SAFHE 2026
SOUTHERN AFRICAN HEALTHCARE CONFERENCE

9 – 10 JUNE 2026
CTICC 2 CAPE TOWN

Connection · Innovation · Quality · Collaboration · Future-focused · Inclusive

MEDICLINIC GROUP

WORKING TOGETHER TO FIND PRACTICAL SUSTAINABLE SOLUTIONS FOR HEALTH-CARE

Speakers Dr Francois Rozon SU & David Volkwyn GLA

Stellenbosch UNIVERSITY IYUNIVESITHI UNIVERSITEIT

GREENLINE AFRICA SUSTAINABLE ENERGY SOLUTIONS

CENTRE FOR RENEWABLE & SUSTAINABLE ENERGY STUDIES

green

THE PV-T THERMAL BATTERY & HEAT RECOVERY REVOLUTION

South Africa's First Integrated PV-T, Heat Pump & Heat Recovery System In Healthcare

Zero Carbon Hospitals

Mediclinic Cape Town | 128 Beds
Presented by: Greenline Africa & Stellenbosch University
30th IFHE Conference | ICC Cape Town
9–11 June 2026

THE GLOBAL HOSPITAL ENERGY CRISIS

WHY ENERGY MATTERS IN HEALTHCARE

- Hospitals operate 24/7 — energy never stops
- Energy = 2nd largest hospital operating cost after labour
- Hot water demand is constant: sterilisation, hygiene, patient care
- Peak demand charges can represent 30–40% of electricity bills
- Load-shedding threatens patient safety and operational continuity

THE CONVENTIONAL PROBLEM

- Electric resistance elements: COP = 1.0 - every kWh in = 1 kWh heat
- Air-to-water heat pumps: COP 2.5–3.0 - better but still grid-dependent
- No storage = demand spikes between 06:00 and 18:00 every day
- Roof space wasted on PV-only or solar thermal - never both combined

THE OPPORTUNITY

- A single integrated system can solve ALL of these challenges
- PVT + Water-to-Water Heat Pumps + Thermal Storage + Heat Recovery
- **This is that system — proven, measured, operating now**

THE ROOF SPACE PARADOX — DOING MORE WITH LESS

THE CHALLENGE FOR HOSPITALS

- Urban hospitals have severely limited roof space
- Traditional choice: PV for electricity OR solar thermal for hot water
- Never both — roof area forces a compromise
- Result: hospitals remain dependent on the grid for one or the other

THE PV-T SOLUTION

- PVT (Photovoltaic-Thermal) produces BOTH electricity AND heat simultaneously
- Same 188 m² footprint delivers 38 kW electrical + 137 kW thermal
- Equivalent separate systems would need 57% MORE roof area
- One installation, one set of penetrations, one maintenance contract

ABORA SOLAR aH72 — GLAZED PV-T COLLECTOR

- Glazed design: higher thermal efficiency, suitable for high-temp hospital duty
- Monocrystalline PV cells laminated directly onto absorber plate
- Copper tube manifold — water circulates directly behind PV cells
- Dual output: cooler PV cells = higher electrical efficiency too

ROOF AREA COMPARISON

SYSTEM	AREA NEEDED
PV only (38 kW)	~190 m²
Solar thermal only (137 kW)	~188 m²
Both separate	**~378 m²**
PVT combined (both)	**188 m² ✓**
SAVING	**190 m² (50%)**

CRITICAL FOR URBAN HOSPITALS

- **Most city hospitals cannot expand their roof**
- **PVT is the ONLY technology that delivers both outputs**
- **Enables 100% renewable hot water on a constrained roof**

MEET THE SYSTEM: MEDICLINIC CAPE TOWN

SYSTEM SPECIFICATIONS

COMPONENT	SPECIFICATION
PVT Collectors	100 × Abora Solar aH72 (glazed)
Aperture Area	188 m²
Peak Thermal Output	137 kW
Peak Electrical Output	38 kW
Heat Pump 1	Stiebel Eltron WPF 66 — W-to-W — 66 kW
Heat Pump 2	Stiebel Eltron WPF 27 HT — W-to-W — 27 kW
Combined HP Capacity	93 kW total
Thermal Storage	12,500 L — the thermal battery
Source Buffer Tank	SBP 1500 — 1,500 L
Heat Recovery	Chiller ring main heat exchanger
Controller	Stiebel Eltron STE — integrated
Hospital	128 beds | Cape Town | South Africa

FIRST INTEGRATED PVT + W-W HP + HEAT RECOVERY SYSTEM IN SOUTH AFRICA

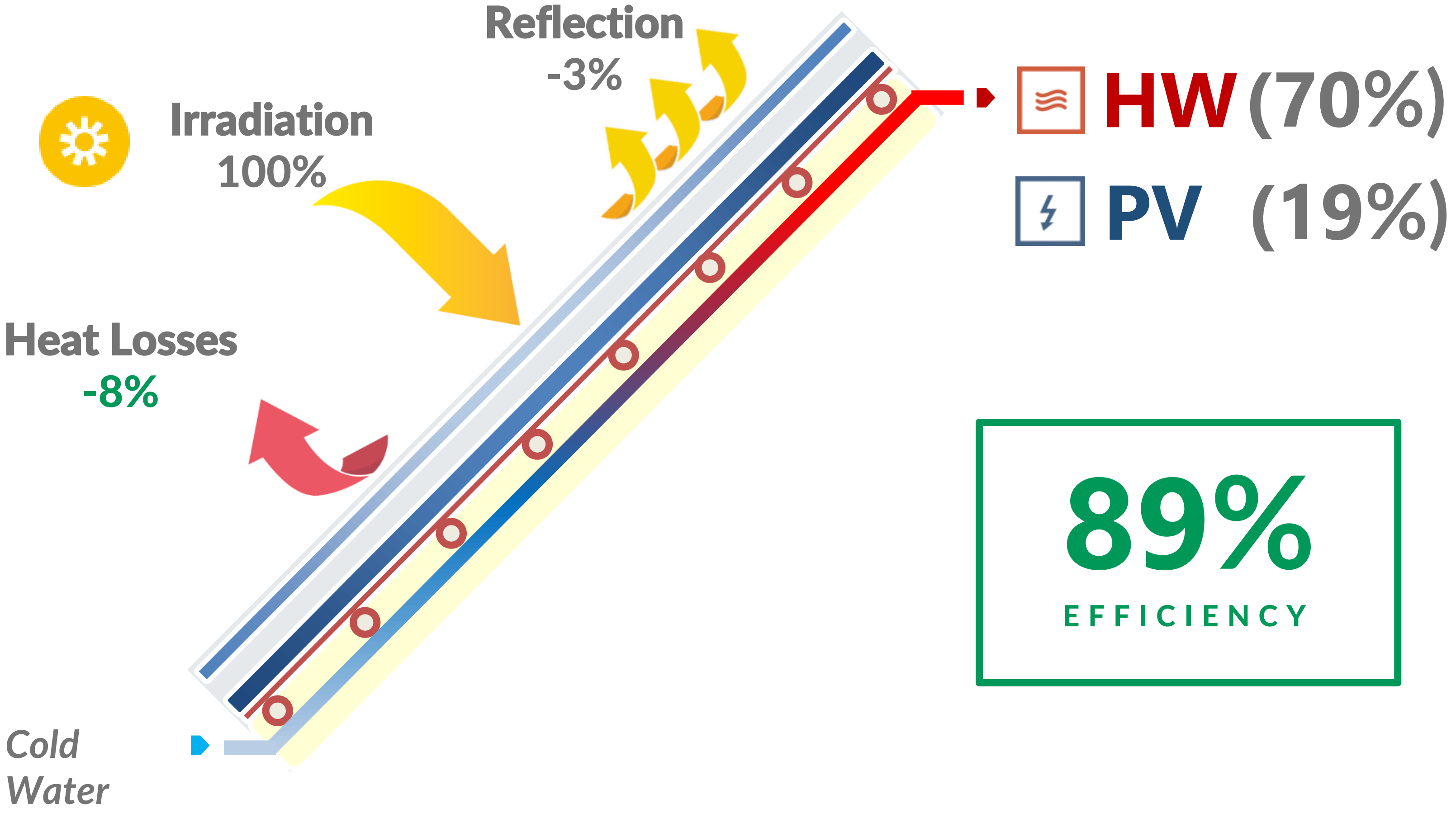
- Commissioned 2024 | Monitored from June 2025
- Funded with support from SOLTRAIN / AEE InTec Austrian Development Agency

