GridSync

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The other flexible load

How aggregated load from households, clinics and public buildings can absorb South Africa's surplus power, and what it takes

GridSync (Pty) Ltd
Johannesburg · www.gridsync.co.za

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ABOUT THE LEAD AUTHOR

Thuba "Lihle" Moyo, CTO, GridSync. Thuba led the drafting of this paper. He is a renewable-energy specialist in deploying virtual power plants and flexibility programmes. He served as a technology adviser to the Victorian Government in Australia on its virtual power plant, zero-emission vehicle and neighbourhood battery initiatives, and was part of the team behind AEMO's Project EDGE and Project Symphony. The Africa Finance Corporation's Climate Leadership initiative has recognised his work. He holds an MSc in Renewable Energy, a BSc (Hons) in Physics and an MBA.

EXECUTIVE SUMMARY

The surplus is here. The programmes are built for big loads.

South Africa now has more electricity than it can sell in the middle of the day. Government's answer is to find large customers who can switch on when the surplus appears. It is a reasonable response and an incomplete one, because the programmes built so far can only be used by customers of a certain size.

R49 bn
a year of potential revenue lost to curtailment, according to the Minister
ESI Africa, 7 Oct 2026

> 4 GW
average surplus on the system, mostly during the day
TechCentral, 7 Oct 2026

5.2 m
electric geysers in South African homes, drawing about 6.6 GW in a winter peak
LBNL with Wits, May 2024

10 MW
smallest load the transmission operator's instantaneous demand-response product will take
NTCSA

THE FINDING

Every aggregator-facing flexibility programme we reviewed has a size or voltage threshold. As reported, the pilot tariff under consultation at NERSA excludes customers below 500 V, and the reports do not mention aggregators.[1] The transmission operator's instantaneous demand-response product starts at 10 MW.[2] A household electric geyser draws about 1.3 kW in a winter peak.[3] Taken one at a time, it falls below every threshold. Taken together, 5.2 million of them draw about 6.6 GW at the winter peak and use roughly 25.6 TWh a year, about two and a half times what Hillside aluminium smelter consumes.[4]

The same is true of the home batteries bought during load shedding. Nobody counts them, but on our estimate between one and four gigawatt-hours of residential battery capacity sits idle for much of the year, in a country where daytime power is now the cheap hour. That is an estimate, and Part 3 shows how it was built.

WHAT THIS PAPER PROPOSES

The obstacle is not technology. Water heaters can be controlled, and several South African studies and pilots show it.[5] The obstacle is that the market has no way to recognise a portfolio. Three things are missing:

1. **Portfolio eligibility.** Let a verified aggregate of small loads qualify for the same flexibility programmes as one large customer. The test should be what the portfolio can be shown to deliver, not the size of any single connection.
2. **A surplus-hour price signal.** A published, day-ahead price for the hours when generators are being curtailed, open to any participant that can respond, built on the ring-fenced design Eskom used for its smelter agreements, where shortfalls are not passed on to other customers.[6]

3. **A measurement standard.** An agreed baseline method, interval data and control groups, so that a delivered kilowatt-hour can be audited by the utility, the regulator and the customer.

The ask is parity of access, not parity of price. Smelters negotiated a rate in exchange for a commitment to take a large volume of energy. A portfolio would have to earn its place the same way, by committing to a measured response.

WHERE TO START

Not with a national rollout. Public institutions can own large numbers of hot-water loads under a single decision-maker: social-housing units, clinics and correctional centres. The Social Housing Regulatory Authority reports 50,178 units in its portfolio, spread across social-housing institutions.[7] A twelve-month measured pilot with a matched control group would give the regulator and Eskom the evidence they need to write a rule. Part 6 lists ten moves that do not wait for new transmission lines or new investors.

WHERE GRIDSYNC FITS

GridSync (Pty) Ltd is a South African company that is developing the control, measurement and consent layers a portfolio needs. It does not make batteries or generate electricity. As the wholesale market opens, GridSync intends to be a key part of how small-scale embedded generators, and the loads and batteries behind them, are coordinated into it. Part 9 explains how.

WHAT THIS PAPER DOES NOT CLAIM

Distributed loads will not replace smelters or data centres; they add to them, and can start sooner.

They cannot cure curtailment that is caused by a transmission bottleneck unless they sit behind that bottleneck. Analyst Chris Yelland reads Eskom's system outlook as attributing most expected curtailment to transmission constraints.[8]

The participation figures in Part 3 are scenarios built from published inputs, labelled as such. They are not forecasts, and they are not claims about any company's installed base.

NOTES

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I

SECTION I

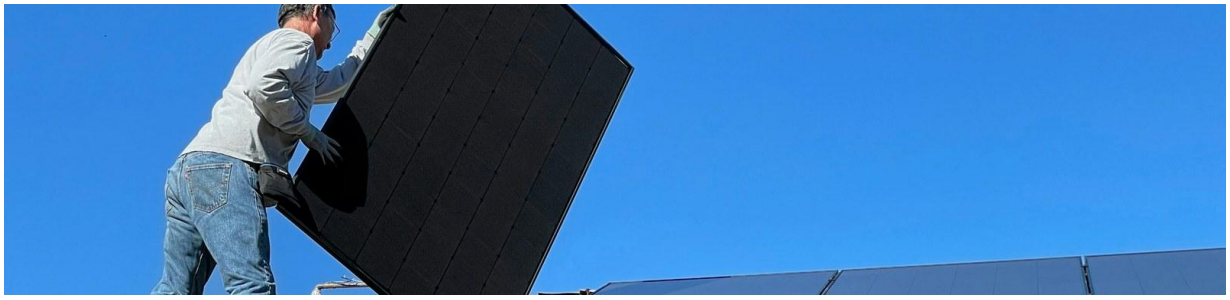
The surplus and the policy response

Why South Africa now has power it cannot sell, and what government has built to sell it.

PART 1

The surplus is real, and it arrives in daylight

Two years ago the national question was whether the lights would stay on. National load shedding has not occurred since mid-May 2025, and by 25 September 2026 Eskom counted 497 consecutive days without it.[9] The question now facing the Minister of Electricity and Energy, the regulator and Eskom is how to sell power that is already being generated.



Rooftop solar is where the daytime surplus begins. Photo: Bill Mead

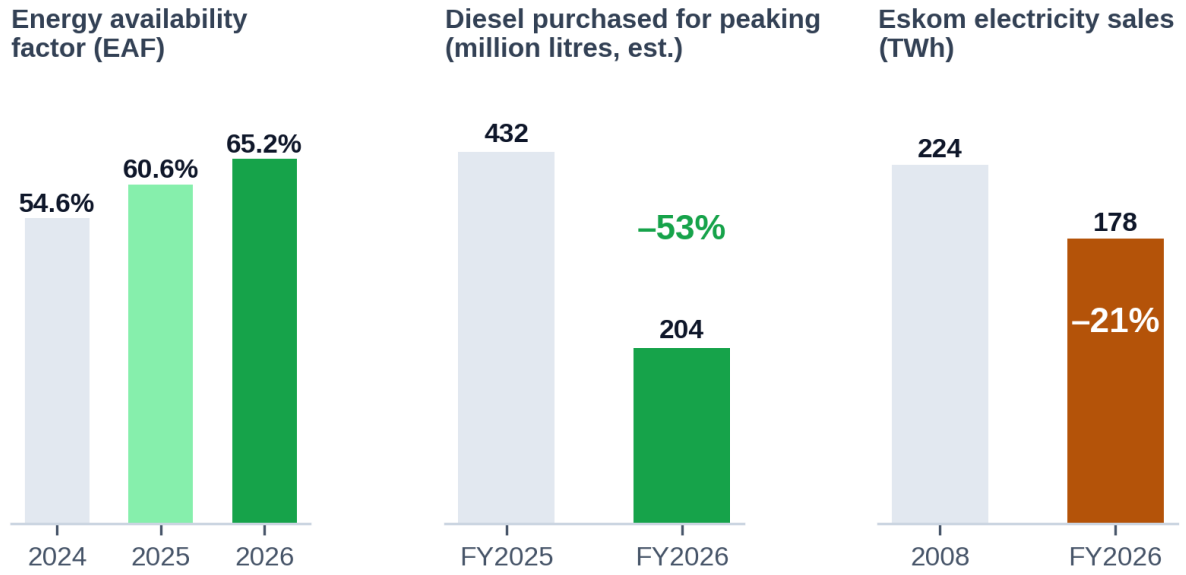
Scarcity gave way to surplus in under three years

Eskom's energy availability factor rose from 54.56% in 2024 to 60.6% in 2025 and 65.16% in 2026.[10] Estimated diesel purchases for its open-cycle gas turbines fell from 431.7 million litres in FY2025 to 203.7 million in FY2026, a fall of 53%.[11] Over the same period, demand on the grid fell. Eskom sold 178,032 GWh in the year to March 2026, about 6% less than a year earlier and the lowest in at least eighteen years; sales to industrial customers fell 22.5%, or 9.7 TWh.[12] In 2008 it sold 224,366 GWh.[13]

Customers did not stop using electricity. Many of them started making their own. SAPVIA put installed solar PV at 10.12 GW in July 2026, and press reports of Eskom's results put rooftop solar behind the meter at 9.1 GW, against 6.9 GW in Eskom's system outlook of November 2025.[14] The system that load shedding was meant to protect is now selling less of its product to the customers who have it.

EXHIBIT 1

Generation recovered while sales fell: three indicators of the swing from scarcity to surplus



Note: EAF is energy availability factor, the share of installed capacity available to generate. Eskom financial years. Diesel is for open-cycle gas turbines, Eskom and independent producers. FY2026 sales are in TWh, converted from 178,032 GWh and 224,366 GWh.
Source: Eskom and press compilations (Daily Investor, Engineering News), 2024 to FY2026

> *"We've got this power that we cannot sell, that's the reality of the situation."*
>
> Mteto Nyati, Chair of Eskom, August 2026[15]

How much surplus, and when

There is no single agreed figure for the surplus, and the published estimates measure different things. Some describe capacity, some energy, some a peak and some an average. They should be read side by side, not added together.

EXHIBIT 2

Published estimates of the surplus differ in what they measure

Statement	Figure	Source and date
Surplus generation capacity over the next few years	2 to 3 GW	Eskom results, via Business Day, 1 Sep 2026[16]
Surplus peak capacity	about 6 GW	Eskom, via Datacenter Dynamics, 13 Aug 2026[17]
Spare capacity "at times", driven by daytime solar and low demand at night	5 to 7 GW	Eskom proposal to NERSA, via TechCentral, 2 Oct 2026[18]
Average surplus, mostly during the day	more than 4 GW	Minister Ramokgopa, as reported by TechCentral, 7 Oct 2026[19]
Curtailment on a single bad day in winter 2026	up to 3,000 MW	NTCSA, via TechCentral, 7 Oct 2026[20]

Note: The figures are not comparable with one another and are not additive.
Source: Eskom, NTCSA, Minister of Electricity and Energy as reported by the outlets named

What is common to all of them is the hour. Surplus arrives when solar output is high and demand is low, which means the middle of the day. TechCentral reported the Minister as describing an average surplus of more than 4 GW, mostly during the day.[21] The system operator's Gav Hurford told TechCentral that curtailment had reached up to 3,000 MW on a particular day, and that curtailment was now "almost a daily routine".[22]

What the surplus costs

Curtailment is the deliberate reduction of a generator's output because the system cannot take the power.[23] Engineering News reported the Minister as putting the national share at about 3% today, against a level of 15% to 20% at which it becomes a "terrible problem".[24] The cost is already visible. Curtailment instructions to independent producers rose from about 100 a month early in 2026 to more than 1,000 a month by July.[25] Outstanding claims stood at about R2 billion in mid-June and R1.5 billion by 24 July.[26] Reporting from Windaba on 7 October, ESI Africa quoted Dr Ramokgopa saying that government was losing potential revenue of "close to R49-billion per annum" through curtailment.[27]

That R49 billion is potential revenue, not a payment made, and the reporting does not give the scenario or time horizon behind it. It is still the number the Minister chose to put in front of the industry, and it frames the policy problem correctly. Energy that can be generated but not sold is a cost to the generators, to Eskom, and ultimately to every customer who pays for the system.

