

ILLUSTRATIVE CASE · COMPOSITE SITE · NOT A CLIENT PROJECT



CASE STUDY · TELECOMS

Sixteen exchanges on their own sun, out of the peak.

16 × A1000 · PULSE · HELIOS

PER SITE: 500 KW · 1 044 KWH · 160-280 KWP SOLAR · SOLARIS

A mobile operator puts an A1000 behind a PULSE P500, with roof and carport solar on a HELIOS, at each of its 16 highest-draw exchanges, on Eskom Miniflex. At the core exchange modelled here the sun carries the middle of the day, the battery takes 84 % of the peak energy off the bill, and 17 of 24 interruptions pass without the standby set. The operator owns the plant; the programme pays back in less than six years.

24.3 R m

GROSS SAVING, YEAR ONE
sixteen sites, FY2027/28

<6 years

SIMPLE PAYBACK
indicative turnkey cost

26 %

OFF THE BILL
at the core exchange

17 of 24

OUTAGES, NO SET START
core exchange, modelled year

24 %

15-YEAR IRR
NPV R104 m at 12 %

CONTENTS

MODELLED ON ESKOM MINIFLEX 2026/27

01 The site	02 The load	03 The plant	04 How it runs	05 The bill	06 Fifteen years	07 Resilience & delivery
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This case study describes composite sites, assembled from typical South African exchange and switching-centre loads. It is not a client, a project or a result. Tariff rates, time-of-use periods and product ratings are real; the sites, their loads, the outages and the outcomes are modelled; solar yield is PVGIS hourly data for Johannesburg. A site proposal replaces every figure with one from your own data.

01 • THE SITE

An exchange that never stops drawing.

The modelled core exchange runs every hour of the year. Its bill is R7.1 m, and 32 % of the energy cost is bought in 14 % of the hours.

■ SITE PROFILE

COMPOSITE

Operation	Core exchange + switching centre
Region	Gauteng Highveld
Supply	400 V, Eskom mini-substation
Tariff	Miniflex Mi01N, zone 0
Network load	≈ 255 kW, round the clock
Average draw	344 kW · peak 411 kW
Notified demand	500 kVA
Recorded peak	432 kVA
Standby	500 kVA diesel set
Roof and yard	≈ 990 m ² of flat roof, 40 bays
Annual energy	3.01 GWh
Annual bill	R7.1 m ex VAT

■ ANNUAL BILL, BEFORE

R M EX VAT

Energy, peak		R1.80 m
Energy, standard		R2.07 m
Energy, off-peak		R1.72 m
Levies & subsidies		R1.08 m
Capacity & service		R0.39 m

Peak energy costs more than all off-peak energy, in a seventh of the hours. It is the line the battery attacks.

■ ENERGY BY END USE

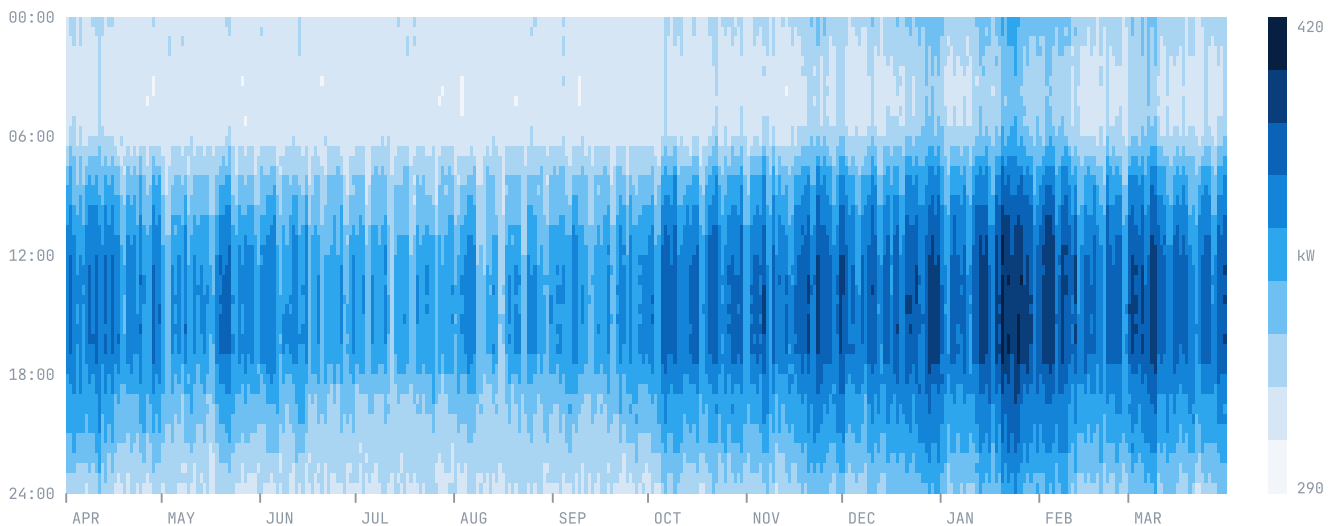
MWH A YEAR

Rectifiers, -48 V		1 813 MWh
Cooling		607 MWh
AC IT & transport		440 MWh
Building		153 MWh

The rectifier plant and the core IT set a floor that never moves. Cooling adds the swing on summer afternoons.