THE PV-T COLLECTOR — DUAL OUTPUT FROM A SINGLE PANEL

HOW THE ABORA aH72 GLAZED PVT COLLECTOR WORKS

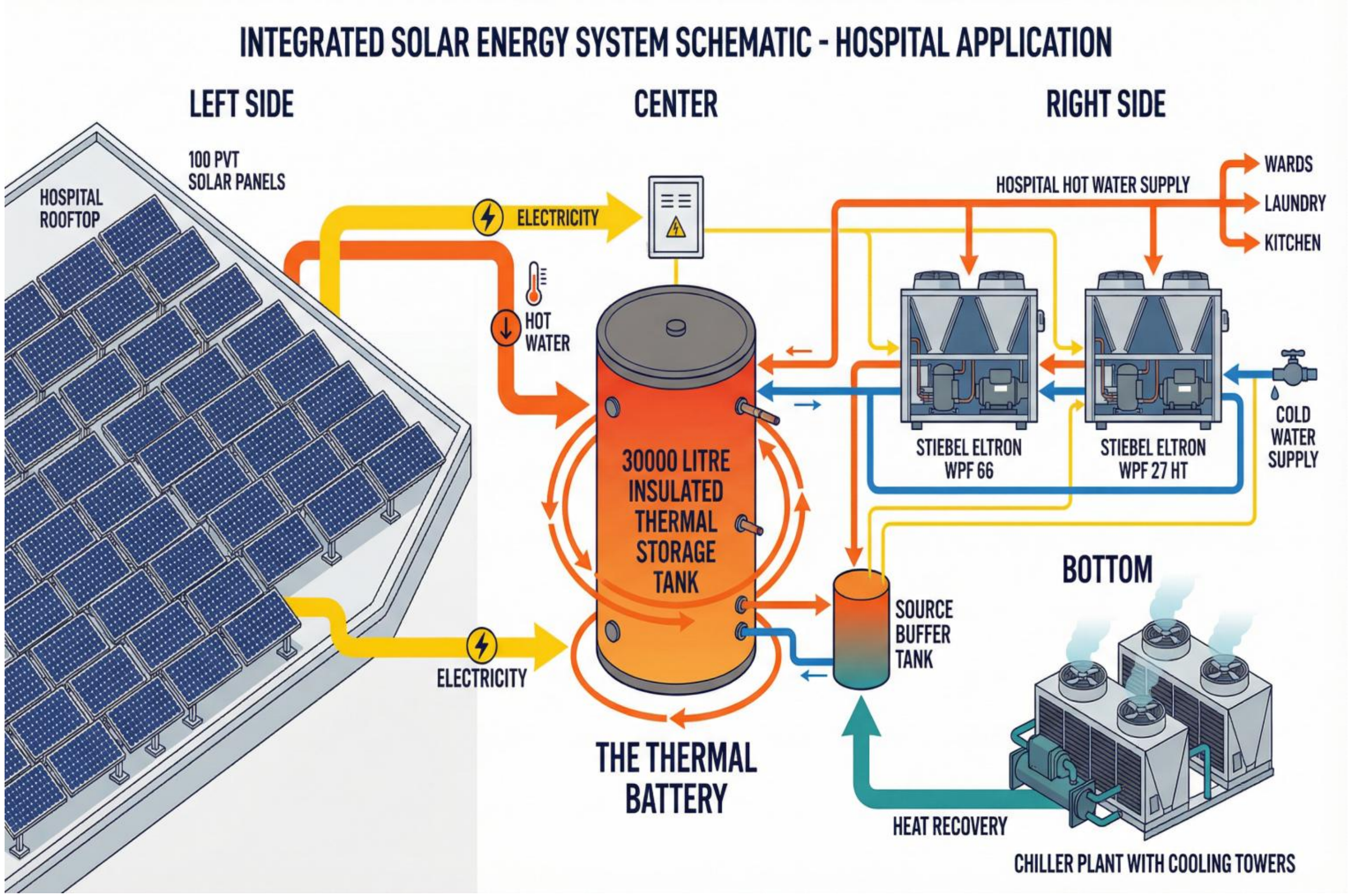
- Solar radiation strikes the glazed cover — glass reduces convective heat loss
- Monocrystalline PV cells convert ~20% of radiation to electricity directly
- Remaining ~80% of absorbed energy heats the aluminum absorber plate
- Copper tubes bonded to absorber carry water — extracting heat continuously
- Cooling the PV cells improves electrical efficiency by ~0.4%/°C reduction
- Output: **38 kW electrical** + **137 kW thermal** from **188 m²** — simultaneously
- Hydraulic arrangement: balanced flow across 100 panels in 4 arrays (NW + SE orientation)

NEXT GENERATION – PV-T MODULES



89%
EFFICIENCY

HOW THE INTEGRATED SYSTEM WORKS



SYSTEM LOGIC

- PVT array heats water in source buffer tank (SBP 1500)
- Source water maintained ≤20°C for optimum HP COP
- W-W heat/P extract heat: source → 8,500 L storage tanks
- Storage tanks pre-charged overnight and during solar hours
- Hospital draws from tanks — no direct HP operation at peak
- Chiller ring main heat exchanger recovers waste heat 24/7

THE RESULT

- Heat pumps run only 2–5 hrs/day vs 10+ hrs conventionally
- Peak electrical demand eliminated — tanks supply the load
- Three independent heat sources working in synergy
- **COP 3.38–3.94 measured | Theoretical 4.8–5.5**