Which surplus can small loads reach?

Two different things are called surplus, and they call for different responses. The first is a system-wide midday surplus: more energy is available than the country is using, wherever it is. A kilowatt-hour absorbed by a geyser in Soweto helps just as much as one absorbed in Saldanha. The second is a location-constrained curtailment: the power is generated in one place and cannot be carried to where demand is. Chris Yelland's reading of Eskom's own outlook is that transmission constraints, rather than true oversupply, account for most of the curtailment expected by 2028.[28]

Distributed loads can address the first kind everywhere. They can address the second only where the portfolio is behind the constraint. This paper is clear about that boundary, and it shapes the products described in Part 4: two work anywhere on the system, and the third works only in the right place.

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14 SAPVIA, Solar PV passes 10 GW, 3 Jul 2026.
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15, 17 Datacenter Dynamics, Eskom courts hyperscalers for excess energy, 13 Aug 2026.
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19–22 TechCentral, The giant batteries coming to the grid, 7 Oct 2026.
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25, 26 SAPVIA, IPP curtailment events climb tenfold, 30 Jul 2026.
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27 ESI Africa, Windaba 2026 pledges on curtailment, 7 Oct 2026.

PART 2

What government builds for large loads, and what it leaves out

Government's response to the surplus has so far been to find large customers. The approach has produced real agreements and a real pilot. It has also drawn a line, in tariffs and in eligibility rules, below which a customer cannot join.



Programmes for large customers rely on utilities that plan, connect and operate each site. Photo: Aboodi Vesakaran

The smelter agreements set the template

NERSA approved amendments to Eskom's negotiated pricing agreements with ferrochrome smelters on 28 May 2026 and announced the decision the next day.[29] The tariff is 62 c/kWh, escalating at producer-price inflation plus 1%, down from 136 c/kWh previously.[30] Two agreements run for five years (Samancor) and three years (Glencore-Merafe) from 1 June 2026. As described in Engineering News in May, the customer commits to take 80% of an agreed volume, and upside above a ferrochrome price threshold is shared equally.[31] Any shortfall is ring-fenced within Eskom rather than being passed to other customers.[32]

The design matters more than the price. It trades a commitment to use a large volume of energy for a lower rate, and it protects other customers from the cost. A similar logic runs through the Hillside agreement, where the first-year tariff of R682.92/MWh compares with R1,135.95/MWh on the standard large-user time-of-use tariff, a discount of 39.9%, for about 10.3 TWh a year.[33]

> *"We need to deploy excess generation capacity to get people and the South African economy going."*
>
> Dr Kgosientsho Ramokgopa, Minister of Electricity and Energy, reported by Mining Weekly, 19 May 2026[34]

The flexible-load pilot extends the idea to new customers

On 2 and 3 October 2026 TechCentral and TimesLIVE reported on an Eskom proposal to NERSA for a two-year pilot tariff aimed at customers who can move their consumption in time.[35] As reported, the benchmark is R1.20/kWh for the highest-voltage customers in the southern zone. Large-user time-of-use hours would be re-

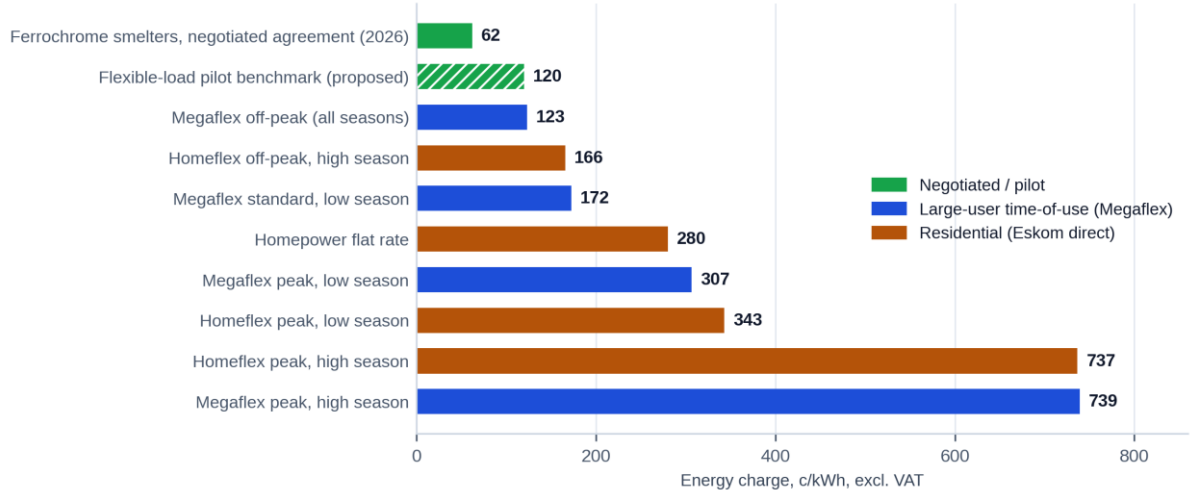
classified so that most standard-rated weekday daytime hours become off-peak, and the flexible window would run for 12 to 16 hours a day. Customers connected below 500 V are excluded. Two cryptocurrency-mining companies have expressed interest, with combined initial demand of about 10 MW and potential expansion to 500 MW. Participants may be required to provide demand response.

NERSA has asked for comment on whether curtailment should be mandatory, what telemetry and penalties would apply, and how so-called "time-flexible" off-takers should be defined beyond miners.[36] The reports do not mention aggregators. Comments close at 4 p.m. on 23 October 2026, hearings are set for 3 November, and a decision for 7 December.

The Minister has set a wider ambition for mining. Speaking to TechCentral, he said government was "looking at up to 1-3GW in the next two years" of flexible mining load.[37] The pilot's reported interest, 10 MW initially and potentially up to 500 MW, is a fraction of that ambition.

EXHIBIT 3

The flexibility that large customers are being offered is priced far below what households pay



Note: All prices exclude VAT. Megaflex energy rates are for supply below 500 V within 300 km, 2026/27. Homeflex and Megaflex bundle capacity and network charges differently, so the bars compare energy rates and are not like-for-like bills. The pilot benchmark is as reported by TechCentral and has not yet been approved. Hatched bar indicates a proposed rate.
Source: Eskom Tariffs and Charges Booklet 2026/27; NERSA; Engineering News; TechCentral, 2 Oct 2026

The ladder is steep. A residential customer on Homeflex pays 736.61 c/kWh at peak in the high-demand season and 165.94 c/kWh off-peak.[38] A ferrochrome smelter under the new agreements pays 62 c/kWh. Part of that gap is real cost: smelters connect at high voltage, take a flat load and commit volume. Part of it is the price of being small. The point of this paper is that the second part can be reduced if small loads can be shown to behave like large ones.

Every product has a threshold

Eskom and the transmission operator run several programmes that pay customers for flexibility. Each has a minimum size, and the minimums were written for industry.

EXHIBIT 4

Minimum sizes in published flexibility and demand-response programmes

Programme	Minimum	Source
Instantaneous demand response (NTCSA)	10 MW	39
Supplemental demand response (NTCSA)	the greater of 500 kW or 15% of the plant's average demand	40
Distribution load management (Eskom)	0.2 MW (0.5 MW in a 2023 presentation)	41
Distribution residential load management (Eskom)	1 MW within a single municipality; R3 million per MW over 24 months	42
Demand-response pilot for small commercial and residential load (Eskom, 2023)	aggregator submissions of 1 to 5 MW; R2,500/MWh; evaluation window to 29 September 2023 or 50 MW	43
Megaflex time-of-use tariff	above 1 MVA	44
Flexible-load pilot tariff (proposed)	highest-voltage customers; below 500 V excluded	45

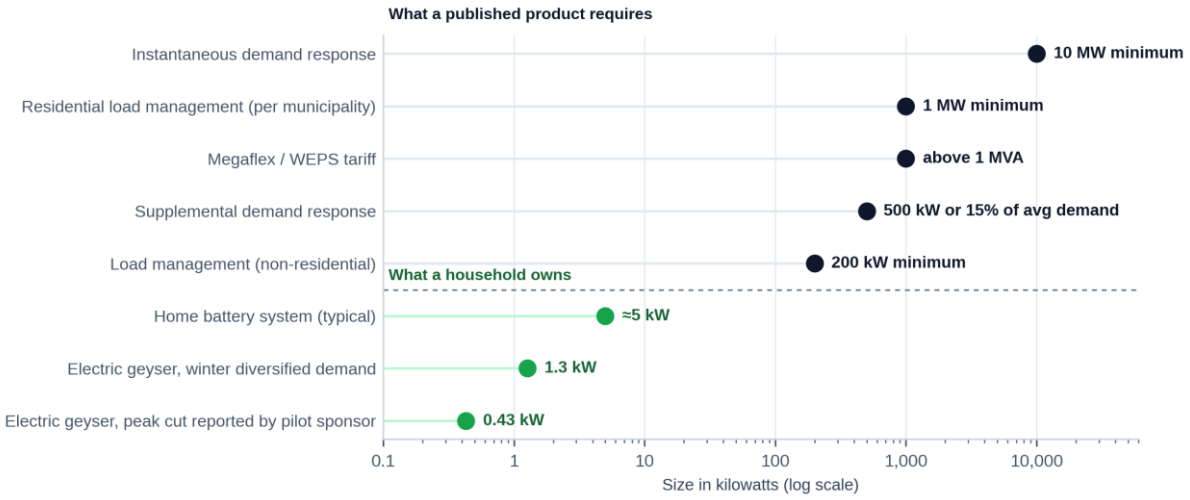
Source: Programme documents named in the table, as accessed 7 October 2026

Eskom has tried to reach smaller customers. A 2023 pilot for small commercial and residential load invited aggregator submissions of 1 to 5 MW at R2,500/MWh, but its evaluation window ran to 29 September 2023 or until 50 MW was reached, and we found nothing on what followed.[46] Its residential demand-response agreement of July 2025 works through the customer's smart meter limiting load, and credits a fixed R90 a month if a limiting event occurred. It has no interval-data, baseline or aggregator provisions.[47]

One entry deserves attention. Eskom's distribution programme includes a residential load-management product with a threshold of 1 MW in a single municipality, low enough to be met by a portfolio of geysers. Eskom's own programme page describes the demand-management programme as placed on hold pending management review.[48] A municipal geyser rollout under the programme was reported as recently as May 2026.[49] The mechanism that comes closest to portfolio eligibility exists and has been used. Whether it is open to new entrants today is the first thing to establish.

EXHIBIT 5

The programmes that pay for flexibility start where a household's loads end



Note: Logarithmic scale. Battery size is an indicative typical home system and is not drawn from a survey. The 0.43 kW figure is the average peak-load reduction per geyser reported by the sponsor of a South African pilot; 1.271 kW is the winter diversified demand per geyser.
Source: NTCSA; Eskom; LBNL with Wits (2024); GridSync analysis

Storage procurement is also at utility scale

The Minister told Windaba that government is accelerating 4.6 GW of battery storage, and a new determination of 7 October opens public procurement of large-scale batteries and gas-to-power.[50] The programmes already procured total 1,744 MW and 6,976 MWh of storage across three rounds.[51] Bid window 3 alone covered 616 MW and 2,464 MWh at a cost of R9.5 billion, with evaluation prices of R1,801 to R2,478 per MWh.[52] Eskom's own first phase is 833 MWh.[53]

These are the right investments, and they take years to build. They also have a counterpart that nobody is counting. Batteries bought privately by households and businesses during load shedding already sit behind customers' meters. Part 3 estimates what that stock may amount to.

