



GreenCape

CASE STUDY



Green economy industrialisation: Combating systemic loadshedding

The application of a hybrid solar photovoltaic system with Li-ion storage to combat systemic loadshedding in a manufacturing small, medium and micro enterprise in Cape Town.



Challenge

A lack of energy security is one of the issues holding back industrialisation in South Africa.

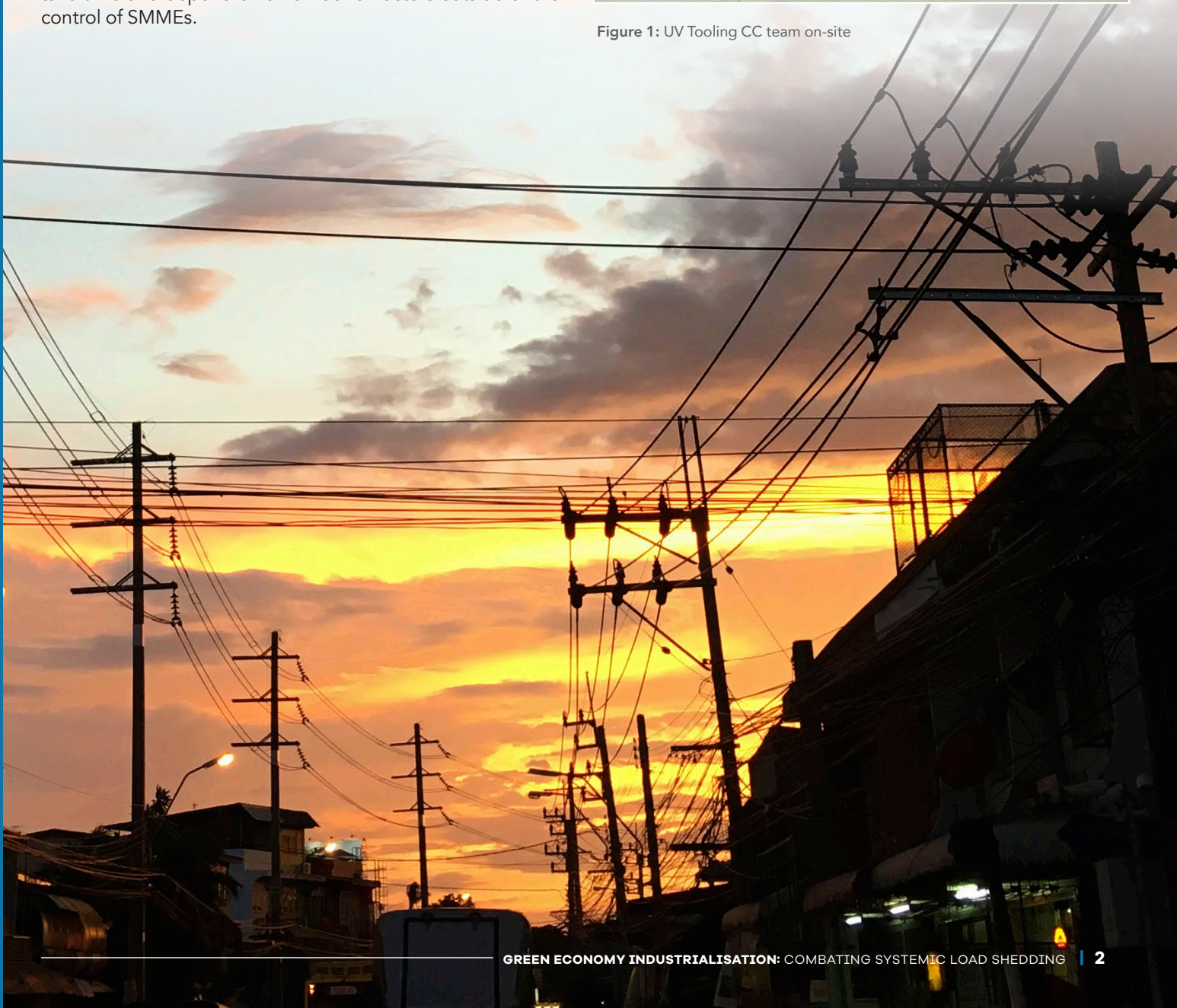
In a developing economy, local manufacturing has inherent positive linkages and spill over effects (such as an employment multiplier effects) that lead to increased employment and economic activity. UV Tooling CC, a leading parts manufacturer, has been producing tools and engineering plastic parts for South African industry since 1986 employing upwards of 70 people.

Small, medium or micro-sized enterprises (SMMEs), such as UV Tooling CC, face a myriad of challenges in South Africa, including loadshedding. The effects of loadshedding on manufacturing businesses include damage to manufacturing equipment (particularly in plastics moulding) and loss of production and profit during loadshedding.