THE THERMAL BATTERY: PEAK SHIFTING WITHOUT LITHIUM

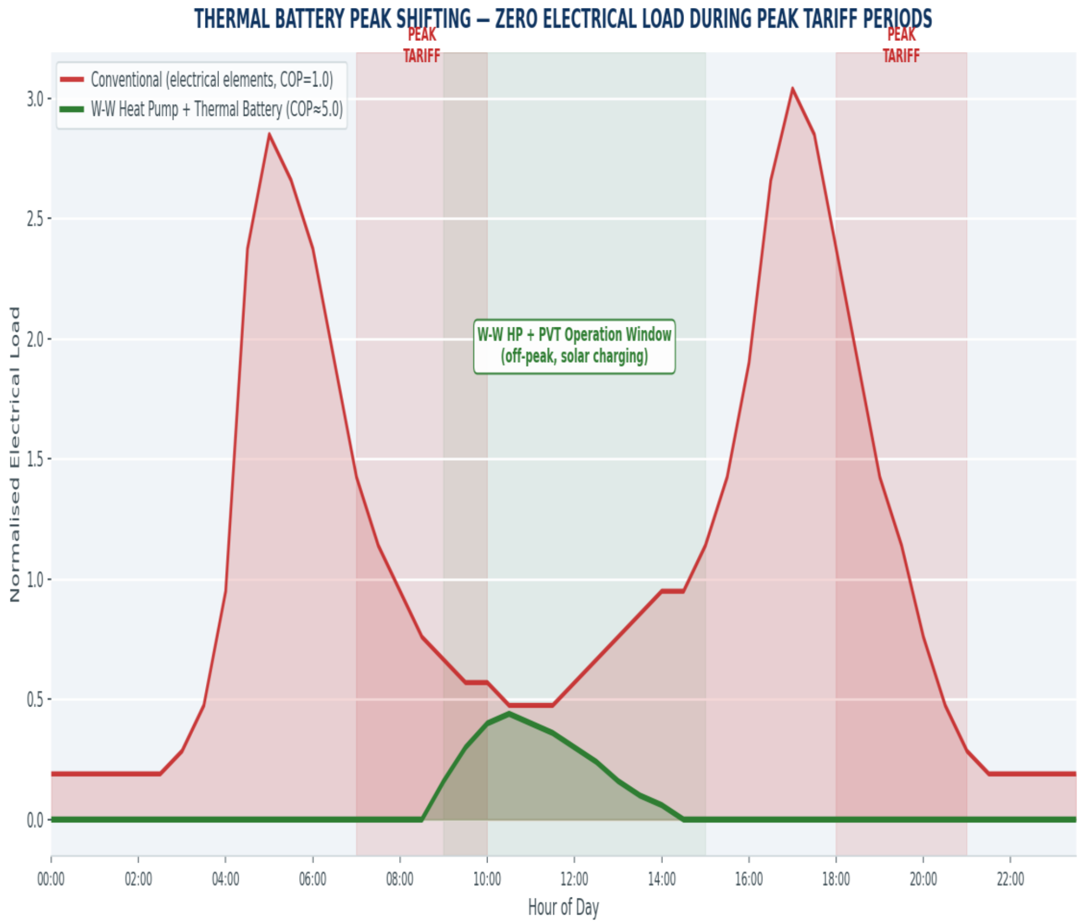
THE THERMAL BATTERY CONCEPT

- 30,000 L of water stores thermal energy like a battery stores electricity
- Charging: heat pumps run during solar hours (08:00–16:00) at low tariff
- Discharging: hospital draws hot water from tanks at peak (06:00–09:00, 17:00–20:00)
- Heat pumps OFF during peak — zero electrical demand spike

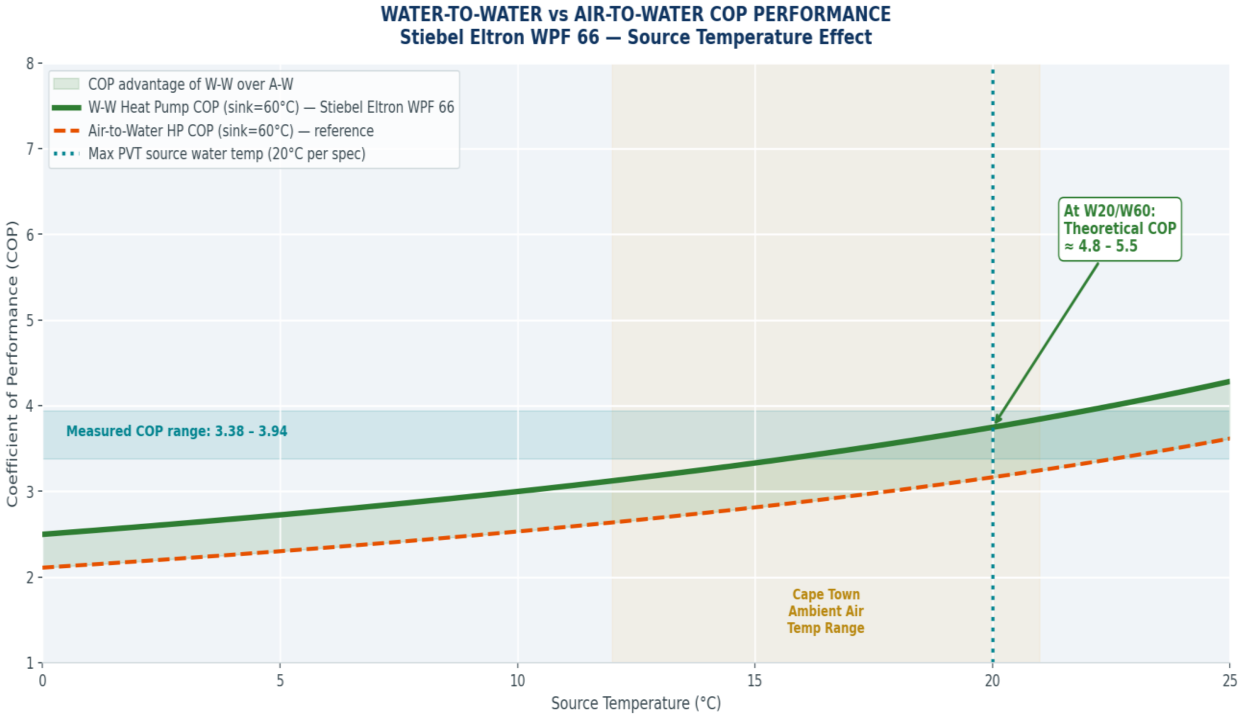
WHY THERMAL BEATS LITHIUM FOR HOSPITALS

METRIC	THERMAL TANK	LITHIUM BATTERY
Cost per kWh stored	R150–300	R 4,000–8,000
Lifespan	25–30 years	8–12 years
Maintenance	Minimal	Regular BMS care
Efficiency	95%+	85–92%
Fire risk	None	Thermal runaway risk

- **Thermal storage is 15–25× cheaper per kWh than lithium-ion**
- **No hazardous materials | No fire risk | No degradation**



WATER-TO-WATER HEAT PUMPS: THE COP GAME CHANGER



STIEBEL ELTRON WPF 66 — CERTIFIED COP DATA

RATING CONDITION	COP
W10/W35 (standard)	6.2
W10/W55 (high temp)	4.1
W20/W55 (PVT pre-heat)	5.2
W20/W60 (hospital + PVT)	**4.8–5.5 ★**
Measured at Mediclinic	**3.38–3.94**
Conventional element (ref)	1.0

WHY WATER-TO-WATER BEATS AIR-TO-WATER

- Water has 3,400 × the heat capacity of air
- Stable source temperature — no frost/defrost cycles
- No defrost energy penalty in winter
- PV-T pre-heats source water to ≤60°C — designed for each other

THE PVT SYNERGY

- PV-T raises source temp from ~18°C ambient to ~40°C
- This single change raises COP from ~2.5 to 4.8–5.5
- **Measured COP 3.38–3.94 at W20/W60 high-temp hospital duty**

CHILLER PLANT HEAT RECOVERY: THE HIDDEN ENERGY MINE

WHAT IS RING MAIN HEAT RECOVERY?