Data centres are the long game

Government intends to attract data centres as a source of new demand. In the February 2026 Budget the Minister of Finance said that data infrastructure "should be considered as critical as electricity, ports and transport networks".[54] On 6 October the Minister told Windaba that Eskom would facilitate more data centres, and an Eskom announcement was expected soon.[55]

A data-centre campus takes years to plan, permit, connect and build, and its load is most valuable to the grid if it can flex. A study by Duke University researchers estimated that the 22 largest US balancing authorities could take 76 GW of new load if it curtails for 0.25% of the year, 98 GW at 0.5% and 126 GW at 1%, because grids are rarely at their limit.[56] The authors describe the work as a first-order estimate that does not model local network constraints. Demonstrations have followed: a 2025 Phoenix trial cut a GPU cluster's power by 25% for three hours during the evening peak,[57] and a December 2025 London trial reduced draw by up to 40% in simulated grid events.[58] Ireland's regulator has gone further and made connection conditional on supplying generation or storage on site or nearby.[59] The same logic could apply in South Africa, where data-centre capacity is reported at roughly 400 MW and the announced Cape Town projects alone amount to about 580 MW, which one report puts at 34% of the city's maximum demand.[60] A data-centre customer that accepts curtailment may be connected sooner. That needs someone to dispatch the flexible parts of its demand and prove the response.

GridSync's role there is as an enabler, not an owner of data centres, and it needs the control and verification stack that Part 5 specifies for small loads.

READING ACROSS PART 2

Government is building a demand programme for customers it can see, which are customers that are big. Small loads are excluded less by intent than by the way eligibility is written.

NOTES

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II

SECTION II

The overlooked resource

Geysers, batteries and public buildings: loads that are small one by one and large together.

PART 3

The overlooked resource: small loads that add up

Three kinds of small load are already in place and already paid for: electric water heaters, home and business batteries, and the buildings that public institutions own. None of them meets a size threshold on its own. This part sets out what each is worth, how we arrived at the figures, and where the evidence is thin.

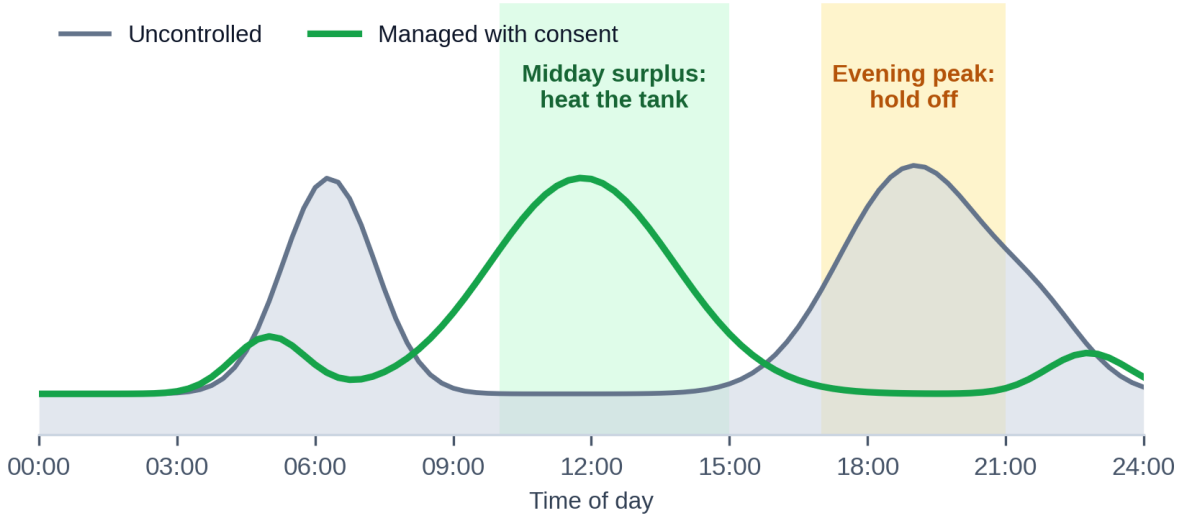
Geysers: the largest controllable household load

Lawrence Berkeley National Laboratory, working with the University of the Witwatersrand, estimated 5.2 million electric storage water heaters in South African homes in 2023 and projected 6.4 million by 2033.[61] The diversified demand per unit is 1,271 W in winter and 698 W in summer. Across the stock that is a winter maximum of about 6,643 MW and an annual consumption of 25.6 TWh.[62] The same study modelled what control could achieve by 2033: switching 30% of geysers cut the winter peak by about 157 MW, while a scheme pairing control with solar PV cut it by about 2.2 GW but let winter comfort fall to 76%.[63] Daily Maverick's reporting on the Tjommie smart-geyser rollout in Nelson Mandela Bay attributes to the chief executive of the device maker the figures that geysers account for about 40% of household use and about 20% of peak load; no independent data is cited.[64]

A geyser is a good flexible load for a simple reason: it is a thermal battery that people already own. A 150 to 250 litre tank heated through a 40 K rise holds between about 7 and 12 kWh of heat. Multiplied across 5.2 million tanks, that is 36 to 60 GWh of heat in full tanks, against 6.976 GWh of storage procured through the government's large-scale battery programme.[65] That is the heat content of full tanks, on our arithmetic, not spare room to absorb extra energy: tanks are usually warm already, households must still have hot water when they want it, and only a fraction of owners will take part. It does show that the thermal store is large relative to the batteries being built.

EXHIBIT 6

A geyser can heat at midday and hold off in the evening without the household noticing



Note: Schematic only. The curves are illustrative and do not show measured data from any site.
Source: GridSync illustration, shaped on published load profiles

What South African studies and pilots have found

South Africa has a long record of controlling water heaters. Eskom's own demand-side programme reported 589 MW of savings in the year to March 2013, excluding residential initiatives; its Residential Mass Roll-out Campaign saved a further 188.7 MW.[66] Municipalities still run ripple-control networks: City Power's load-reduction scheme uses ripple relays at no fewer than 69 substations.[67] University research since 2012 has tested smarter control.

EXHIBIT 7

What South African studies of water-heater control have found

Study	Setting	Finding
Catherine, Wheeler, Wilkinson and de Jager (2012)[68]	Hot-water usage profiling	An adaptive set-point lowered mean geyser temperature by 9.5 °C and cut energy by 31.5%. Water heating was 36.1% of residential electricity.
Roux, Apperley and Booysen (2018)[69]	34 field geysers, 28 days, simulated	Plain ripple control produced a 106 kW evening peak, against 62 kW under thermostats. A central peak manager held the peak to a chosen cap of 20 to 50 kW, but cold-water events rose as the cap tightened, from 3.7% under thermostats to 10.4% at the tightest cap.
Ritchie, Engelbrecht and Booysen (2022)[70]	77 geysers, simulated	Central optimal control cut per-heater peak demand from 1.05 kW to as low as 0.4 kW, with no loss of comfort reported by the authors.
Lawrence Berkeley National Laboratory with Wits (2024)[71]	Model of the national stock, 2033	Switching 30% of geysers cut the winter peak by about 157 MW. Pairing control with solar PV cut it by about 2.2 GW, with winter comfort at 76%.
Gerber, Rix and Booysen (2019)[72]	Schools	Peak-limiting two-temperature control cut bills by 30%, with only a 0.2 percentage point reduction in warm-water events.

Study	Setting	Finding
Nonyane (2022)[73]	Centurion capacity test, 8,000 receivers	Projected municipal saving of over R11.59 million a year from ripple control of water heaters.
Project Smart Geyser (Plentify HotBots), Cape Town and Hessequa[74]	500 geysers, 30 months	Up to 80% less peak-period energy per geyser, up to 60% lower fleet maximum demand, and up to 430 W less peak load per geyser on average. All are sponsor-reported figures.
Ritchie, Engelbrecht and Booysen (2024)[75]	6,724 households	Recharging batteries after load shedding can raise grid demand sharply. How batteries and water heaters are managed after an outage matters.

Source: Papers and reports named in the table

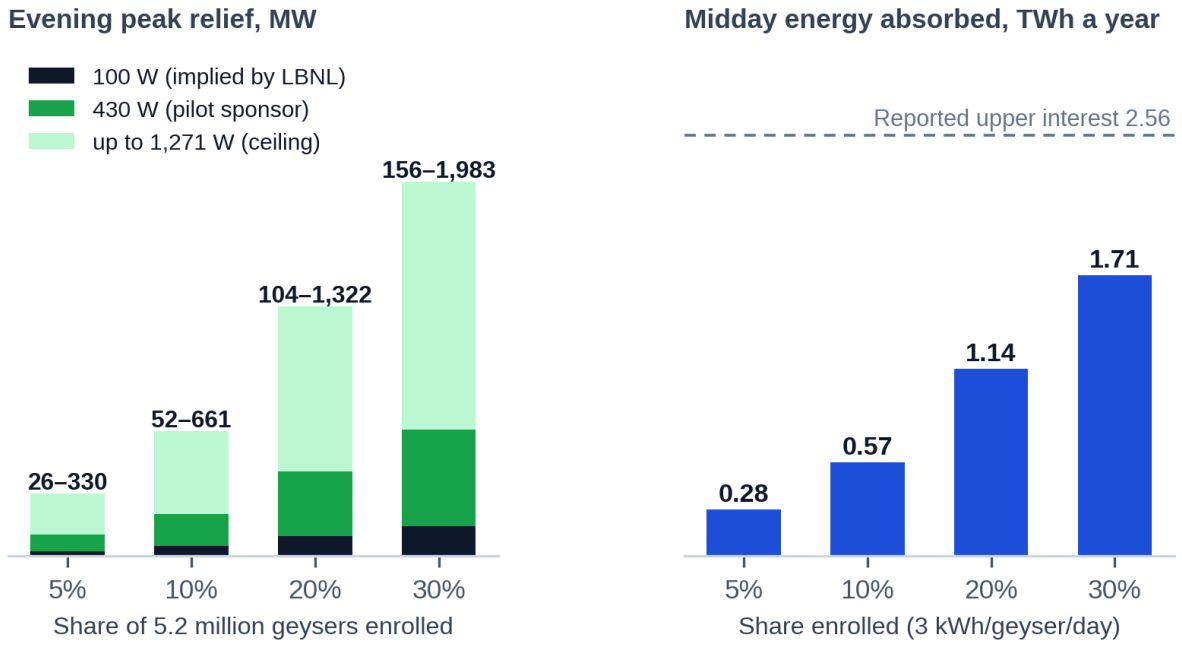
Three lessons run through this evidence. The first is that plain ripple control creates its own peak when the load comes back, which the Stellenbosch sample shows clearly. The second is that comfort is the binding constraint: the tighter the peak cap, the more cold-water events. The third is that the numbers differ by more than a factor of four depending on the scheme. The Berkeley Lab model implies roughly 80 to 100 W of peak relief per geyser from simple switching (82 W on the 2033 stock of 6.4 million, 100 W on today's 5.2 million), and Project Smart Geyser, a pilot in Cape Town and Hessequa that used Plentify's HotBots devices, reports up to 430 W per geyser on average, figures supplied by the pilot's sponsor from a small sample. The winter diversified demand of 1,271 W is the physical ceiling, since a geyser cannot shed more than it draws. We found no study that has measured a full fleet over a full year, which is the gap the pilot proposed in Part 6 is designed to close.

