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Battery Feasibility – SA Pharmacy Council

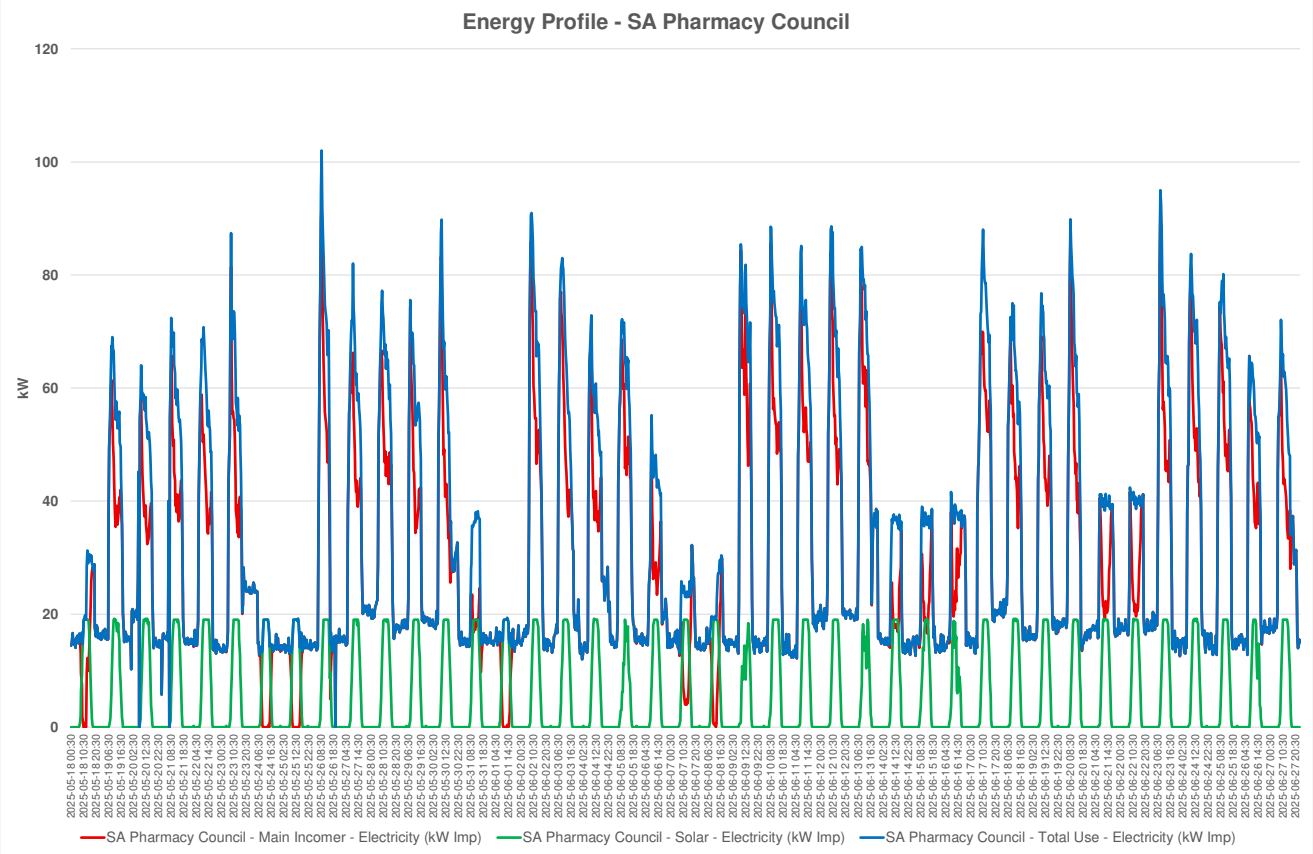
Introduction

The purpose of this report is to assess the practicality and potential benefits of implementing battery backup system at the South African Pharmacy Council building in Pretoria. Although the building is not subject to load shedding batteries might assist in lowering the monthly energy costs as it will enable the building to reduce the expensive energy purchased from the grid during peak times. (06h00 – 08h00 and 17h00 to 20h00 winter weekdays; 07h00 – 09h00 and 18h00 – 21h00 summer weekdays)

The building has a 40kWp grid tied rooftop photovoltaic solar system.