■ FIG 01-1 • EVERY HALF-HOUR OF THE YEAR

GRID DRAW WITHOUT STORAGE • KW



Each column is a day from April 2026 to March 2027, each row a half-hour. The network never sleeps: the darker afternoons are the cooling plant in the Highveld summer, the weekday blocks are staff and lighting, and the floor of about 300 kW is there at 03:00 on a Sunday.

THE BRIEF

Cut the peak bill and the set's running hours, use the roof, and leave the -48 V plant and the network alone.

THE CONSTRAINT

One 400 V board, no medium-voltage room, a yard of a few square metres, and a site that cannot go dark during the works.

THE RISK

Cable theft and network faults: every interruption is a set start, and every refuel is diesel worth stealing.

02 • THE LOAD

Flat by design, swung by the weather.

02

The network draws the same at 03:00 as at 18:00, with a small swell when traffic peaks in the evening. Cooling adds the swing on top, and the sun on the roof arrives in the standard hours between the peaks.

FIG 02-1 • AVERAGE HIGH-SEASON WEEKDAY

JUNE TO AUGUST • KW

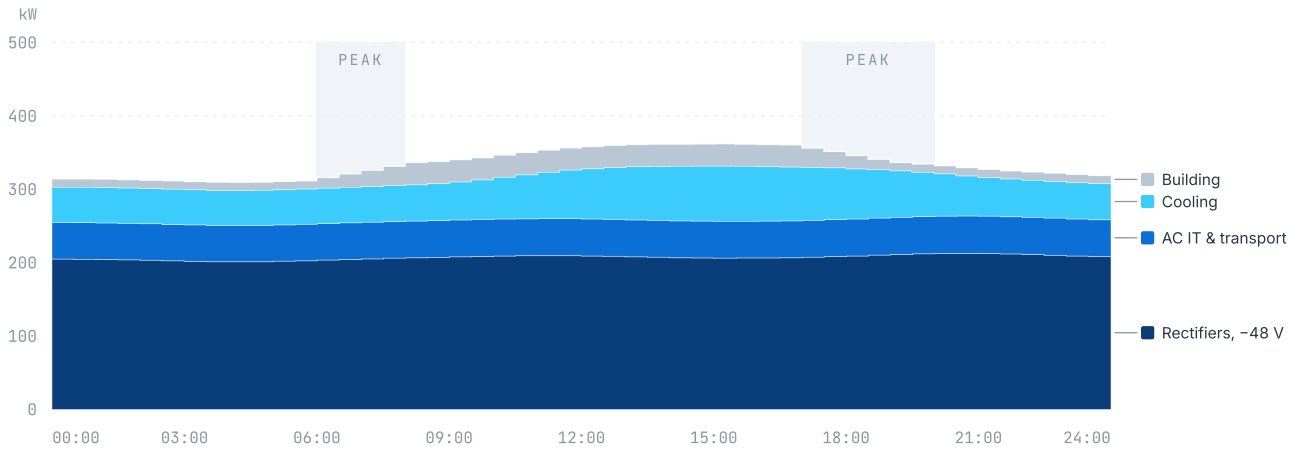


FIG 02-2 • AVERAGE LOW-SEASON WEEKDAY

KW

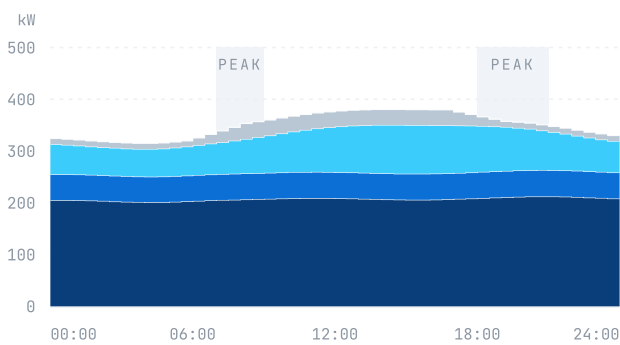


FIG 02-3 • SOLAR, 280 KWP

AVERAGE DAY • KW

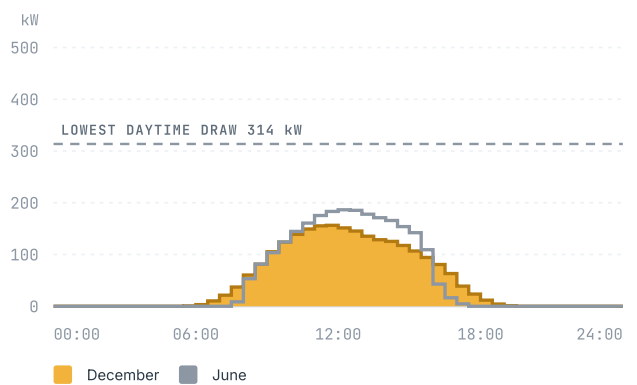
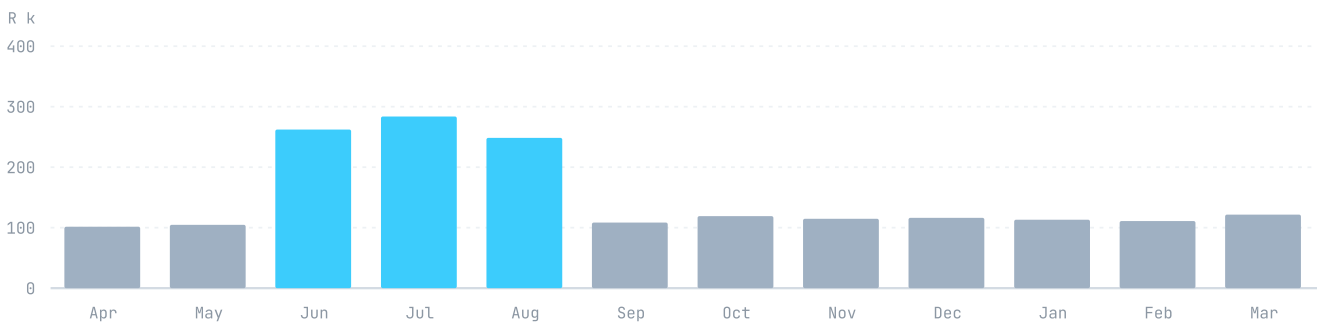


FIG 02-4 • WHAT THE PEAK PERIODS COST, BY MONTH

R K ACTIVE ENERGY, WITHOUT STORAGE



Finding 01

The peaks cannot be moved

77 % of the load is the network itself, on the rectifiers and core IT. It cannot be shifted or switched off, only supplied differently.

Finding 02

Winter costs 2.4 times more

The same kilowatt-hour costs R7.39 in a June peak and R3.07 in a November one, so 44 % of the year's peak bill falls in three months.

Finding 03

The roof never outruns the load

The arrays peak near 235 kW against a daytime floor of 314 kW, so every kilowatt-hour is used on site and nothing is exported.

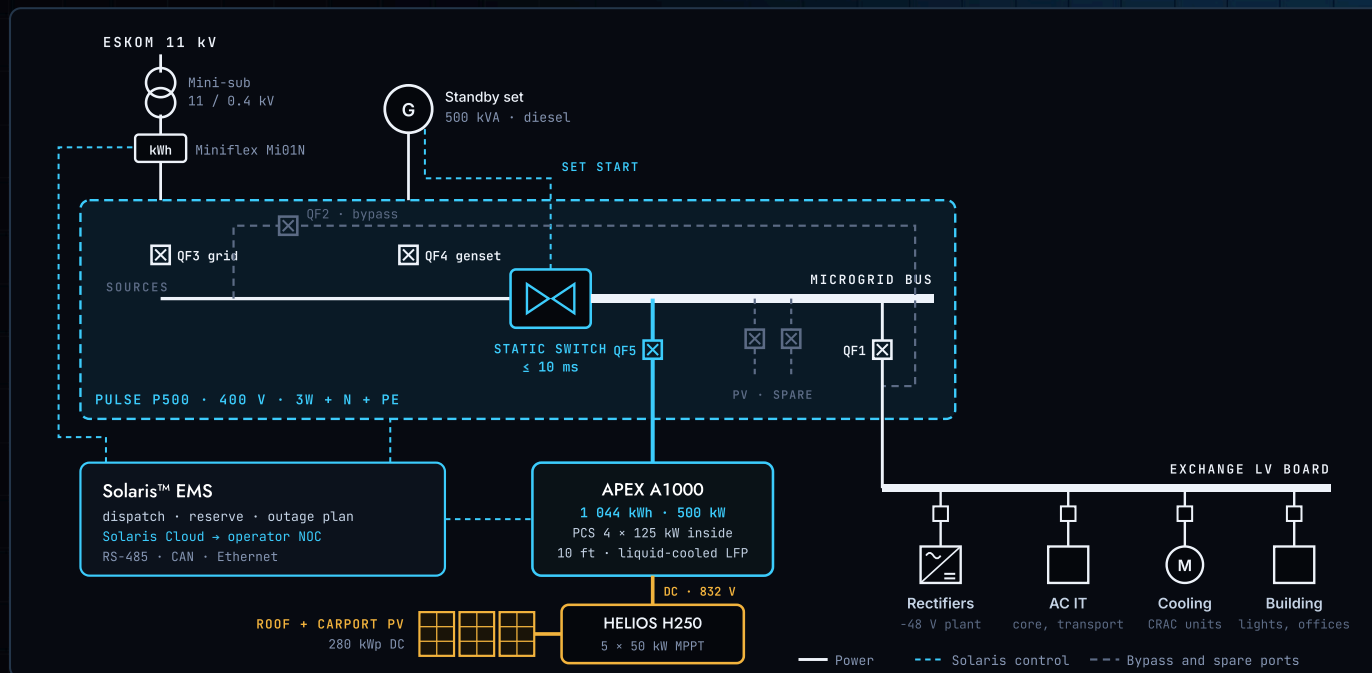
03 · THE PLANT

One container, one switch, and the roof.