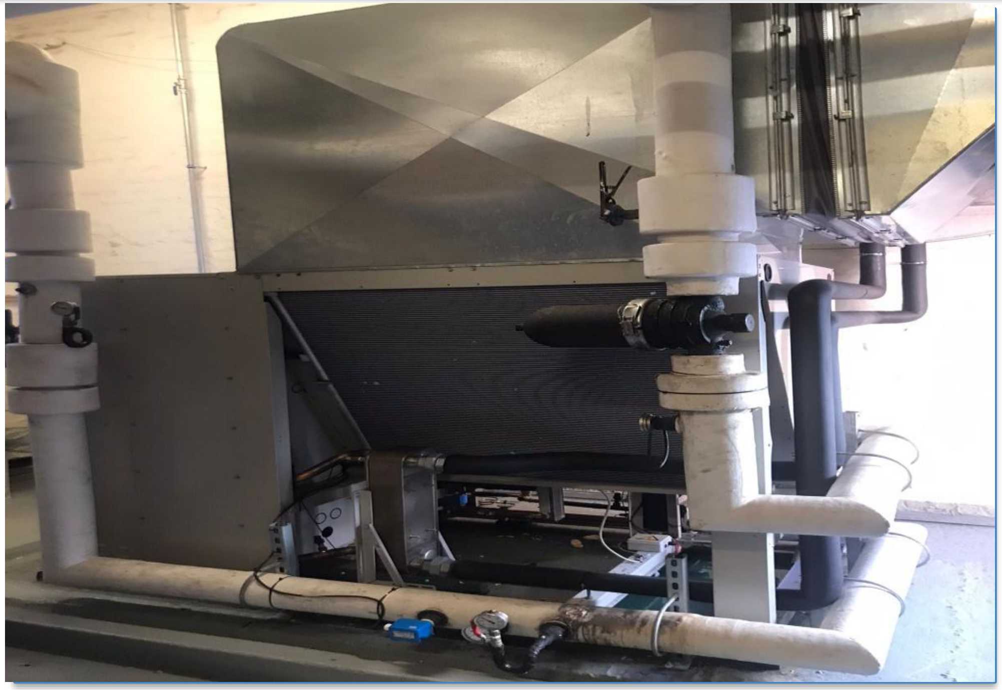
- Hospital chiller plants reject vast amounts of heat to atmosphere
- The chilled water ring main return is typically 12–16°C
- A plate heat exchanger on the ring main return captures this waste heat
- Captured heat pre-warms the HP source water — free energy input
- System operates 24/7 — independent of solar irradiance

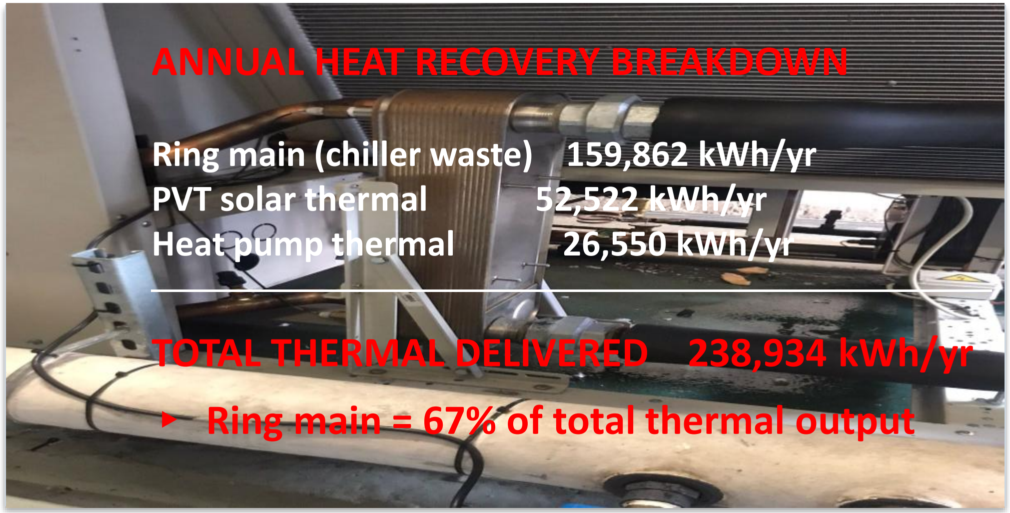
MEASURED IMPACT AT MEDICLINIC CAPE TOWN

- Ring main heat recovery: **114,762 kWh** in 9 months monitored
- Annualised: **~159,862 kWh/year** — the LARGEST single heat source
- Reduces HP electrical consumption by **~18%** annually
- Reduces chiller plant load — chiller runs less, uses less electricity
- Extends chiller and HP equipment life simultaneously

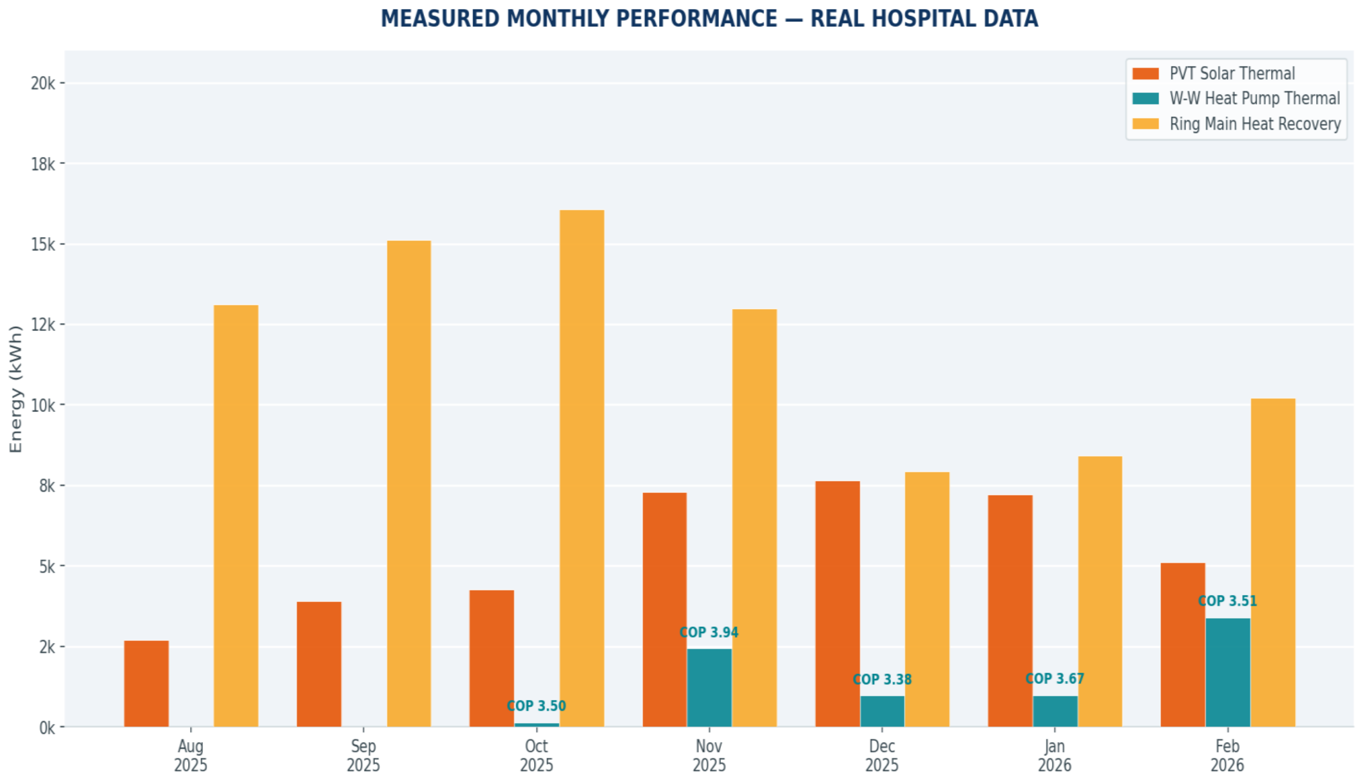
DOUBLE BENEFIT

- **1. Free heat captured from waste = less HP run time**
- **2. Chiller rejects less heat = chiller works less = lower electricity**
- **3. Both systems last longer — operating hours reduced**





