries (Southern Africa - Italy - Cape Verde - Romania - Malta - Cyprus - Lebanon - Mauritius - Malaysia - Nigeria - Kenya - India - Saudi Arabia - Seychelles), and operates as an Independent Professional Consultant and Human Resources Trainer to industry. His area of intervention is:

World Class Performance for Small and Medium Enterprises in the Project, Manufacturing, and Service sectors.

His favourite area of action is: the "lean" area.

He has co-operated, inter-alia, with the Cyprus Chamber of Commerce, the Cyprus Productivity Centre, the Malta Federation of Industry, the Mauritius Employers' Federation, the Romanian Paper Industry Association, the United Nations Industrial Development Organisation and the University of Cape Town.

His courses and seminars, conducted in English, Italian and French, have been attended by well over 20.000 Entrepreneurs, Managers, Supervisors and Workers. They feature a very high level of interaction, and are rich in simulations, exercising and real case studies. The approach is invariably "hands-on" and addressed to immediate, practical application.

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