PULSE goes between the supply and the exchange board; the A1000 sits behind it, and HELIOS puts the roof and carport arrays straight onto its DC bus. The rectifiers and the network see nothing new.

FIG 03-1 · SINGLE-LINE, AS CONNECTED

SIMPLIFIED



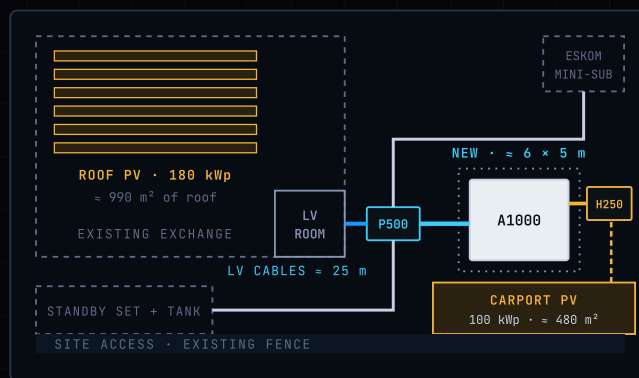
PLANT AT A GLANCE

PER THE RANGE DATASHEETS

Battery	APEX A1000, 1 044 kWh · 940 usable
Conversion	4 x 125 kW PCS inside · ≥ 88 % AC-AC
Solar	180 kWp roof + 100 kWp carport
Solar input	HELIOS H250, DC onto the battery bus
Transfer	PULSE P500, ≤ 10 ms static switch
Connection	400 V, ahead of the exchange board
Control	Solaris™ EMS, Solaris Cloud to the NOC
Footprint	≈ 6 x 5 m of yard, plus roof and carport

FIG 03-2 · THE YARD

INDICATIVE



Indicative plan, not to scale. No new building: the plant stands in the existing yard.

WHY THIS PLANT, AND WHICH SITES

PER SITE · YEAR ONE AT FY2027/28 PRICES · INDICATIVE TURNKEY COST · NPV AT 12 %

OPTION	SITES	AVERAGE DRAW	CYCLES / YR	GROSS SAVING	PAYBACK	NPV
Core · A1000 only	—	344 kW	393	R952 k	<6 yrs	R3.8 m
Core · + 180 kWp roof	—	344 kW	374	R1 549 k	<6 yrs	R7.5 m
Core · + 280 kWp roof and carport ♦	6	344 kW	369	R1 884 k	<6 yrs	R9.2 m
Regional · + 160 kWp	10	232 kW	301	R1 297 k	<6 yrs	R5.0 m
Hub · + 100 kWp	—	136 kW	175	R783 k	<9 yrs	R0.8 m

Solar lifts the core site's NPV 2.4-fold. Hub sites under 200 kW use half the battery: there, resilience is the reason. ♦ Modelled in detail.

04 · HOW IT RUNS

Sun at midday, battery in the peaks.

Solaris carries the morning peak on the battery, lets the roof carry midday while the battery refills under a 420 kW ceiling, then carries the evening peak. It never spends the last 15 %: that is for the next fault.