MEASURED PERFORMANCE: THE DATA SPEAKS



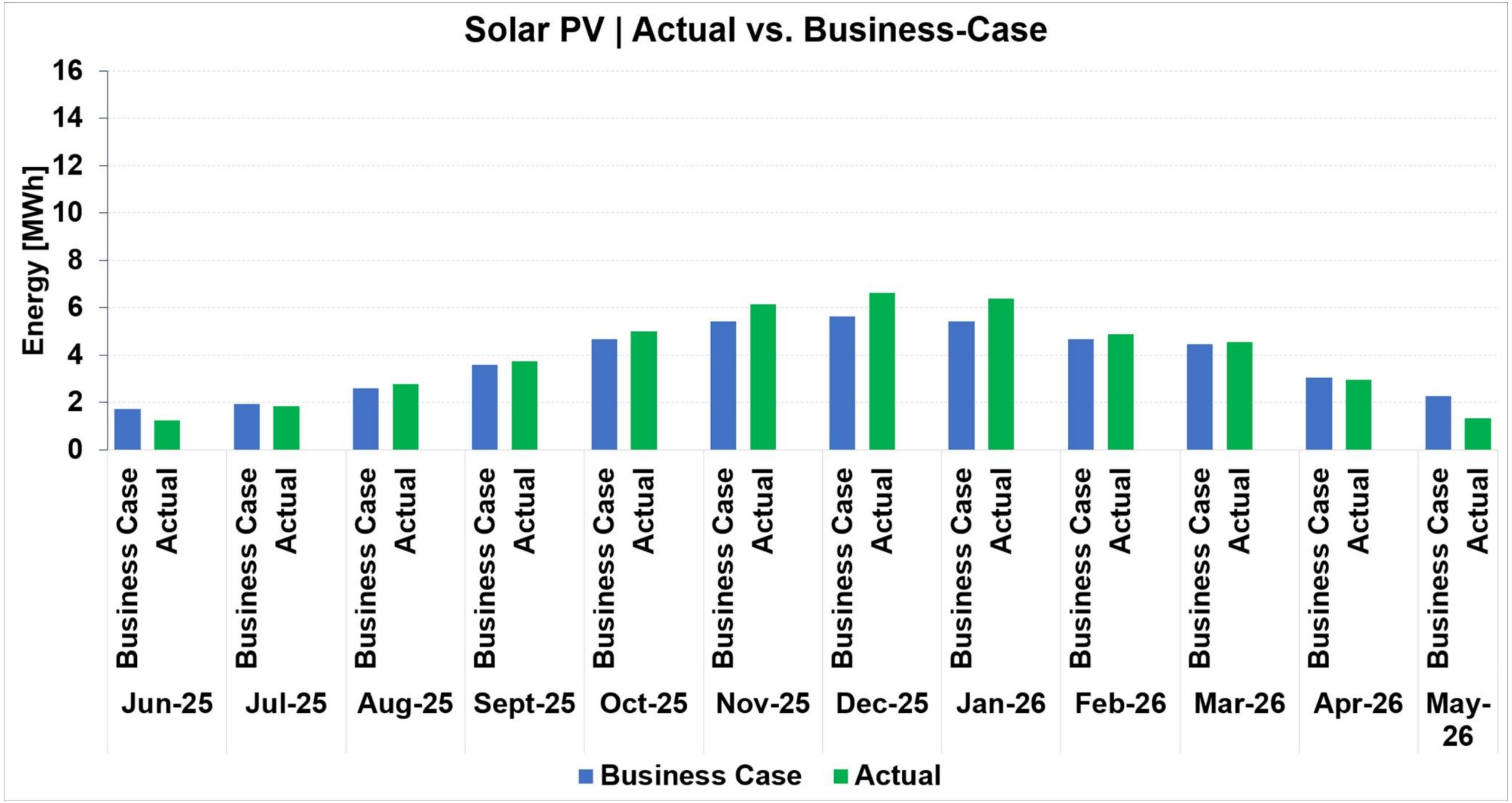
Month	PVT kWh	W-W HP	Ring Main	PV Gen	COP
Aug 2025	2,698	—	13,126	2,795	—
Sep 2025	3,912	—	15,130	3,733	—
Oct 2025	4,273	140	16,062	5,022	3.50
Nov 2025	7,294	2,440	12,979	6,150	3.94
Dec 2025	7,647	980	7,934	6,624	3.38
Jan 2026	7,216	990	8,423	6,405	3.67
Feb 2026	5,119	3,400	10,208	4,885	3.51
TOTAL	38,159	7,950	83,862	35,614	3.60

- **9-month monitored total: 169,862 kWh thermal delivered**
- **Heat pump electrical input: only 15,040 kWh for 9 months**
- **Ring main heat recovery: 114,762 kWh — largest single source**

KEY FINDING

- COP improves as ambient temperature rises (summer months)
- Winter months still achieve COP > 3.38 — far above conventional
- System performs in ALL seasons — not just summer