Energy Consumption

The building consumes most energy between 08h00 and 17h00 on weekdays. Some weekends show activity. During the past month the solar system delivered 15% of the energy needs 3 782 kWh. The building draw 21 427 kWh from the City of Tshwane, It is noted that the solar system only peaked at 19.2 kW which is about 50% of the original installed system capacity. During this time all the energy delivered by the solar system was used. (no feed back or clipping of the output noted). The graph below shows the energy consumption profiles.



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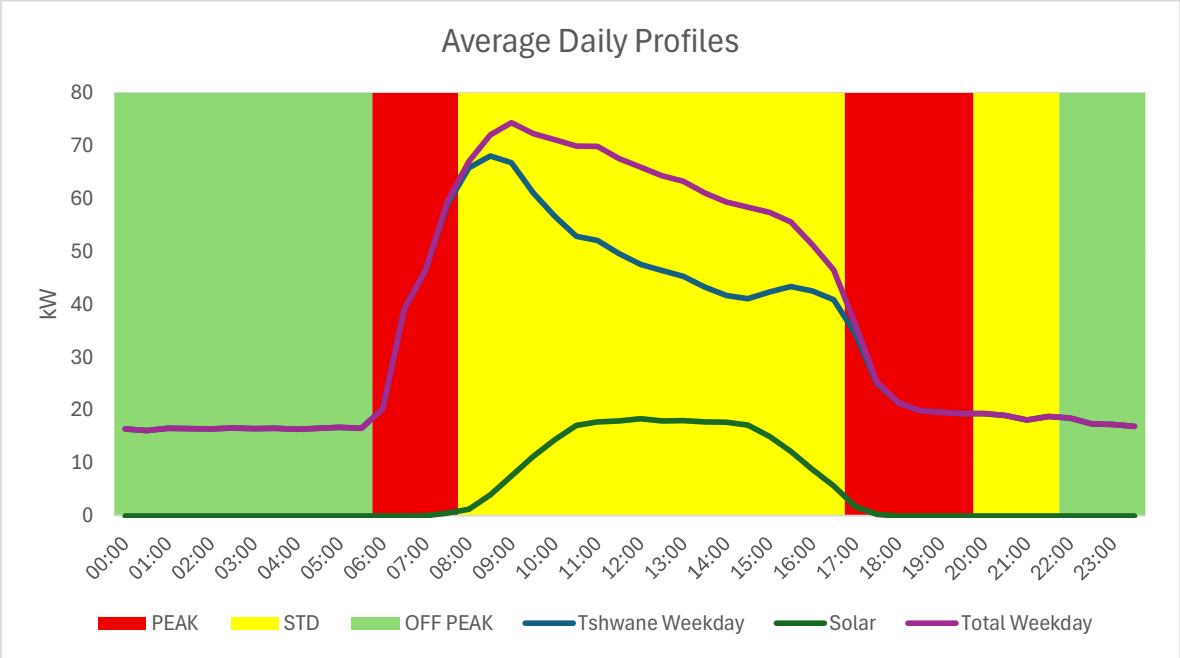
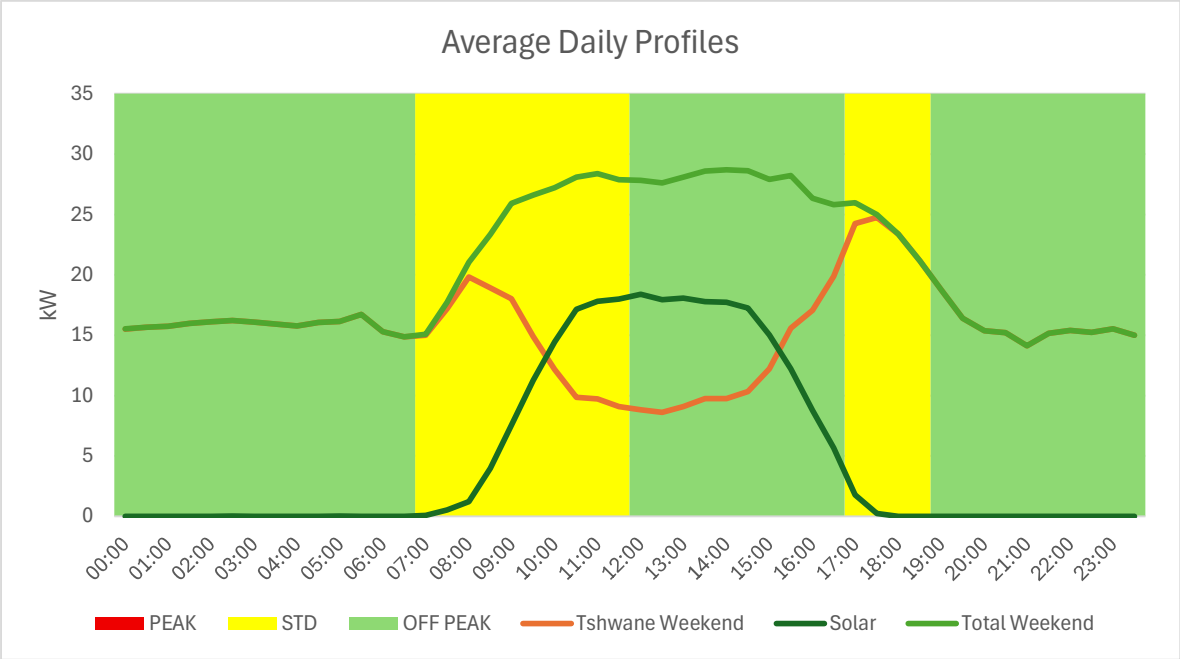
The average daily energy consumption is shown below. On weekdays the energy consumption during the peak times is 100 kWh (morning Peak) and 67 kWh (evening Peak).