FIG 04-1 · WEDNESDAY 15 JULY 2026 · HIGH SEASON

MODELLED · KW

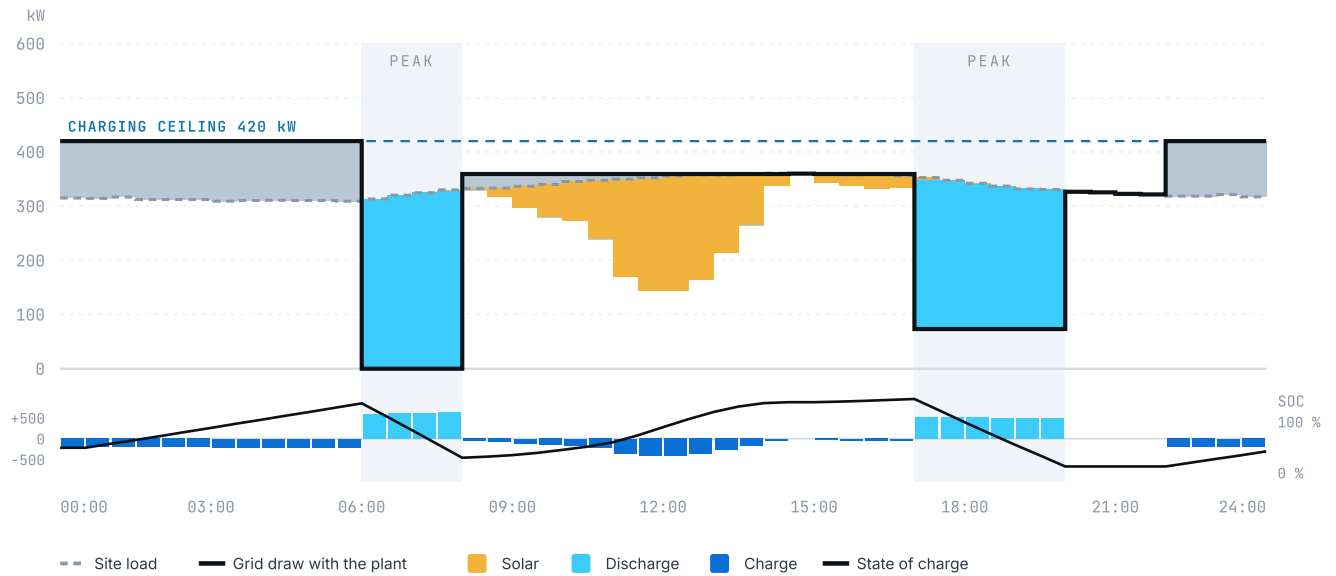
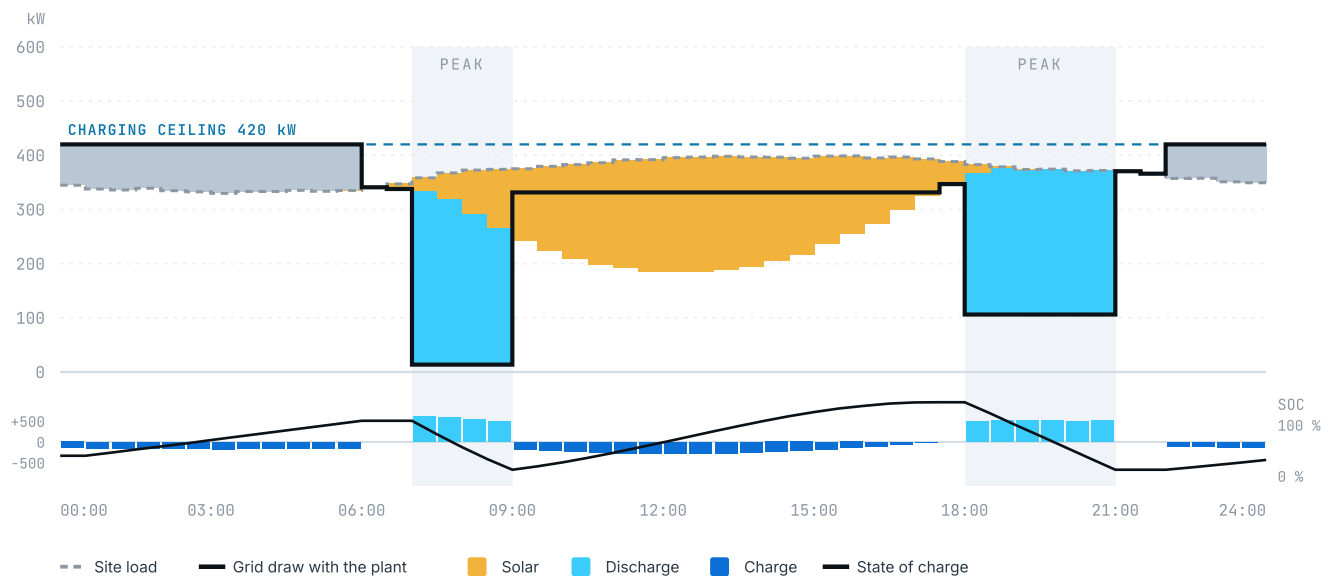


FIG 04-2 · WEDNESDAY 13 JANUARY 2027 · SUMMER, LOW SEASON

MODELLED · KW



Amber: solar from the roof and carport. Between the peaks most of it refills the battery through HELIOS (lower strip) while the grid carries the site under the ceiling. Cyan: energy the battery supplies. Grey: energy bought to recharge, off-peak or in the standard hours. Lower strip: battery power (± 500 kW) and state of charge, reserve included.

369

EQUIVALENT FULL CYCLES A YEAR

347 MWh

DELIVERED FROM THE BATTERY

447 MWh

SOLAR, ALL USED ON SITE

141 kWh

HELD BACK FOR FAULTS,
ALWAYS

05 • THE BILL

R2.0 m a year off
a R7.1 m bill.

05

51 % of the saving is the roof, which never exports. The rest is the battery moving the peaks onto cheaper hours, net of what it buys back, and a smaller NMD.