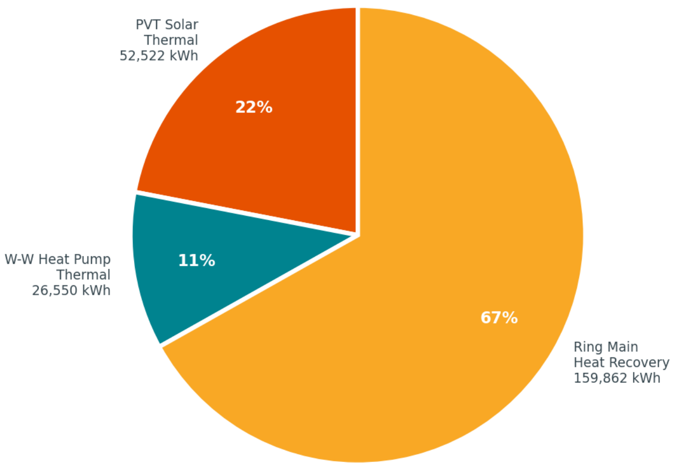
MEASURED PERFORMANCE: THE DATA SPEAKS



ANNUAL PERFORMANCE: JUNE 2025 TO JUNE 2026

JUNE 2025 – JUNE 2026: FULL YEAR PERFORMANCE

ANNUAL THERMAL ENERGY
Total: 238,934 kWh



KEY ANNUAL METRICS

238,934 kWh
Total Thermal Energy Delivered

50,586 kWh
PV Electricity Generated

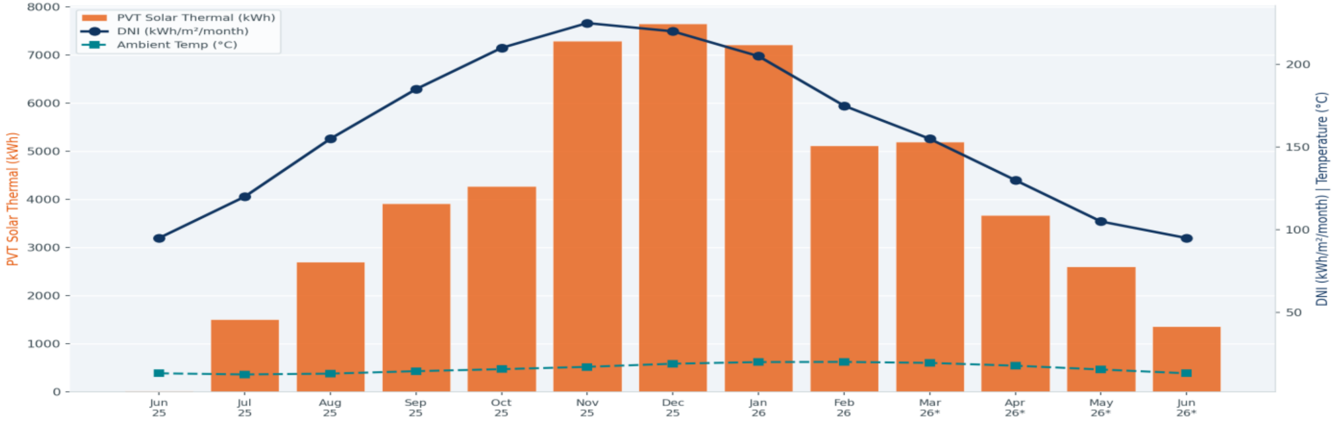
42,996 kWh
Net Electrical Surplus to Hospital

3.60
Average Measured COP (W-W)

66.4%
Annual Solar Fraction

120 tonnes
CO_2 Avoided Per Year

SOLAR THERMAL PRODUCTION vs CAPE TOWN DNI — R^2 = 0.96 CORRELATION



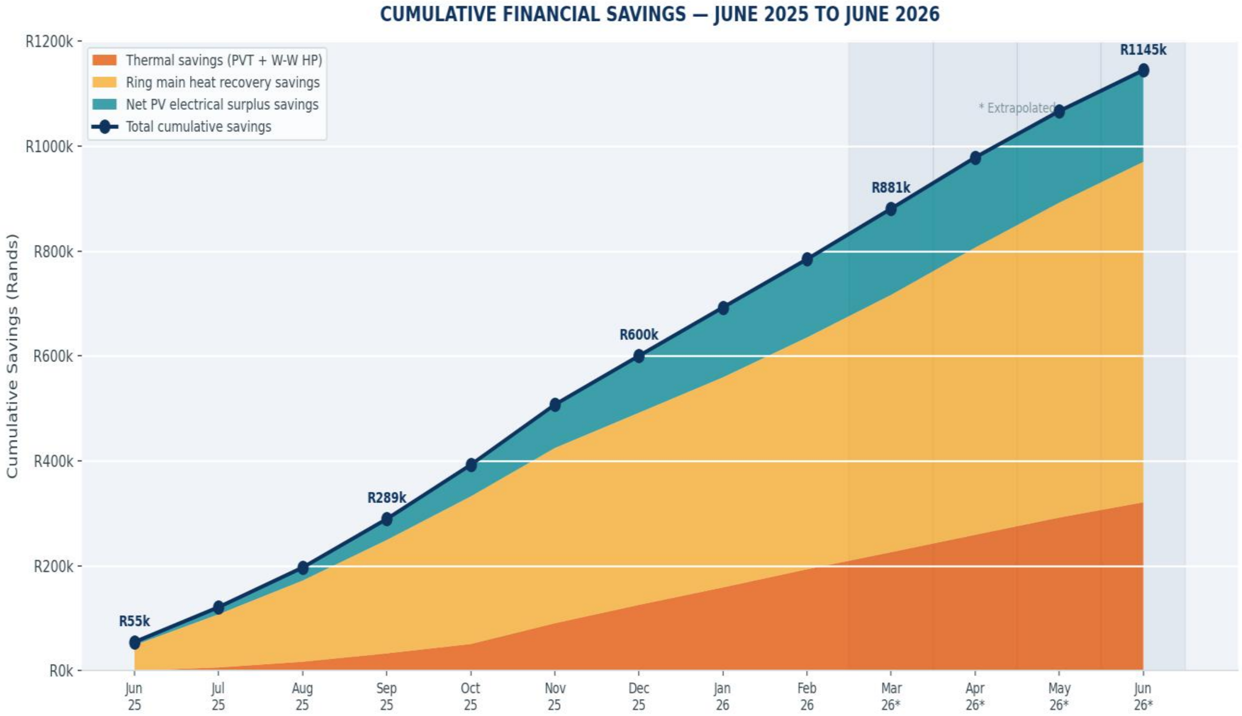
EXTRAPOLATED ANNUAL PERFORMANCE

(June 2025 – June 2026, Cape Town DNI + Temperature Adjusted)

METRIC	ANNUAL VALUE
Solar Thermal (PVT)	52,522 kWh
Heat Pump Thermal Output	26,550 kWh
Ring Main Heat Recovery	159,862 kWh
TOTAL THERMAL DELIVERED	**238,934 kWh**
PV Electrical Generation	50,586 kWh
HP Electrical Consumption	7,590 kWh
Net Electrical Surplus	**42,996 kWh**
Average Heat Pump COP	3.53
System COP (thermal/HP elec)	**31.5**
CO_2 Avoided	113 tonnes/year

- **System COP of 31.5 = 31.5 kWh heat per kWh HP electricity**
- **Cape Town summer peak: DNI 7.2 kWh/m²/day in January**

THE FINANCIAL CASE: R1.14 MILLION PER YEAR



ANNUAL SAVINGS BREAKDOWN

Thermal energy savings (vs elements @ R2.50/kWh)	R 597,335
PV electricity to hospital grid (R2.50/kWh)	R 107,490
Peak demand charge avoidance (est.)	R 180,000
Equipment life extension value (Annualised)	R 228,994
TOTAL ANNUAL BENEFIT	**R 1,113,819**