By mid-2023 SMMEs like UV Tooling CC have had to deal with more loadshedding than they experienced in the whole year of 2022. By May 2023, accumulated loadshedding time had reached 34.56 days, a staggering 27% of the year to date. This phase of loadshedding has also taken on a new characteristic with multiple loadshedding slots during a single day, often over two to four hours at a time. Recovering from this position will take time and depend on a number of factors outside of the control of SMMEs.



Figure 1: UV Tooling CC team on-site





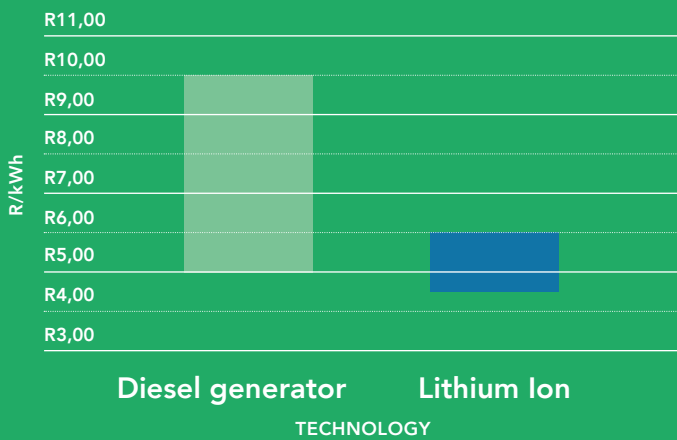
Solution

SMMEs are exploring options to combat this crisis, ranging from diesel generators to battery energy storage. Each solution has its own pros and cons. Within a systemic loadshedding environment (multiple times a day every day) back-up solutions have had to adapt.

For example, systems now need to provide two to four hours of loadshedding protection, multiple times a day. Currently diesel generators and Lithium ion (Li-ion) storage are the two dominate solutions for energy security in manufacturing companies.

The investment cost (R/kWh) for a diesel generator ranges between R2 000 and R4 000, while the investment cost (R/kWh) for Li-ion ranges from R4 000 to R10 000. However, the rising and unpredictable diesel prices and demands of loadshedding has resulted in a competitive levelised cost of storage.

Figure 2 shows that Li-ion storage can in some applications be more affordable than a diesel generator.



UV Tooling CC has installed a hybrid solar photovoltaic (PV) system with Li-ion storage to combat systemic loadshedding. The system was designed in consultation with SPV Solar and financed through Nedbank. The system can provide the factory with 2.5 hours of protection from loadshedding. The integration with solar PV also allows for cost saving through peak shaving on the time-of use (TOU) tariff and as a supplement to the storage during daytime loadshedding hours.

Figure 2: Levelised cost analysis - Diesel vs Li-ion storage

Applicable tariff - Eskom high demand season TOU (VAT incl.) 2022/23:

- PEAK: R5.61
- STANDARD: R1.70
- OFF-PEAK: 92c

Typical system operation during day of stage 4 loadshedding:

- 06:00 – 09:00: Morning peak, batteries are discharged to utilize cheap stored electricity (peak shaving)
- 09:00 – 17:00: Standard time, solar supplements and charges batteries allowing for a 60:40 energy split of PV: storage over 3 cycles for 3 periods of stage 4 loadshedding
- 17:00 – 19:00: Evening peak, batteries are discharged to utilize cheap stored electricity (peak shaving)

A summary of the solution is provided in Table 2 below.

Table 2: Hybrid PV system details

SOLUTION	TECHNOLOGY	MANUFACTURER
Generation: Solar PV	150 kWp Power optimizers	Risen SolarEdge
Backup: Li-ion battery storage	Containerised, 55 batteries 290 kWh rated capacity Li-ion (261kWh with 90% DoD) 2.5 hours protection from loadshedding 2-hour recharge time	Freedom Won
Inverter	550 kVA battery inverter	ATESS



Business benefits



UV Tooling CC is protected from 2.5 hour periods of loadshedding multiple times a day.



Expected cost of diesel per year: More than R1.2m avoided by not purchasing a diesel generator.



73% of electricity consumption covered by solar in combination with peak consumption reductions through the storage has resulted in a 47% reduction in UV Tooling CC's monthly electricity bill.



Payback on the overall system is 7.5 years.



Lesson learned and future plans

A lack of energy security is one of the issues holding back industrialisation in South Africa. UV Tooling CC addressing its energy security needs has inherent positive linkages and spill over effects in the economy (such as employment multiplier effects) that lead to increased employment and economic activity.

The company can accommodate 1.5MW of solar PV on their site. The company is considering doubling the size of the current system, and would like to take advantage of a feed-in tariff or wheeling arrangement for excess generation. Like many other manufacturing companies, it is situated in an industrial cluster of similar business profiles and warehouses.



This case study was made possible thanks to the support of the City of Cape Town

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