FIG 05-1 • WHERE THE SAVING COMES FROM R k, FY2027/28

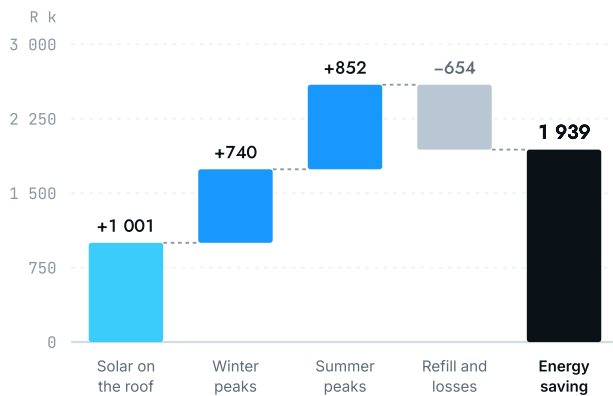
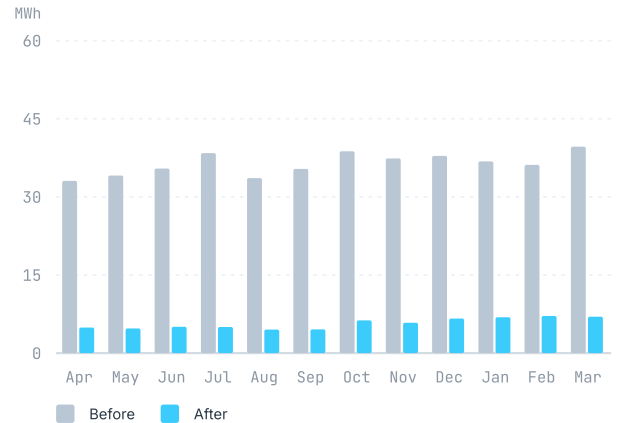


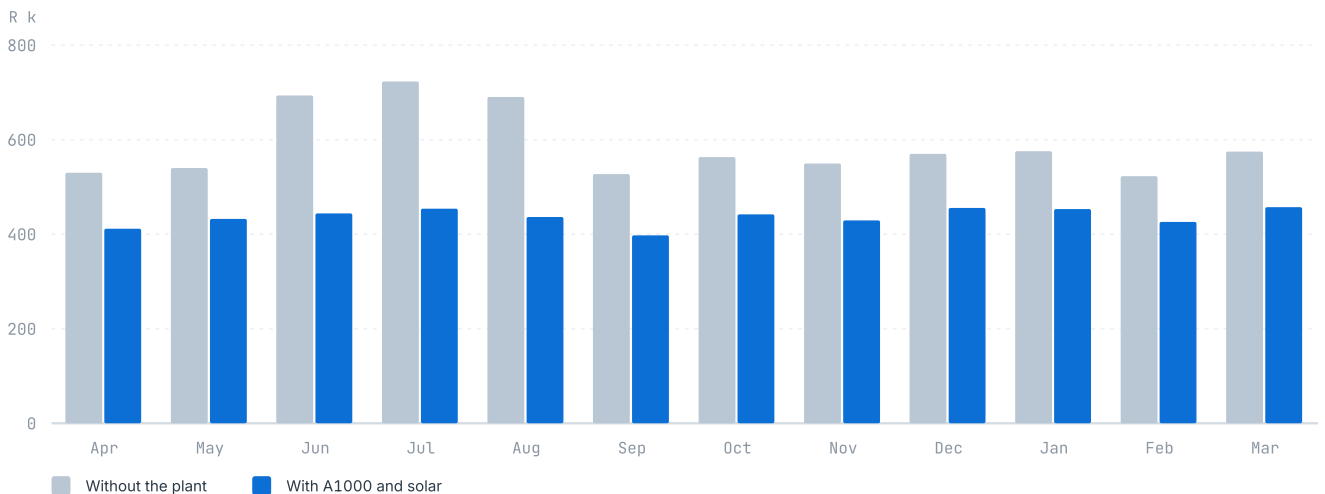
FIG 05-2 • ENERGY BOUGHT IN PEAK HOURS MWh A MONTH



LINE	HOW IT IS EARNED	PER YEAR
Solar	447 MWh a year from 280 kWp, all used on site in the daylight hours	R1 001 k
Winter peaks	June – August, 06:00 – 08:00 and 17:00 – 20:00, carried on stored energy	R740 k
Summer peaks	The rest of the year, 07:00 – 09:00 and 18:00 – 21:00	R852 k
Refill	Bought back off-peak and in the standard hours, losses included	-R654 k
Notified demand	Renewed at 450 kVA from year two: the sun takes the top off the midday draw	R39 k
Power factor	PCS holds 0.99 at the bus; the high-season reactive charge falls away	R3 k
Bill saving, full year		R1 981 k
Counted in year one	At 97 % availability, as in the fifteen-year cash flow	R1 884 k

FIG 05-3 • MONTHLY BILL, BEFORE AND AFTER

R k EX VAT, FY2026/27 RATES



Bills are rebuilt line by line from the Miniflex schedule (< 500 V, zone 0): active energy by period and season, legacy, subsidy and ancillary charges, generation and network capacity on the notified demand, reactive energy in the high season, and daily service and administration charges. Solar is PVGIS 5.3 hourly (2023, Johannesburg) with 14 % system loss, no export. Savings are taken at 97 % availability; the NMD saving starts in year two. Diesel saved is not counted.

06 • FIFTEEN YEARS

Less than six years to pay back. Then it saves.

The operator buys 16 sites turnkey, battery, switch and solar, and we run them. The saving rises with the tariff and eases as cells and panels age; O&M is the only cost after day one.