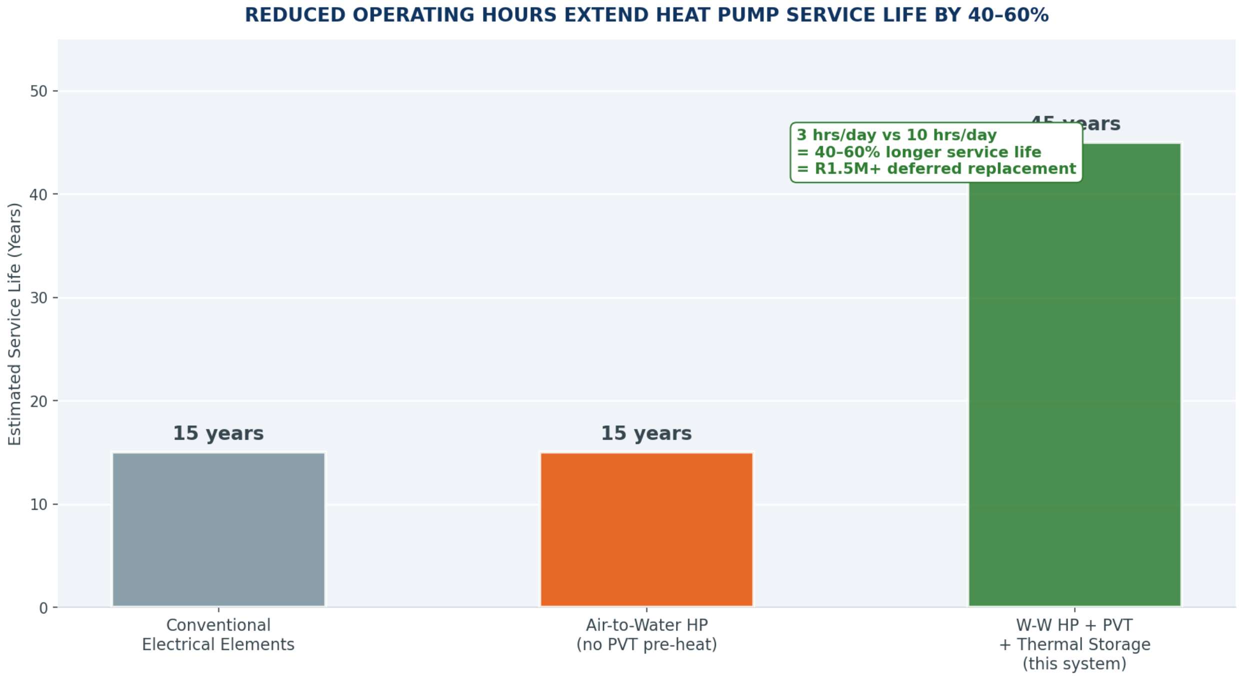
INVESTMENT & PAYBACK ANALYSIS

ITEM	VALUE
System capital cost	R 4,200,000
SOLTRAIN / AE Intec grant contribution	R 1,800,000
Net cost to hospital	R 2,400,000
Annual financial benefit	**R 1,113,819**
Simple payback (net cost)	**2.2 years**
Simple payback (full cost)	3.8 years
25-year NPV (8% discount)	**R 9.8 million**

TARIFF ESCALATION ADVANTAGE

- Eskom tariff escalation: ~12% per year historically
- System output is inflation-proof — sun & waste heat are free
- Year 10 annual saving projected: R 3.1 million
- Year 25 annual saving projected: R 9.7 million
- **Every R invested returns R4.08 over 25 years**

EQUIPMENT LONGEVITY: THE HIDDEN DIVIDEND



WHY THIS SYSTEM MAKES EQUIPMENT LAST LONGER

HEAT PUMPS

- Conventional hospital HP: 10–12 hrs/day operation
- This system: 2–5 hrs/day — thermal tanks supply the rest
- Operating hours reduced by 60–80%
- Compressor cycles reduced — fewer start/stop stress events
- Estimated lifespan extension: 40–60% (15 yrs → 20–24 yrs)

CHILLER PLANT

- Heat recovery reduces chiller heat rejection load
- Chiller runs fewer hours — less wear on compressors
- Condenser water temperature reduced — improved chiller COP
- Estimated chiller life extension: 20–30%

THERMAL STORAGE TANKS

- No moving parts — Steel tanks last 25–30 years
- No degradation — water stores heat indefinitely
- No replacement cycles unlike lithium batteries

EQUIPMENT	CONVENTIONAL	THIS SYSTEM
Heat Pumps	12–15 years	20–24 years
Chiller Plant	15–20 years	20–25 years
Thermal Storage	N/A	25–30 years
PVT Collectors	N/A	25+ years

CAPE TOWN'S SOLAR RESOURCE & AFRICAN REPLICABILITY

CAPE TOWN SOLAR RESOURCE

MONTH	DNI (kWh/m²/d)	AVG TEMP (°C)
Jun/Jul	3.8–4.2	12–14°C (winter)
Aug/Sep	4.8–5.5	14–17°C
Oct/Nov	6.0–6.8	17–21°C
Dec/Jan	7.0–7.2	22–25°C (peak)
Feb/Mar	6.5–7.0	23–24°C
Apr/May	5.0–5.8	18–21°C
Annual	**5.5 avg**	**18°C avg**

REPLICABILITY ACROSS AFRICA

CITY	DNI (kWh/m²/d)	ADVANTAGE vs CPT
Cape Town	5.5	Baseline
Johannesburg	5.8	+5%
Nairobi	5.9	+7%
Lagos	5.4	-2%
Cairo	7.2	+31%
Dubai	7.8	+42%

- **If it works in Cape Town winter — it works EVERYWHERE in Africa**

RESILIENCE: PERFORMING THROUGH SOUTH AFRICA'S LOAD-SHEDDING CRISIS

THE SOUTH AFRICAN CONTEXT

- South Africa experienced 200+ days of load-shedding in 2023
- Hospitals are critical facilities — power interruptions risk lives
- Conventional electric geysers fail instantly when power cuts
- This system provides inherent resilience through thermal storage

HOW THE SYSTEM PROVIDES RESILIENCE

- 30,000 L thermal battery holds 6–8 hours of hospital hot water supply
- PV generation (38 kW) offsets daytime grid consumption directly
- Heat pumps can be programmed to charge tanks before scheduled outages
- Ring main heat recovery continues during load-shedding (chiller on UPS)
- No hot water interruption during Stage 1–4 load-shedding events

COMPARISON WITH BACKUP ALTERNATIVES

SOLUTION	COST	HOT WATER?	ELECTRICITY?
Diesel generator	R 800k+	Yes	Yes (expensive)
Lithium battery	R 2–5M	No	Yes (limited)
This system	**R 4.2M**	**YES ✓**	**YES ✓ (PV)**

- **Only this system provides BOTH hot water resilience AND electricity**

REPLICABILITY: EVERY HOSPITAL CAN DO THIS EVEN WITH LIMITED ROOF SPACE

MINIMUM REQUIREMENTS FOR REPLICATION

REQUIREMENT	MINIMUM	MEDICLINIC CPT
Roof area	150 m²	188 m² ✓
Hot water demand	500 L/day	~3,000 L/day ✓
Chiller plant	Any size	Yes ✓
Grid connection	Standard	Standard ✓
Structural load	~25 kg/m²	Confirmed ✓

SCALABILITY

- System scales linearly — double the panels, double the output
- Modular design: add panels, tanks, or heat pumps independently
- Suitable for 50-bed clinics to 500-bed tertiary hospitals
- Works in any climate with DNI > 4.0 kWh/m²/day

HOSPITAL ARCHETYPES SUITED TO THIS SYSTEM

TYPE	BEDS	ROOF NEEDED	ANNUAL SAVING
District hospital	50–80	100–150 m²	R400–600k/yr
Regional hospital	100–200	150–300 m²	R800k–1.5M/yr
Tertiary hospital	300+	300–600 m²	R2–5M/yr

- **South Africa has 406 public hospitals + 200+ private facilities**
- **Total addressable market: R 400M+ per year in energy savings**

ENVIRONMENTAL IMPACT: 113 TONNES OF CO_2 AVOIDED EVERY YEAR

CO_2 EQUIVALENCES — 113 TONNES/YEAR

- = 49 passenger cars removed from the road
- = 12,700 trees planted and growing for 10 years
- = 565,000 km of driving avoided
- = 25-year total: 2,825 tonnes CO_2 avoided

ANNUAL CARBON IMPACT BREAKDOWN

SOURCE	kWh SAVED	CO_2 AVOIDED
Thermal energy (vs elements)	238,934 kWh	91.6 t CO_2
PV electricity to grid	42,996 kWh	16.5 t CO_2
Reduced chiller load (est.)	13,000 kWh	5.0 t CO_2
TOTAL	**294,930 kWh**	**113.1 t CO_2/yr**