Sizing the prize

We have built four scenarios, from 5% to 30% of geysers enrolled. They use only published inputs: the LBNL stock and demand figures, and three values for relief per geyser: 100 W, which is what the Berkeley Lab result implies on today's stock (about 82 W on the 2033 stock), 430 W, the average reported by the pilot's sponsor, and 1,271 W, the ceiling. At 10% participation, which means 520,000 geysers, the evening peak could be relieved by between 52 and 661 MW, and by 224 MW at the sponsor-reported 430 W. At 20%, the range is 104 to 1,322 MW. The same portfolios could absorb 0.57 TWh a year at 10% and 1.14 TWh at 20% in the middle of the day, if each enrolled geyser took 3 kWh a day of surplus energy.

EXHIBIT 8

Participation scenarios: evening relief and midday energy absorbed, by share of geysers enrolled

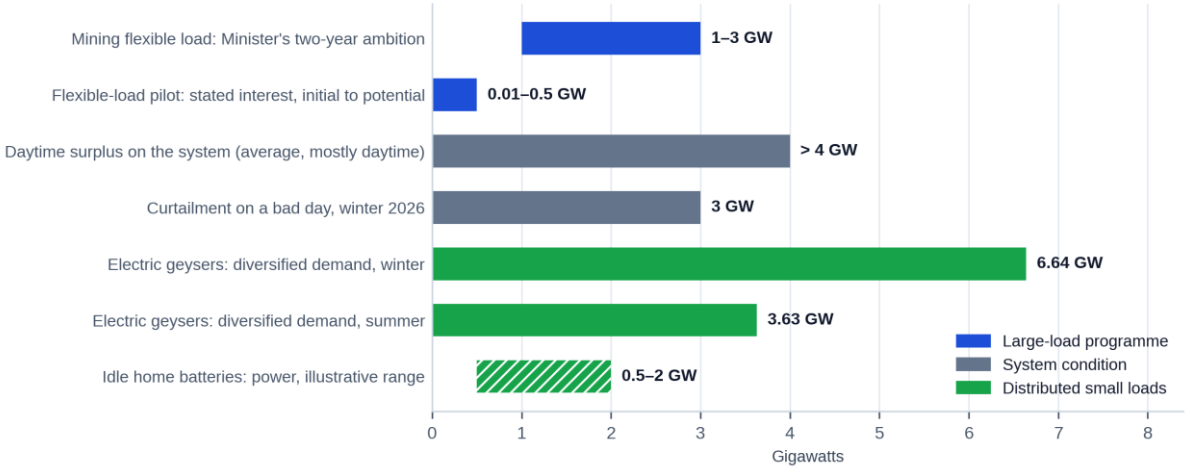


Note: Scenario arithmetic, not a forecast. Evening relief is 100 W, 430 W or up to 1,271 W per enrolled geyser, out of 5.2 million geysers; 100 W is the figure implied by the Berkeley Lab result (157 MW for 30% of geysers) if the 30% is applied to today's 5.2 million; the result was modelled against a 2033 baseline, and on the 2033 stock of 6.4 million the implied figure is about 82 W. Midday energy assumes 3 kWh per enrolled geyser per day, 365 days. The reported upper interest in the flexible-load pilot is 500 MW, taken here at 14 hours a day, the midpoint of the reported 12 to 16 hour window; it is not a cap.
Source: GridSync analysis using LBNL with Wits (2024) and Business Day (2023) on Project Smart Geyser

To put those figures in context, the Minister's stated ambition for flexible mining load is 1 to 3 GW over two years, and the reported interest in the flexible-load pilot runs from 10 to 500 MW. At the energy level, the 25.6 TWh a year that geysers use is about two and a half times the 10.3 TWh a year consumed by Hillside aluminium smelter. Geysers will not match smelters one for one. The stock of small loads is nonetheless large enough to belong in the same conversation, and today it is not in it.

EXHIBIT 9

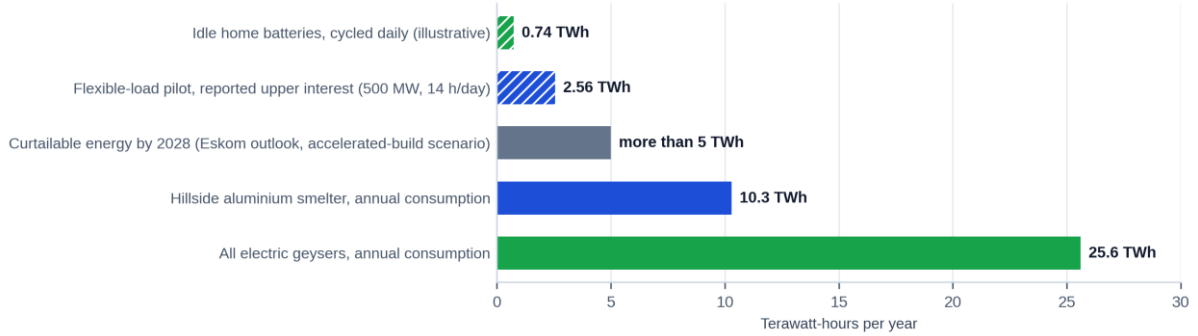
In power terms the small loads sit alongside the large-load ambition



Note: Geyser bars show diversified demand, not controllable capacity. The battery range is an illustrative estimate (see Appendix A).
Source: Minister Ramokgopa via TechCentral (7 Oct 2026); TechCentral (2 Oct 2026); LBNL with Wits (2024); GridSync analysis

EXHIBIT 10

In energy terms all geysers use two and a half times the energy of Hillside smelter



Note: Curtailable energy is the Eskom outlook's accelerated-build scenario, most of which is transmission-driven. The pilot bar is the reported upper interest (500 MW for 14 hours a day), not a cap; the battery bar is an illustrative scenario.
Source: Meridian Economics (2025); LBNL with Wits (2024); Engineering News (2025); GridSync analysis

Idle batteries: a stock nobody has counted

During load shedding South Africans bought batteries in large numbers. Imports of solar panels, batteries and inverters reached R70 billion in 2023.[76] What happened to those systems when load shedding stopped is not recorded anywhere. We found no register of installed batteries, and no survey of how many are used only as a backup.

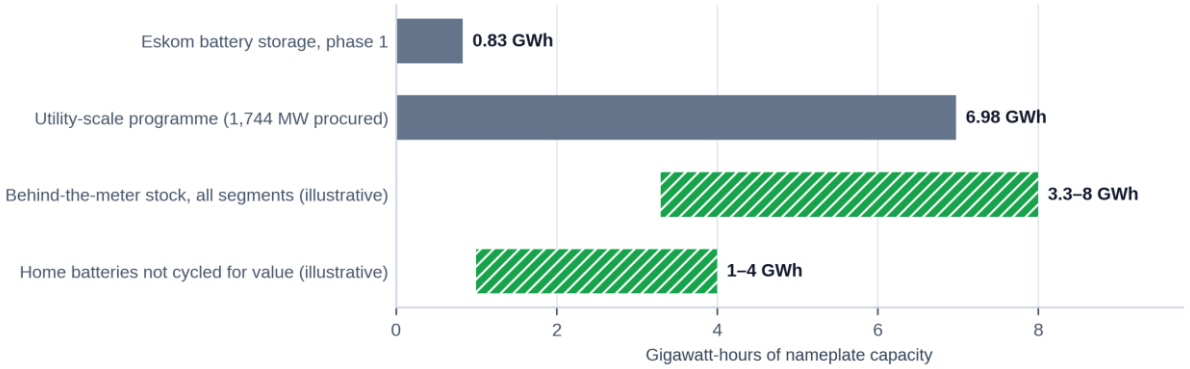
The pieces of evidence that do exist point in the same direction. A battery supplier's managing director told a trade publication that more than 500,000 residential and about 15,000 commercial and industrial installations are in service, an industry estimate that does not come from a register.[77] Plentify said in July 2026, as reported on 4 August, that it would connect more than 160,000 home batteries, representing 2.7 GWh, to a virtual power plant; the report describes an intention to connect rather than demonstrated dispatch.[78] PV Tech estimated, without naming a source, that demand for household PV systems fell 65 to 80% from its 2023 peak, and for commercial and industrial systems 15 to 20%, after load shedding eased.[79] That is demand for equipment, not for grid electricity, and GreenCape reported that the end of load shedding "resulted in a demand reduction for BESS".[80]

Tariffs may help explain why some batteries sit idle. Where a household's tariff is flat and exports earn nothing, a battery has little to arbitrage, and where a time-of-use tariff exists the owner has to configure the battery to use it. We have no survey of how many households are in each position. On Eskom's Homeflex tariff for 2026/27 the high-season peak price is 847.10 c/kWh including VAT and the off-peak price is 190.83 c/kWh.[81] Cape Town's residential feed-in tariff for exported energy is 124.18 c/kWh including VAT, plus a 28.75 c incentive.[82] A household that chooses to cycle its battery against the spread in winter would save about R6.56 for each kilowatt-hour moved out of the peak. Whether most do is not known.

Our estimate follows from these inputs. Take the 500,000 residential systems at 5 to 10 kWh each, which gives 2.5 to 5 GWh, with 3.75 GWh as the central case. One operator's announced 2.7 GWh would on its own account for most of that central case, so the stock may well be larger; we have kept the range built from the inputs above. If between 40% and 80% of them are used only as backup, between 1.0 and 4.0 GWh of residential battery capacity is idle, and the central case, with 60% idle, is 2.25 GWh. Cycled once a day at 90% efficiency, that is about 0.74 TWh a year. At an average spread of about R2 per kilowatt-hour, which blends seasons and tariffs, it would be worth around R1.5 billion a year to someone, and between R0.5 billion and R3.3 billion across the range, which also varies the spread from R1.5 to R2.5 per kilowatt-hour. Plentify's reported 2.7 GWh over more than 160,000 systems implies about 17 kWh per system, so the 5 to 10 kWh assumption may be low.

EXHIBIT 11

Behind-the-meter battery capacity may be of the same order as the utility-scale programme, but nobody has measured it



Note: Hatched bars are GridSync estimates with the assumptions stated in Appendix A. The behind-the-meter stock is not drawn from a register or survey.
Source: Eskom; Engineering News (7 Oct 2026); GridSync estimate (Appendix A)

HOW FIRM IS THIS NUMBER?

Not very, and the paper says so on purpose. The stock of installed batteries and the share used only for backup are the two inputs that drive the result, and neither has been measured. The idle-battery figures are therefore an order of magnitude, not an estimate with a confidence interval. A measured pilot is the cheapest way to replace them with data.

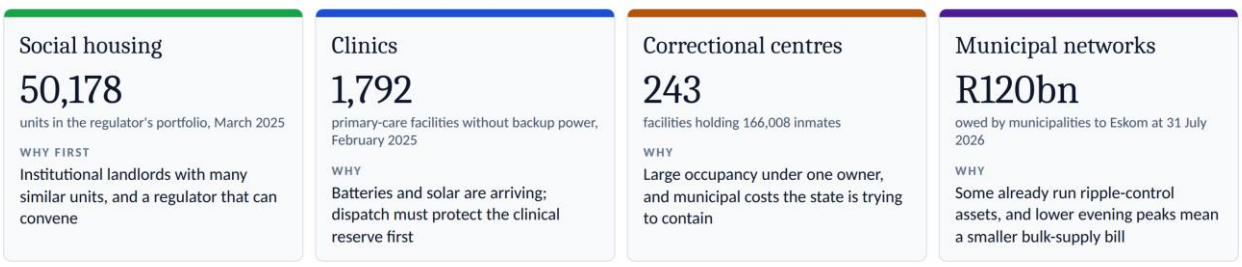
What the batteries could do is straightforward. At midday they could charge from surplus, and in the evening they could discharge or hold off the grid. The Stellenbosch work on load-shedding transients also shows the risk: if thousands of batteries recharge at once after an outage, they create their own peak.[83] A portfolio operator would stagger recharging, which a household cannot do alone.