<6 yrs

SIMPLE PAYBACK, PROGRAMME

24 %

PROJECT IRR

104 Rm

NPV AT 12 %

4.7 x

THE INVESTMENT, RETURNED

FIG 06-1 • SIXTEEN SITES: SAVING, RUNNING COSTS, CASH RETURNED

NOMINAL R M • TARIFF +8.83 %, THEN 7 % A YEAR

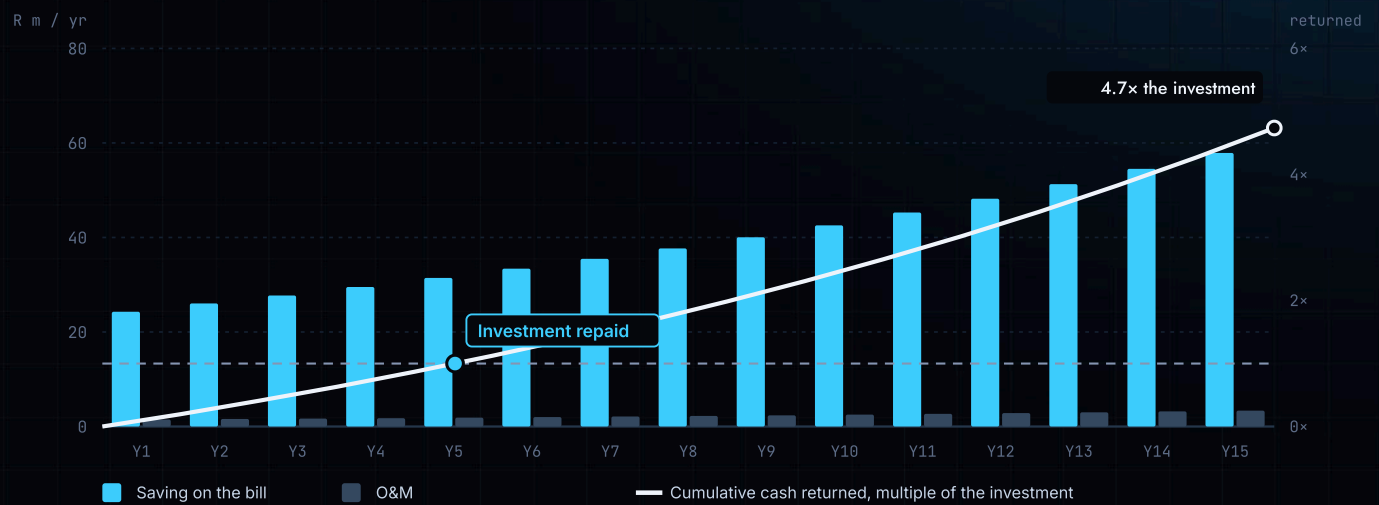


FIG 06-2 • WHAT MOVES THE NPV

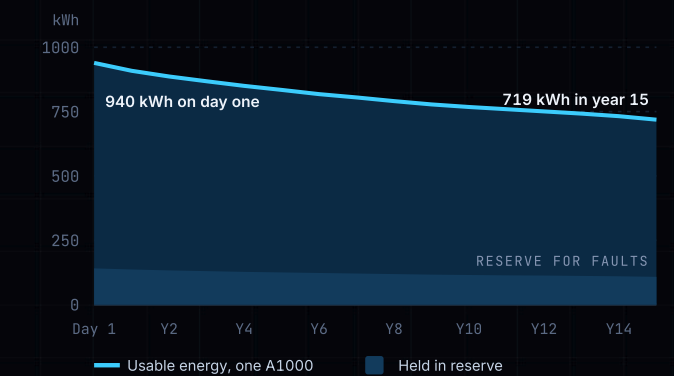
R M AT 12 %



Even the worst single case leaves an NPV of R69 m.

FIG 06-3 • ONE A1000, USABLE ENERGY

MEASURED • KWH



On the cell maker's measured curve at 1.01 cycles a day; each year's saving uses the energy left that year. Panels lose 0.5 % a year.

INDICATIVE OWNERSHIP TERMS

FINAL TERMS IN THE PROGRAMME PROPOSAL

Structure	Turnkey supply, install and commissioning
Ownership	The operator, site by site
O&M	15-year service agreement, AMPROTEQ
Availability	≥ 97 %, measured monthly

Capacity	Battery tested yearly; solar yield monthly
Augmentation	None planned: ageing is in the model
Monitoring	Solaris Cloud, 24 / 7, into the NOC
Alternative	Service agreement: fixed fee per site

07 · RESILIENCE & DELIVERY

When the grid goes, the set stays cold.

PULSE moves the board to the battery in under ten milliseconds. On a published interruption Solaris holds the charge; on a fault it spends what it has, and the set starts only if the outage outlasts the battery.