ESKOM EMISSION FACTOR: 0.000983 t CO_2/kWh

SDG ALIGNMENT

- SDG 3: Good Health — clean, reliable energy for patient care
- SDG 7: Affordable and Clean Energy — renewable thermal
- SDG 11: Sustainable Cities — urban hospital decarbonisation
- SDG 13: Climate Action — 113 t CO_2/yr avoided per hospital

25-YEAR ENVIRONMENTAL LEGACY

- 2,825 tonnes CO_2 avoided over system lifetime
- Equivalent to planting 317,500 trees
- **One hospital. One roof. One integrated system.**

An AFRICAN -FIRST: FIVE SIMULTANEOUS INNOVATIONS IN ONE SYSTEM

WHAT MAKES THIS A WORLD-FIRST COMBINATION

① GLAZED PVT IN A HOSPITAL HOT WATER SYSTEM

- First use of glazed PVT (Abora aH72) for hospital-grade hot water in South Africa
- Glazed design achieves higher temperatures required for sterilisation and hygiene

② WATER-TO-WATER HEAT PUMPS FED BY PVT

- PVT pre-heats source water to ≤40°C — purpose-designed synergy with W-W HP
- Achieves COP 4.8–5.5 theoretical vs 2.5 for conventional A-W units

③ THERMAL STORAGE AS A DEMAND MANAGEMENT TOOL

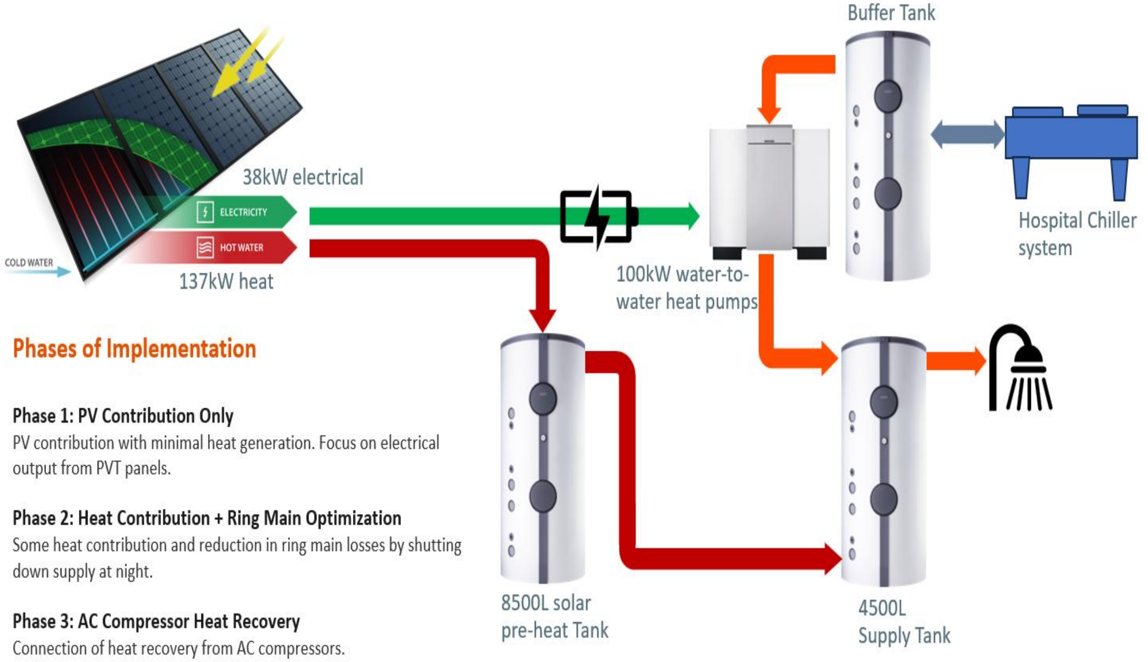
- 30,000 L tanks used as a thermal battery for peak shifting — not just buffer storage
- Eliminates morning and evening electrical demand peaks entirely

④ CHILLER RING MAIN HEAT RECOVERY INTEGRATED INTO THE LOOP

- Waste heat from chiller plant captured and fed into the HP source circuit
- Reduces both heating load AND chiller electrical consumption simultaneously

⑤ FULLY MONITORED, VERIFIED, PUBLISHED PERFORMANCE DATA

- 9 months of real-world measured data — not simulation or modelling
- Independent monitoring by **Greenability** — transparent, auditable, replicable



- NO OTHER HOSPITAL IN SOUTH AFRICA — OR AFRICA — HAS ALL FIVE SIMULTANEOUSLY

THE CALL TO ACTION: REPLICATE, SCALE, DECARBONISE

FOR HEALTHCARE ENGINEERS

- Specify PVT — not PV-only or solar thermal alone
- Require W-W heat pumps when source water > 15°C
- Design for thermal storage from day one
- Integrate chiller heat recovery into every new hospital
- Demand monitored performance data — not just simulation

KEY DESIGN PARAMETERS

- PVT array: 1.5–2.0 m² per bed minimum
- Thermal storage: 150–200 L per bed
- HP sizing: 0.5–0.8 kW per bed
- Heat recovery: plate HX on ring main return

- **Contact: Greenline Africa / CRSES for design support**

FOR ENERGY CONSULTANTS

- This system achieves SANS 10400-XA compliance and beyond
- Qualifies for SOLTRAIN, SANEDI and DBSA green funding
- Supports EDGE Advanced and Green Star certification
- Bankable with as low as a 2.2-year payback on net cost
- Eskom IDM and C&I incentive programmes applicable

FINANCIAL MODELLING INPUTS

- Thermal output: 1,270 kWh/m²/yr (Cape Town)
- PV output: 269 kWh/m²/yr (Cape Town)
- HP COP: 3.5 conservative | 4.8 with full PVT synergy
- Ring main recovery: 160,000 kWh/yr per hospital

- **Full performance dataset available on request**

FOR HOSPITAL DIRECTORS

- R 1.14 million annual saving — every year, inflation-proof
- 2.2-year payback on net capital cost
- 25-year NPV: R 9.8 million per hospital
- No hot water interruption during load-shedding
- Reduces carbon footprint by 113 tonnes CO_2/year

NEXT STEPS

- 1. Commission a feasibility study for your facility
- 2. Apply for SOLTRAIN / SANEDI co-funding
- 3. Specify PVT + W-W HP + thermal storage in next capex
- 4. Install monitoring from day one
- 5. Share your data — build the African evidence base for **SAFHE**

- **The revolution starts with one hospital. Yours.**

THE REVOLUTION
STARTS HERE.

One roof. One system.
Three energy sources.
Zero compromise.

South Africa's first integrated PVT +
Water-to-Water Heat Pump +
Chiller Heat Recovery system
is proven, measured and ready to scale.

Greenline Africa (Pty) Ltd

Greenability — Monitoring & Analysis Institute

SOLTRAIN / AEA — Funding Partner

30th IFHE Conference | ICC Cape Town
9–11 June 2026

Stellenbosch
UNIVERSITY
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CENTRE FOR RENEWABLE &
SUSTAINABLE ENERGY STUDIES

238,934 kWh/yr thermal | 113 t CO_2/yr avoided | COP 3.53 avg | R 1.14M/yr saving | 2.2 yr payback