Public buildings: one decision-maker, many identical loads

Households are the largest pool, but they are harder to start with: each one must consent, and each one has a different meter and a different bill. Public institutions offer a faster route to scale. A social-housing institution, a provincial health department or a correctional service can decide once, on behalf of many sites.

EXHIBIT 12

Four places where one decision covers many loads



Note: Social housing: units at March 2025, across social-housing institutions. Clinics: primary health care facilities without backup power. Correctional centres: 243 facilities. Municipal debt: owed to Eskom at 31 July 2026.
Source: SHRA Annual Report 2024/25; Minister of Health reply NW130 (Feb 2025); DCS annual report 2024/25; TimesLIVE (23 Sep 2026)

The Social Housing Regulatory Authority reports 50,178 units in its portfolio at March 2025, 56.1% of them in Gauteng and 17,807 in Johannesburg alone.[84] Government funds each unit through a standard capital grant of

R426,308.[85] We could not find an energy programme at the Authority. The City of Johannesburg's housing company has already built social-housing units with solar water heaters and prepaid meters, so the building type is familiar.[86]

Of 3,473 primary-care facilities, 1,792 had no backup power as at 14 February 2025.[87] A June 2025 reply reported solar installations at some of them (67 completed, 44 ongoing) and batteries and inverters, in Limpopo, at others (104 completed, 120 ongoing).[88] A clinic that has a battery is a clinic that needs a rule: dispatch must protect the clinical reserve first. Vaccine fridges hold their temperature for about 48 hours in an outage.[89] In the Western Cape, the provincial health department's briefing put grid power at R1.59/kWh, diesel at about R5 and solar at about R1.[90]

South Africa's correctional portfolio has 243 centres, 238 of them active. The Department's 2024/25 annual report counted 166,008 inmates against an approved capacity of 107,067, a population whose hot-water demand has not been published but is plainly large.[91] The Auditor-General's briefing put the Department's R677 million of unauthorised expenditure down primarily to overspending on municipal costs.[92] The Department of Public Works and Infrastructure's programme to retrofit government buildings with renewable energy has been running since 2021; the Minister of Finance's reply of 31 March 2026 reports payments to its transaction advisers and no preferred bidder.[93] Where a solar contract has not arrived, flexibility on existing loads can start without one.

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PART 4

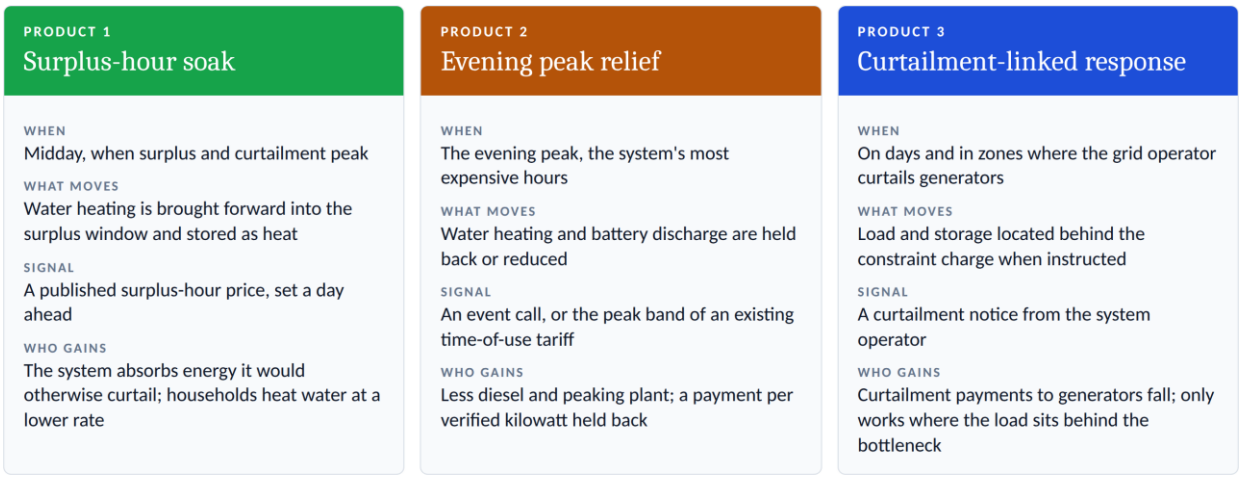
The proposition: absorb the surplus with portfolios

The proposition is straightforward. A portfolio of small loads, measured and controlled with the owner's consent, absorbs surplus energy in the middle of the day and gives it back as relief in the evening. Three products follow from this, and each works at a different time and in a different place.

Three products for three problems

EXHIBIT 13

Three products, each answering a different part of the surplus problem



Note: The signal in Product 1 draws on the day-ahead price mechanism already used in Eskom's Standard Offer, set by 14:00 the day before.
Source: GridSync design

Surplus-hour soak is the one with the largest potential, and the simplest. It uses the hours when generation exceeds demand to heat water and, where batteries exist, to charge them. The signal can be a published price, set the day before, in the same way that Eskom's Standard Offer already sets a dynamic energy price by 14:00 on the preceding day, capped at R1,093.20/MWh.[94] A signal that is public and day-ahead lets any portfolio plan, and lets the regulator audit the result.

Evening peak relief is the product the system already knows how to buy. It reduces demand at the hours when diesel plant and the highest-priced time-of-use periods apply. Eskom has bought residential peak savings before, as Part 3 showed. The diesel bill gives some idea of its value: open-cycle gas turbines cost Eskom and independent producers R12.81 billion in the 2025/26 year.[95] Fuel alone came to about R5.91 for each kilowatt-hour generated between 1 April and 7 August 2025, and about R7.66 between 1 April and 18 June 2026, when

the turbines ran at a 1.3% load factor. Both figures are our arithmetic from the published spend and generation.[96]

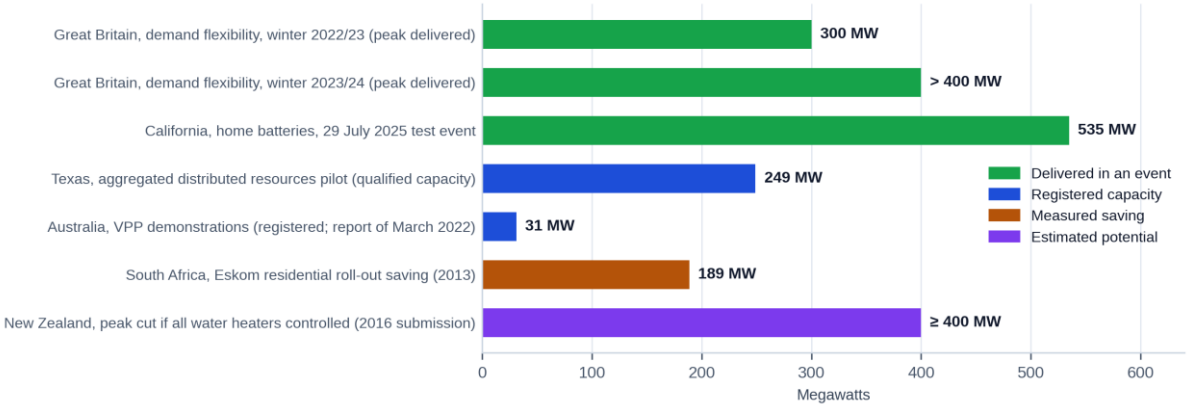
Curtailment-linked response is the narrowest and the most valuable where it applies. When the system operator curtails a wind or solar plant because a line is full, load or storage behind that constraint can absorb the energy instead. That requires knowing where the constraints are, and it requires a notice that portfolio operators can act on. It cannot be sold nationally. It can be sold in specific zones, and it is the product most likely to pay for the others.

Other countries have already done this

The evidence from other markets is consistent. Aggregated small loads deliver real megawatts, they deliver them well enough to be paid for, and they need good measurement to do so.

EXHIBIT 14

Aggregated small loads already deliver hundreds of megawatts elsewhere, and Eskom's residential rollout saved 189 MW in 2013



Note: Bars differ in kind, as the legend shows: delivered in an event, registered capacity, measured saving and estimated potential. They are not directly comparable and are shown to give a sense of scale.
Source: NESO; US installer press release (Aug 2025); ERCOT; AEMO; Leyland (NZ, 2016); Engineering News; IEA

EXHIBIT 15

What the international programmes show

Market	What was done	Result	Lesson
Great Britain	National demand flexibility service for households and non-domestic customers, winter 2022/23[97]	About 1.6 million participants and about 300 MW peak delivery;[98] £11.1 million cost.[99] In 2023/24, 2.6 million meters and more than 400 MW.[100]	Open to households with smart meters. Delivery accuracy in 2024/25 was 71.9%.[101] Measurement matters.
California	Home batteries dispatched as a fleet in a test event, 29 July 2025	About 535 MW from more than 100,000 batteries.[102]	Batteries delivered at scale when called.
Texas	Aggregate distributed energy resource pilot	249 MW of qualified capacity in the pilot, August 2026; a fourth phase is proposed.[103]	A grid operator will schedule an aggregate as a single resource, in a pilot first.
Australia	VPP demonstrations; wholesale demand response	31 MW of registered capacity from about 7,150 consumers in the demonstrations.[104] Baseline accuracy tests of 8 to 11% against a 20% threshold.[105]	Measurement standards, not hardware, decide whether a result counts.

Market	What was done	Result	Lesson
Germany	Controllable consumption devices, from 1 January 2024	In an overload the operator may reduce draw, but not below 4.2 kW.[106]	Limits protect the customer. A minimum service is guaranteed.
France	Off-peak hours moved into the middle of the day	Water heaters had moved 2 GW of load to 14:00 by 2023, with 7 GW projected for 2030.[107] The regulator is moving off-peak hours into the middle of the day.[108]	Moving the hours is a policy decision, and it works.

Source: Sources as footnoted

One engineer's 2016 submission estimated that New Zealand's peak demand could fall by at least 400 MW if all water heaters were controlled.[109] Brattle's study for US utilities found that a virtual power plant of thermostats, water heaters, chargers and batteries could provide capacity at roughly 40% to 60% of the cost of the alternatives, a gas peaker or a utility battery.[110] The US Department of Energy says that deploying 80 to 160 GW of virtual power plants by 2030 could meet 10 to 20% of peak load.[111] Australia has gone further, with a national battery subsidy that has produced more than 438,000 installations and 12.4 GWh, and a "Solar Sharer" offer from 1 July 2026 that gives smart-meter households in New South Wales, South Australia and south-east Queensland who opt in three free midday hours, with a 24 kWh daily cap.[112] That offer is, in effect, what Product 1 would be for South African households.

What South Africa has that others did not

South Africa begins with three advantages. The first is the geyser: 5.2 million electric storage water heaters, a large share of household demand. The second is the batteries bought for resilience in recent years, which on our estimate are now partly idle. The third is time. The country has a surplus now and a transmission build programme that will take years, which means the next three to five years are the window in which flexible local demand has the most value.

NOTES

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III

SECTION III

What it takes to deliver

The system requirements, and ten moves that can start without new lines or new investors.

PART 5

System requirements: seven layers

The question every department and utility asks when geysers come up is what system requirements would be needed. The answer has seven layers. The first two are about seeing the load, the next two about moving it, the fifth about proving it, and the last two about getting paid and staying accountable.