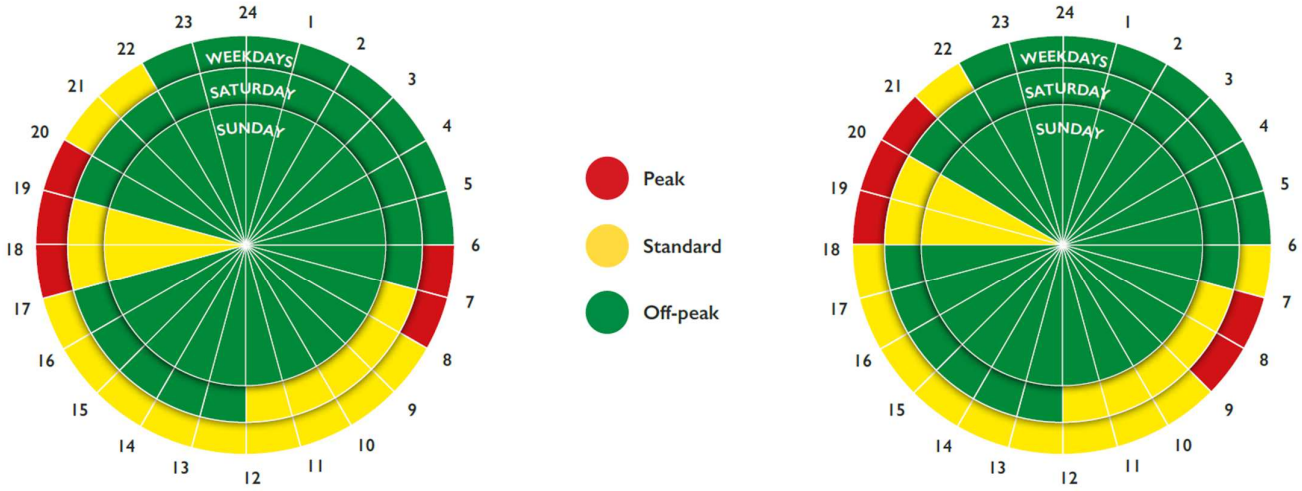


The average weekend consumption is shown below.