FIG 07-1 · A PUBLISHED TWO-HOUR INTERRUPTION, TUESDAY 14 JULY

MODELLED · KW

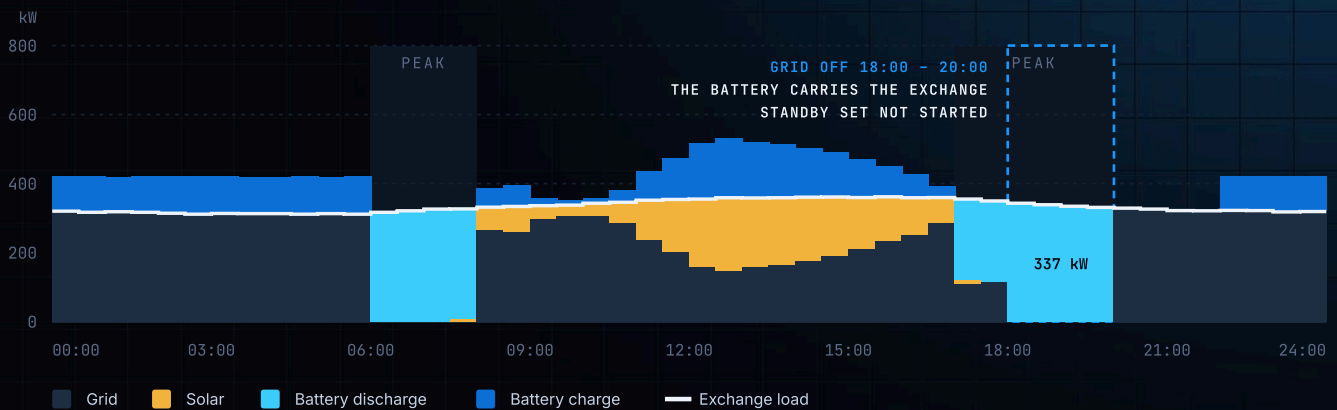
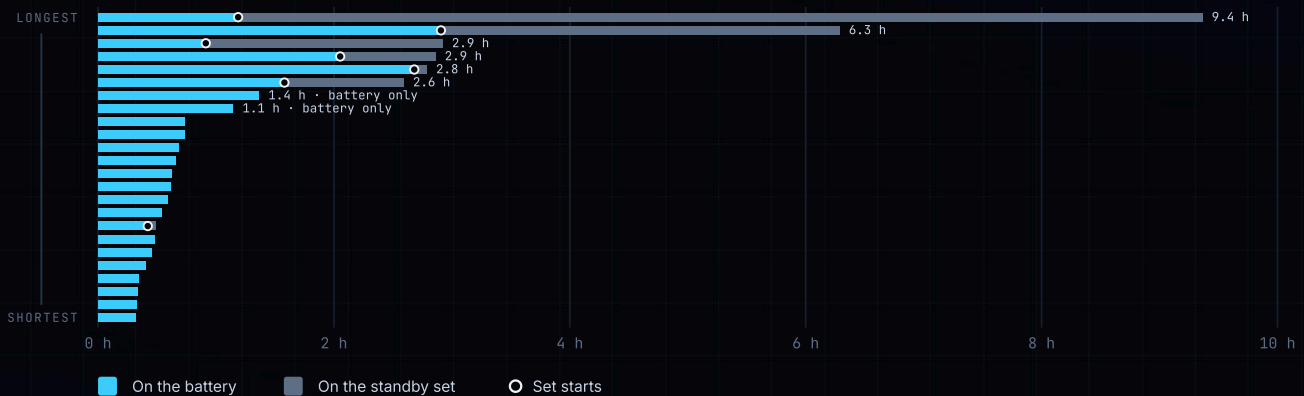


FIG 07-2 · EVERY UNPLANNED INTERRUPTION OF THE YEAR, LONGEST FIRST

ASSUMED · HOURS


17
of 24

OUTAGES, NO SET START

22
of 38 h

CARRIED ON THE BATTERY

≈ 2 100 litres

DIESEL NOT BURNT, A YEAR

≈ 190 litres

SAVED PER TWO-HOUR SLOT

Interruptions are an assumption for a site with cable-theft exposure: 24 a year, from 15 minutes to 10 hours, each carried on whatever charge the dispatch has left; in daylight the roof keeps feeding the battery through HELIOS. Generic set fuel curve; at R22 a litre the diesel is worth ≈ R47 k a year here. Not counted in the payback.

RISKS WE CARRY, AND HOW

FIRST SITE IN 24 WEEKS

Work on a live exchange	The PULSE bypass carries the board through one planned cut-over
Diesel and cable theft	Fewer refuels; the A1000 is locked, alarmed and watched from the NOC
Cell ageing	Measured curve in the model; capacity tested every year

Your network, your numbers.

Send twelve months of half-hour data for your highest-draw sites, with their tariffs, NMDs, standby sets and roof plans. Within five working days we return the sites that pay first, the bill before and after, the set starts avoided and the payback.

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AMPROTEQ (Pty) Ltd · Agone House, 53 Adriana Crescent, Gateway Industrial Park, Centurion 0157. Illustrative case on composite sites; not a client project and not an offer. Modelled with Eskom's Schedule of Standard Prices 2026/27 (Miniflex, < 500 V, zone 0), PVGIS 5.3 solar data and APEX A1000 / PULSE P500 / HELIOS H250 ratings. Tariff escalation beyond 2027/28, the installed cost, the outages, the set fuel curve and all site data are assumptions.