EXHIBIT 16

Seven layers a portfolio needs, grouped as see it, move it, prove it, settle it

1	**Device and safety**	Controller inside the distribution board; thermostat and safety devices stay in charge; reverts to normal heating if it loses contact.	SEE IT
2	**Connectivity**	Wi-Fi by default, cellular fallback, and a local schedule that keeps working when the network does not.	SEE IT
3	**Identity, consent and privacy**	Each household opts in, can opt out, and knows what is collected. Interval data handled under POPIA.	MOVE IT
4	**Control and orchestration**	Portfolio dispatch against a price or event signal, with a comfort floor and a limit on how many units move at once.	MOVE IT
5	**Measurement and verification**	Interval metering, a stated baseline method and a control group, so a delivered kilowatt-hour can be audited.	PROVE IT
6	**Settlement and market interface**	A signal in, a verified delivery statement out, and a payment route that does not depend on the customer's meter type.	SETTLE IT
7	**Governance and security**	Access control, audit trail, incident response and a complaints route that a regulator or municipality can inspect.	SETTLE IT

Source: GridSync design

A minimum specification for each layer

The table below is a proposal, written for a regulator or a utility that wants to know what to ask a portfolio operator for. It is deliberately minimal. Each line is a requirement that can be tested.

EXHIBIT 17

Minimum specification for a portfolio operator, with an acceptance test for each layer

Layer	Requirement	Acceptance test
1 Device and safety	A controller that fits within the existing distribution board without a board upgrade. The geyser's own thermostat and safety devices keep priority. The device returns to normal heating if it loses contact or power. Installation by a registered electrician, with a certificate of compliance. A regular full-temperature cycle, following health guidance, is built into the control logic.	A device failure leaves the geyser heating normally. An installer can show a certificate for every site.

Layer	Requirement	Acceptance test
2 Connectivity	Wi-Fi by default with a cellular fallback. A local schedule that continues if the network drops. Time kept accurately on the device.	A site that loses connectivity for 48 hours still heats on schedule and reports on reconnection.
3 Identity, consent and privacy	Named account holder and property owner. Recorded opt-in, an opt-out that takes effect on the next cycle, and a plain-language notice of what is collected. Interval data held under the Protection of Personal Information Act.	A customer can see and withdraw consent. Data is held for a stated period and shared only as the notice says.
4 Control and orchestration	Dispatch of a portfolio against a published signal. A comfort floor per household. A cap on how many units start or stop in the same minute. Staggered recharge after an outage. For clinics, a reserve that dispatch cannot touch.	A test event moves load within a stated tolerance without any household falling below its floor.
5 Measurement and verification	Interval data at the meter or device, a stated baseline method, and a control group of matched sites that are not dispatched. Results reported with an accuracy measure.	An independent party reproduces the delivered kilowatt-hours from the raw data.
6 Settlement and market interface	A signal received in a defined format. A delivery statement sent back. A payment route that works for prepaid and postpaid customers and for municipal and Eskom supply.	A month of events reconciles between the portfolio operator, the utility and the customer.
7 Governance and security	Role-based access, an audit trail, an incident-response plan, and a complaints process the regulator can inspect. Cyber-security controls proportionate to a fleet that could move hundreds of megawatts.	A third-party review finds no unauthenticated route to dispatch. Complaints are logged and closed in a set time.

Source: GridSync proposal

EXHIBIT 18

Rules and references that touch each layer

Layer	Reference	What it provides
1 Device and safety	Certificate of compliance; NRS 097-2-1 inverter test certificate	Eskom lists both among the documents needed to register a grid-connected solar system.[113] Grid-connected systems up to 100 kW register with Eskom or the municipality, and larger ones with NERSA.[114]
2 Connectivity	ICASA type approval	Radio and communications equipment sold in South Africa needs type approval.[115]
3 Consent and privacy	Protection of Personal Information Act, section 22	A responsible party must notify the Information Regulator and affected people of a security compromise as soon as reasonably possible.[116]
5 Measurement and verification	Elexon P376 (Great Britain); AEMO baseline accuracy tests	Formal baseline methods exist and are tested for accuracy, in Great Britain from 23 February 2023 and in Australia.[117]
6 Settlement	NTCSA supplemental demand-response programme	Load providers are called through an aggregator system, with interval metering.[118]
7 Governance and security	ETSI EN 303 645 (V3.1.3, 2024); NIST IR 8259A (2020)	Baseline cyber-security provisions for consumer internet-of-things devices.[119]

Note: Only references we could open are listed. A certification or approval route for a specific controller would be confirmed with the relevant body before sale.
Source: References as footnoted

Why measurement is the hinge

Demand response is only as credible as its baseline. A baseline is an estimate of what a customer would have used if no event had occurred, and the saving is the difference between that and what they did use. If the baseline is poor, the saving is not real. The Australian market operator reported baseline error tests of 8 to 11% against a 20% threshold for its wholesale demand-response mechanism.[120] In Great Britain, delivery accuracy was 71.9% in winter 2024/25, and the evaluation of smart-meter data found that in 14 of 18 events the increase in the hour after the event outweighed the reduction, which its authors note may partly reflect the baseline method.[121] The same evaluation found that the service's own baseline had been adjusted downwards in 77% of customer-events, and the evaluation itself used no control group.[122] A comparison with a randomised trial in California found that even the best weather-adjusted baselines stayed biased.[123] In a Danish field trial on residential heat pumps, a matched reference group gave a median error of 6.7% on the load reduction, about 12% of units did not respond, and releasing units in stages roughly halved the rebound peak.[124]

For a South African portfolio the practical answer is a control group. Instead of estimating what a house would have done from its own history, the operator leaves a matched set of houses undispatched and compares them with the dispatched houses on the same day. It is a method evaluators accept, and it is feasible for geysers because so many of the loads are similar. It is also the strongest answer to the question every regulator will ask: how do you know?

Safety and comfort come first

A geyser that is hot when someone needs it and safe when no one is watching is not negotiable. Thermostats stay in charge. The control layer never overrides a safety device. The UK Health and Safety Executive advises storing hot water at 60 °C or above to control legionella,[125] so the control logic should include a regular full-temperature cycle that follows health guidance. Electrical work must be done by a registered electrician and certified, and the controller must carry the approvals the regulator requires before it is sold.[126]

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PART 6

Ten moves that do not wait for new lines or new investors



Clinics and other public buildings are where a first pilot could start. Photo: Emmanuel M

The ten moves below share one feature: none of them needs a new transmission line, a new generator or a new round of investors. Each one uses an asset, a rule or a relationship that exists today.

Ten moves that can start now

EXHIBIT 19

Ten low-hanging moves, who acts, and what each needs

#	Move	Who acts	What it uses
1	Respond to the NERSA consultation by 23 October, proposing that the definition of a "time-flexible" off-taker include a verified portfolio, with measurement requirements in place of a size.	Industry, associations, GridSync	The open consultation. Comments close 23 Oct 2026, hearings 3 Nov, decision 7 Dec.[127]
2	Confirm the status of Eskom's residential load-management product and open it to portfolios, including portfolios that span municipalities.	Eskom Distribution	An existing programme with a 1 MW threshold.[128]
3	Offer households an opt-in midday tariff on the Solar Sharer model: a capped number of low-priced hours when surplus is highest.	NERSA, municipalities, Eskom	The tariff-design experience in Australia.[129]
4	Modernise ripple control from one-way timers to two-way, verified control.	Metropolitan municipalities	Existing ripple networks and relays.[130]
5	Run a social-housing pilot, starting with units that already have a geyser and a meter.	SHRA, one housing institution, a portfolio operator	A regulator whose portfolio covers 50,178 units across social-housing institutions.[131]

#	Move	Who acts	What it uses
6	Pilot clinics with reserve-protected dispatch, where a battery exists or is being installed.	Provincial health department	Installed or planned solar and batteries.[132]
7	Pilot a correctional centre, where hot-water demand is large and municipal bills are a stated cost pressure.	Correctional Services, Public Works	A single owner and a stated budget pressure from municipal costs.[133]
8	Use the flexible-load rules to connect data centres sooner by pairing them with curtailable loads and storage.	Eskom, data-centre developers	The control and measurement layers in Part 5.
9	Turn the NERSA small-scale embedded generation register into a flexible-resource register that includes batteries and controllable loads.	NERSA	Draft registration rules announced for comment on 7 July 2026.[134]
10	Run a twelve-month measured pilot with a control group and publish the result.	A regulator-backed consortium	All of the above.

Source: GridSync proposal; sources as footnoted

Why start with public buildings

Public buildings are not the largest pool, but they are the fastest to start. A single institution can approve a pilot in weeks. A single meter or a single board can be fitted in hours. A public institution has a budget line that a saving can be tested against. And a government that is trying to show the sector what flexible demand can do has an obvious interest in showing it on its own buildings first.

Municipal debt gives the pilot an extra reason to exist. Municipalities owed Eskom R120.26 billion in overdue debt at 31 July 2026.[135] A smaller evening peak means a smaller bulk-supply bill, and a pilot that lets a municipality see that effect could change how it values the load. In June 2026 eThekwini Municipality launched what was reported as the country's first residential battery virtual power plant pilot, which shows that metros are already prepared to try.[136]

A word on wheeling and pooling

Two recent arrangements show that Eskom and municipalities can handle aggregated energy flows on distribution networks. In September 2025 Vodacom reported that it had fully operationalised a virtual wheeling mechanism developed with Eskom; the company operates more than 15,000 low-voltage sites in 168 municipalities.[137] In May 2026 Engineering News reported Cape Town as a pioneer of pooled renewable wheeling for a group of customers.[138] Neither is demand flexibility. Both establish that a portfolio of small connections can be billed, measured and settled as one.

NOTES

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128 Eskom Distribution, Demand Management Programme page, accessed 7 Oct 2026.
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IV

SECTION IV

The ask and the economics

What we ask of government, and where the value sits.

PART 7

Policy asks: parity of access, not parity of price

The ask is narrow. We are not asking government to pay for flexibility it cannot see, to subsidise equipment, or to rewrite the tariff structure. We are asking it to let a measured portfolio stand where a single large customer stands today.

Parity of access, not parity of price

The phrase "the same tariffs as smelters" is shorthand, and it can mislead. A ferrochrome smelter got its rate in exchange for a multi-year commitment to take a large volume of energy, with 80% take-or-pay, shared upside and an annual escalation, and the shortfall risk was ring-fenced inside Eskom.[139] A portfolio of homes cannot match that on day one, and nobody is suggesting it should. What a portfolio can offer is a measured response at the hours the system needs it, and it should be allowed to earn the surplus-hour rate on that basis. If the portfolio under-delivers, it pays. If it over-delivers, it shares the upside.

EXHIBIT 20

Six policy asks, and how each protects other customers

Ask	What it changes	Who it protects, and how
1 Define the aggregated off-taker	NERSA's definition of a "time-flexible" off-taker includes a verified portfolio, with the test being measured delivery rather than the size of a connection.	Other customers: nothing is paid for until it is measured.
2 Publish a surplus-hour price	A day-ahead price for the hours of curtailment, open to any participant that meets the measurement standard.	Other customers: the energy sold is energy that would otherwise be curtailed.
3 Adopt a measurement standard	A baseline method, a control-group requirement and an accuracy test written into the programme rules.	The regulator and the customer: a result can be audited.
4 Open load management to portfolios	Eskom's residential load-management product, described on its page as on hold, is confirmed open to a portfolio that spans municipalities.	Other customers: payment is capped at performance and tied to delivery.
5 Create a registration category	A light-touch registration for aggregators and virtual power plants, in place of the current absence of any category.	Customers and municipalities: complaints and data have a place to go.
6 Keep a flexible-resource register	NERSA's small-scale embedded generation register extends to batteries and controllable loads.	Planners: the stock is counted at last.