Tariffs

The building is charged according to the City of Tshwane Low voltage Time of use tariff. The rates of this tariff varies according to the time of day as well as the month of the year. The diagram below shows the time periods.



High-Demand Season *Low-Demand Season*

High demand season is June, July and August, The applicable rates during these times are:

Tarrif (Time of Use):		**2025 - 2026**	
	Unit	**High Season**	**Low Season**
Peak R/kWh	R/kWh	R7.18	R2.95
Standard R/kWh	R/kWh	R2.75	R1.86
Off-Peak R/kWh	R/kWh	R1.58	R1.32
Demand Charge R/kVA	R/kVA	R359.17	R359.17
Max demand registered during:		Peak,Std,Off	Peak,Std,Off
Service Charge R/month	R/month	R4 992.88	R4 992.88

Battery Strategy

Since the building is not subject to load shedding the best strategy with batteries is to utilise battery power during the expensive peak times. Over weekends the batteries can deliver power for longer periods than the peak times which will reduce the draw from the City of Tshwane.

From the measured data the average energy consumption is 100 kWh (morning Peak) and 67 kWh (evening Peak).

To ensure longevity, batteries should never be drained lower than 20% of their capacity. This implies that the battery should have a capacity of 125 kWh to provide all the power during the morning peak time.

The estimated savings when the battery supplies all the power peak times are:
3 x High Demand Months (June, Jul, Aug) = R7.18 x 167 kWh * 30 days x 3 months = R107 358
9 x Low Demand Months = R2.95 x 167 kWh * 30 days x 9 months = R132 295
However the batteries need to be recharged, using Tshwane power during the off-peak times. The cost associated with that will be:
3 x High Demand Months (June, Jul, Aug) = R1.58 x 167 kWh * 30 days x 3 months = -R23 557
9 x Low Demand Months = R1.32 x 167 kWh * 30 days x 9 months = -R58 997
The annual net saving will be: R107 358 – R23 557 + R132 295 – R58 997 = R157 100

NOTE: Adding additional 20 kWp solar panels will eliminate the charging of the batteries from the Tshwane grid which will then deliver savings of R107 358 + R132 295 = R239 653 per annum.

High Level Specification

The batteries should have a capacity of 125 kWh. It should be industrial type batteries that can handle a dual cycle each day. It must have time of use functionality, and the charging rate must be adjustable to avoid causing a maximum demand when charging to fast.

The hybrid inverter should have a capacity of 150 kW as it needs to cater for the whole buildings maximum demand.

The additional 20kWp solar panels will feed into the new hybrid inverter and needs to be of good quality with a minimum rating of 550W per panel.

Cost Estimate

150 kW Hybrid Inverter, 125 kWh batteries, 40kWp solar panels, supplied and installed is estimated to be R1.24 mil. This will give a simple payback of just over 5 years. With tariff increases this will below 5 years.

Note that the savings from weekend power drawn from the batteries are not included. It is mostly at off-peak rates but will add to the overall return on investment.

Conclusion

SA Pharmacy Council will benefit when installing batteries, additional solar panels and a hybrid inverter. It will require a minimum investment of R1.24 mil delivering an estimated payback around 5 years.

NOTE: Panels are currently relatively cheap (R 7 000/kWp) and therefore one should consider to fully utilise all the available roof space for panels. A rough estimate is the potential for around 75kW of panels. This will reduce the dependency from the City of Tshwane to approximately 25%.