Source: GridSync proposal

Ask 5 is not a small point. In July 2026 Oxpeckers, writing in Business Day, reported that NERSA has no definition of a virtual power plant and no licensing category for one, and that none is being drafted.[140] A portfolio operator

can run without a category. It is much harder to run with a regulator, a utility and a customer who have no common word for what is being done.

NERSA's consultation on the pilot tariff closes on 23 October 2026, with hearings reported for 3 November and a decision for 7 December.[141] GridSync will submit a response proposing that a verified portfolio qualify under the pilot rules.

The ring-fence is the safeguard

Eskom's smelter agreements already show a design that protects other customers. Shortfalls are ring-fenced inside Eskom, and upside is shared.[142] The same principle suits a portfolio. A pilot tariff that sells energy which would otherwise be curtailed adds revenue. It does not take revenue from anyone. Where the pilot delivers evening relief, it replaces more expensive dispatch. The pilot's accounts should be kept apart so that the regulator can see both effects.

WHAT GOVERNMENT WOULD BE ASKED TO DO

Allow a portfolio to qualify for the pilot rules that NERSA is consulting on. Publish a surplus-hour price. Write down how a delivered kilowatt-hour is measured. Everything else, from controllers to consent forms to dispatch software, is the operator's cost and risk.

NOTES

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141 TechCentral, Eskom R1.20/kWh offer for bitcoin miners, 2 Oct 2026.
141 TimesLIVE, Eskom courts cryptocurrency miners, 3 Oct 2026.
142 Mining Weekly, Eskom confirms Nersa approval of smelter tariff, 29 May 2026.

PART 8

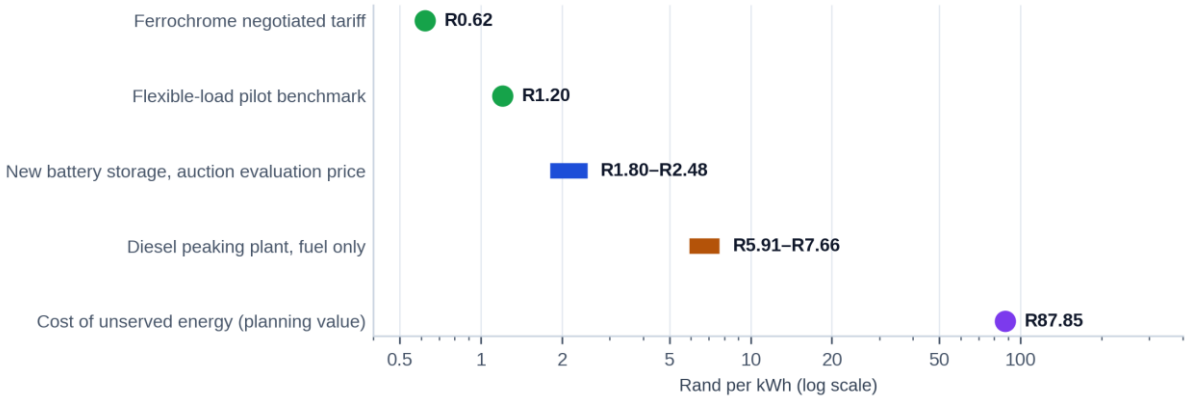
The economics: where the value sits

The value of flexible small loads has four sources: energy that would otherwise be lost, evening peak that would otherwise be met with diesel, capacity that does not have to be built, and the savings that households themselves keep. We lay each out with its basis. All the sizing here is scenario arithmetic, labelled as such.

A value ladder, from tariff to cost of failure

EXHIBIT 21

Electricity costs between R0.62 and R88 per kWh, depending on when, where and how it is bought



Note: Diesel figures are fuel only, calculated by GridSync from published spend and generation. The cost of unserved energy is the planning value in the 2019 Integrated Resource Plan. Logarithmic scale.
Source: NERSA; TechCentral (2 Oct 2026); BESIPPPP bid window 3; Eskom; Energize; IRP 2019

The ladder runs across two orders of magnitude. At the bottom is a smelter's tariff, and above it the pilot's R1.20/kWh. New battery storage procured through the government's auction was evaluated at R1.80 to R2.48 per kWh.[143] Diesel at the margin costs R5.91 to R7.66 per kWh in fuel alone. At the top is the planning value of unserved energy, R87.85 per kWh.[144] The point of the ladder is that a kilowatt-hour moved from the evening to the middle of the day is worth, to the system, somewhere between the battery price and the diesel price. That is considerably more than the household or smelter pays for the midday hour.

An illustrative revenue pool at 10% participation

The table shows what the four lines could amount to if 10% of electric geysers took part. It uses published prices as the basis. It is arithmetic on stated assumptions, not a forecast, and it is not a claim about any company's revenue.

EXHIBIT 22

An illustrative annual value pool if 10% of geysers (520,000) take part

Stream	Basis	Illustrative annual value
Evening peak relief	52 to 661 MW (100 W to 1,271 W per geyser) at R1,500 per kW per year, the equivalent of the Eskom residential load-management rate of R3 million per MW over two years[145]	R0.08 to R1.0 billion; R0.34 billion at the sponsor-reported 430 W
Surplus-hour energy sold	0.57 TWh a year at R0.62 to R1.20 per kWh, the range from the smelter tariff to the pilot benchmark, if portfolios were admitted to the pilot (as reported, it excludes customers below 500 V)	R0.35 to R0.68 billion
Household saving	High-season peak minus off-peak on Homeflex, R6.56 per kWh including VAT, for each kilowatt-hour moved out of the peak[146]	Depends on tariff and on how many kilowatt-hours a household moves
Idle batteries put to work	Central estimate of 2.25 GWh idle residential capacity, cycled daily at 90% efficiency, at an average R2 per kWh spread	About R1.5 billion (range R0.5 to R3.3 billion)

Note: The household saving and battery lines overlap with the first two and should not be added to them. The household saving depends on the household's tariff.
Source: GridSync analysis. Inputs: LBNL with Wits (2024); Eskom (2026/27 tariffs); NERSA pilot reporting (Oct 2026). Method in Appendix A.

The first two lines are large enough to matter and small enough to be credible. Against the Minister's figure of close to R49 billion a year of potential revenue lost to curtailment,[147] the first two lines together come to roughly R0.4 to R1.7 billion, about 0.9% to 3.4% of that figure in the same terms, though they have different payers and are better read as separate pools. Smelters and data centres would also be absorbing surplus. Small loads are one answer rather than the whole of it, and the one that does not depend on construction.

Who gets what

Households would save on their bill and, in some designs, receive a payment. Eskom and municipalities would sell energy that would otherwise be lost and avoid the most expensive hours of peak supply. Generators would see fewer curtailment instructions. The operator would earn a fee for control, measurement and settlement. The split among them is a matter for the pilot to test, and the paper does not prejudge it.

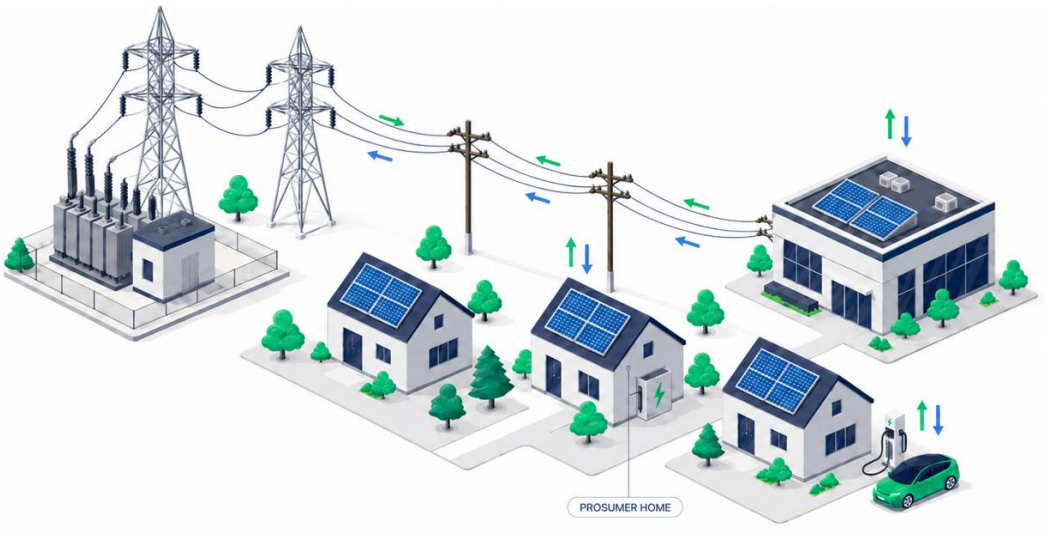
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145 Eskom, DDMP industry engagement, May 2023.
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147 ESI Africa, Windaba 2026 pledges on curtailment, 7 Oct 2026.

PART 9

GridSync's place in the ecosystem

GridSync (Pty) Ltd is a South African company in Johannesburg. It is developing software and devices that connect the energy equipment in homes and buildings to a single platform for monitoring, control and measurement, with an application through which owners give consent and see results.



Software, measurement and consent turn many small sites into one portfolio.

The role GridSync proposes to play

In the model set out in this paper, GridSync proposes to provide the first five layers of the stack in Part 5: the device, the connection, the consent record, the dispatch logic and the measurement. The utility or the municipality remains the counterparty for settlement and the regulator remains the authority over the rules. GridSync does not seek to replace either. It asks to be tested against a standard that both can read.

The company is developing a geyser controller designed to fit inside a standard distribution board without a board upgrade, with Wi-Fi as the default connection and cellular as a fallback. It is in development and will be submitted for certification when the design is complete. The first use of it, if the proposals in this paper are accepted, is the pilot in Part 6: a controlled group and a matched comparison group, with results published.

SAWEM and the small-scale generators

The South African Wholesale Electricity Market, SAWEM, is being introduced by the National Transmission Company South Africa, which was granted the market operator licence in late 2025.[148] The Market Code was submitted to NERSA on 25 February 2026, and the launch, first planned for April, was moved to the third quarter.[149] ESI Africa reported on 9 September that it was due at the end of that month;[150] on 6 October TechCentral reported that commercial launch has slipped to April 2027.[151] NTCSA says the market will open

progressively,[152] and a civil-society summary of the Code states that an individual person cannot go onto the wholesale platform.[153]

That leaves a question the market has to answer. Grid-connected rooftop solar systems of 100 kW or less are registered with the local distributor, and larger ones with NERSA,[154] and behind many of them sit batteries and water heaters that can move in time. Taken one at a time they are unlikely to qualify; we did not review the qualifying criteria in Annexure 1 of the Code. The Market Code does contain the building blocks for taking them together: a Trading Unit, established by a Market Participant, may be "an aggregated construct of production and/or consumption components", and a Balancing Group is a set of two or more Trading Units that a balance responsible party designates for the purpose of aggregating their imbalances. It also defines a demand-side resource as a customer that can respond to the System Operator's instruction to curtail load.[155] The definitions in the Code do not, however, include an aggregator. NTCSA lists aggregators among the parties its SAWEM School is meant to prepare.[156]

GridSync intends to be a key part of how SAWEM coordinates the participation of small-scale embedded generation and the flexible loads behind it. The Code requires that the metering of a Trading Unit cover all of its production and consumption, and that a unit sit within one network zone.[157] Meeting those conditions across thousands of small sites takes exactly the layers described in Part 5: a verified device at each site, interval data, a consent record, and a baseline that a balance responsible party can rely on. GridSync's Managing Director has attended the SAWEM School, and GridSync is designing its platform to feed that interface.

EXHIBIT 23

How the SAWEM Market Code meets small loads, and where GridSync fits

Market Code concept	What the Code says	Why it matters for small sites	GridSync's designed role
Trading Unit	An aggregated construct of production and/or consumption components, established by a Market Participant. It may not span more than one network zone, and its metering must cover all of its production and consumption.	A single home or clinic is unlikely to qualify as a unit on its own (qualifying criteria not reviewed). Complete metering is a condition.	Verify and aggregate interval data from many sites in one zone into a single unit profile.
Balancing Group	A set of two or more Trading Units that a balance responsible party designates for the purpose of aggregating their imbalances.	Someone must forecast, dispatch and answer for the group's balance.	Supply forecasts, dispatch and measured delivery to the balance responsible party.
Demand-side resource	A customer that can respond to the System Operator's instruction to curtail load.	The definition is written for a customer, not a portfolio.	Keep a dispatch and delivery record for each site, so response can be shown in aggregate.
Retail and qualifying criteria	Customers that do not meet the qualifying criteria are supplied by a retailer; where a consumer cannot otherwise be supplied, the distribution system operator is the default retailer.	Most households and small sites reach the market only through an intermediary.	Hold the owner's consent and give a statement, so owners take part without becoming market participants.
Embedded-generation registration	Grid-connected systems up to 100 kW register with the distributor, larger ones with NERSA.	As we read it, the register is organised around generating facilities and does not count controllable loads.	Keep a site-level asset record aligned with the registration.

Note: The Code's qualifying criteria are in an annexure not reviewed for this paper. GridSync's role is as designed and proposed; it is not a description of current operations.
Source: NTCSA, Market Code v2.3 (February 2026); SAnews (3 February 2026); GridSync analysis

What GridSync brings

- **The control and measurement layers.** Software designed for portfolio dispatch, a consent record, interval data and a baseline-and-control-group method.
- **Edge gateways.** Devices designed to sit on a property, connect to existing equipment, and carry out a dispatch instruction safely.
- **A neutral position.** GridSync does not make batteries or generate electricity, which is useful where a portfolio contains several kinds of equipment.
- **Willingness to be measured.** The pilot design in Part 6 is built so that GridSync's results can be checked by someone else, and the first publication would include what did not work.

GridSync is not yet operating in the market and does not hold a licence or a certification. This paper describes the role the company is preparing for, and a market that does not yet exist.

Where data centres fit

Data centres are the long game, and GridSync's role there is as an enabler. The same control and measurement layers can serve a campus that has agreed to curtail: cooling plant, on-site batteries and flexible compute could be dispatched against a signal and the response proven. Of these, only flexible compute has been demonstrated in the trials cited in Part 2. The connection of a data centre may then be sooner because its flexibility is credible.

NOTES

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150 ESI Africa, SAWEM launch date and reform roadmap, 9 Sep 2026.
151 TechCentral, Nersa proposes ban on automated trading, 6 Oct 2026.
153 Natural Justice, FAQs on the Market Code and Rules, Jun 2026.
154 SAnews, NERSA clarifies SSEG regulations, 3 Feb 2026.
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PART 10

Risks and limits

A proposal like this can fail in several ways. We set them out because the regulator and the utility will find them anyway, and because each has a design response.

The risks that matter, and what answers them

EXHIBIT 24

Principal risks and the design responses

Risk	Why it matters	Response
Transmission-bound curtailment	Most expected curtailment is caused by transmission constraints, not by a national oversupply.[158] Load that is far from the constraint cannot absorb it.	Offer Product 3 only in zones where the portfolio is behind the constraint. Products 1 and 2 are system-wide.
Rebound	Consumption after an event can exceed the saving. In the British evaluation the hour-after increase outweighed the reduction in 14 of 18 events, possibly partly a baseline effect.[159]	Stagger recharge and reheating. Measure net of rebound.
Delivery accuracy	Delivery in Great Britain was 71.9% in winter 2024/25.[160] A portfolio that over-promises costs the system.	Pay on measured delivery. Use a control group.
Comfort and health	A cold shower is a fast route to opt-out. Hot water held too cool can carry bacteria.	A household comfort floor and a regular full-temperature cycle in the control logic.
Batteries and warranties	The industry has described a coming "battery graveyard" as warranty windows close, and owners may resist anything that looks like extra cycling.[161]	Warranty-aware dispatch with a depth-of-discharge limit the owner sets.
Privacy	Interval data reveals when people are home.	Collect the minimum, say what is collected, and hold it for a set period under the Protection of Personal Information Act.
No regulatory category	NERSA has no definition or licensing category for virtual power plants and none is being drafted.[162]	Ask 5 in Part 7. Operate the pilot under the utility's own programme.
Pilot programmes on hold	Eskom's programme page describes the demand-management programme as on hold pending management review.[163]	Ask 4 in Part 7, and use a municipal pilot in the meantime.
Small samples	Pilot results quoted in South Africa are best-case "up to" figures from small samples.[164]	A twelve-month pilot with a control group and published data.

Source: GridSync analysis; sources as footnoted

What would change our view

If the pilot showed that evening relief per geyser was nearer the 100 W implied by the Berkeley Lab model than the 430 W its sponsors reported for Project Smart Geyser, the case for Product 2 would weaken, though Product 1 would not depend on it. If households opted out in large numbers after the first cold shower, the whole

proposition would need a different comfort design. If NERSA's final rules settled on a size threshold for the pilot tariff that excluded portfolios, the route would shift to municipalities and to Eskom's own distribution programme. And if curtailment were to fall quickly because of new transmission, the value of Product 3 would fall with it. The proposal should be judged on whether those things happen, and the pilot is built to find out.

In short

THE SHORT VERSION

South Africa has more power than it can sell, mostly at midday. It also has millions of small loads that can move in time and cannot currently be counted. The fix is a rule that lets a measured portfolio qualify, a price for surplus hours, and a standard for proving what was delivered. GridSync is designed to supply the layers that make such a portfolio visible, dispatchable and provable, and intends to be a key part of how the new wholesale market brings small generators and flexible loads into it.

NOTES

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159 NESO (ERM and CSE), DFS smart meter evaluation, winter 2022/23, Apr 2025.
160 NESO, DFS winter review 2024/25, 3 Jul 2025.
161 Engineering News, Battery graveyard as warranty window closes, 5 Aug 2026.
162 Business Day (Oxpeckers), How virtual power plants could reshape the grid, 26 Jul 2026.
163 Eskom Distribution, Demand Management Programme page, accessed 7 Oct 2026.
164 Business Day (by Plentify's CEO), Geyser bots smarter than meters, 10 Dec 2023.

VI

SECTION VI

Appendices

Method, glossary and sources.

APPENDIX A

Methodology and assumptions

Every figure in this paper that is not taken directly from a source is calculated here. Inputs are cited. The arithmetic is shown so that anyone can reproduce or change it.

EXHIBIT A1

Calculations used in this paper

Quantity	Inputs	Calculation	Result
Summer geyser diversified demand	5.2 million geysers; 698 W each[165]	5.2 m × 0.698 kW	3.63 GW
Daily energy per geyser	25.6 TWh a year; 5.2 million geysers[166]	25.6 TWh ÷ 5.2 m ÷ 365	13.5 kWh a day
Heat in full tanks	150 to 250 litre tanks; 40 K rise; 4.186 kJ per kg per K	150 kg × 4.186 × 40 ÷ 3,600 = 7.0 kWh; 250 kg gives 11.6 kWh; × 5.2 m	36 to 60 GWh
Evening relief at 5%, 10%, 20%, 30% participation	260,000, 520,000, 1.04 m, 1.56 m geysers; 0.10, 0.43 and 1.271 kW each; about 80 to 100 W implied by LBNL's 157 MW for 30% of geysers (100 W on today's 5.2 million, 82 W on the 2033 stock of 6.4 million; modelled against a 2033 baseline)[167]	geysers × 0.10 kW; × 0.43 kW; × 1.271 kW	26 to 330; 52 to 661; 104 to 1,322; 156 to 1,983 MW (at 430 W: 112; 224; 447; 671 MW)
Midday energy absorbed	3 kWh per geyser per day; 365 days	geysers × 3 × 365	0.28; 0.57; 1.14; 1.71 TWh a year
Reported upper interest in the pilot	500 MW; 14 hours a day (GridSync assumption for hours)	500 MW × 14 h × 365	2.56 TWh a year
Geysers versus Hillside	25.6 TWh; 10.3 TWh[168]	25.6 ÷ 10.3	about 2.5 times
Residential load-management rate per kW	R3 million per MW over two years[169]	R3 m ÷ 2 years ÷ 1,000 kW	R1,500 per kW per year; R645 for 0.43 kW
Diesel fuel per kWh	R5.842 bn and 988.56 GWh (1 Apr to 7 Aug 2025)[170]; R640.27 m and 83.608 GWh (1 Apr to 18 Jun 2026)[171]	spend ÷ generation	R5.91; R7.66 per kWh
Behind-the-meter stock	500,000 residential units at 5 to 10 kWh each; 15,000 commercial and industrial units[172]	Residential 2.5 to 5 GWh, central 3.75. Commercial and industrial 15,000 units at 50 to 200 kWh each, 0.75 to 3.0 GWh. Total with the residential range 3.3 to 8 GWh	3.3 to 8 GWh
Idle battery power	1.0 to 4.0 GWh idle; 0.5 kW of power per kWh of capacity	1.0 to 4.0 GWh × 0.5 kW per kWh	0.5 to 2.0 GW
Idle residential batteries	Stock of 2.5, 3.75 and 5.0 GWh; 40%, 60% and 80% backup-only	stock × share	1.0 GWh low; 2.25 GWh central; 4.0 GWh high
Energy if cycled daily	2.25 GWh; 90% efficiency; 365 days	2.25 × 0.9 × 365	0.74 TWh a year
Value of cycling	0.74 TWh; spread of about R2 per kWh; R1.5 to R2.5 across the range	central 0.74 × R2.0; low 1.0 × 0.9 × 365 × R1.5; high 4.0 × 0.9 × 365 × R2.5	R1.5 bn central; R0.5 to R3.3 bn range
Winter household spread	Homeflex 2026/27 including VAT: peak 847.10 c; off-peak 190.83 c[173]	847.10 − 190.83	656 c, or R6.56 per kWh

Source: GridSync analysis

All of these are scenarios. They depend on the 5.2 million stock count from LBNL, the pilot and modelled per-geyser figures, battery counts that are industry estimates, and the assumptions stated. They would be replaced by measured values as soon as a pilot reports.

NOTES

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172 Engineering News, Battery graveyard as warranty window closes, 5 Aug 2026.
173 Eskom, Tariffs and Charges Booklet 2026/27, Jul 2026.

APPENDIX B

Glossary

EXHIBIT B1

Terms used in this paper

Term	Meaning
Aggregator	A party that combines many small loads or generators into one portfolio that can be measured, dispatched and settled as a unit.
Baseline	An estimate of what a customer would have used if no event had occurred. The saving is the difference between the baseline and actual use.
Control group	A matched set of customers that is not dispatched, used to check the baseline.
Curtailment	The deliberate reduction of a generator's output below what it could produce, because the system cannot take the power.
DDMP	Eskom's Distribution Demand Management Programme.
Diversified demand	The average demand per unit when many units are on a network at the same time, lower than a single unit's rating because not all run together.
EAF	Energy availability factor: the share of installed capacity available to generate.
Homeflex, Homepower, Megaflex	Eskom tariffs: Homeflex is a residential time-of-use tariff, Homepower a residential flat-rate tariff, Megaflex a large-user time-of-use tariff.
Measurement and verification	The process of proving that a delivered saving is real, using a stated method.
MTSAO	Eskom's Medium-Term System Adequacy Outlook.
NERSA	National Energy Regulator of South Africa.
NTCSA	National Transmission Company South Africa, the system operator.
Rebound	A rise in use after a flexibility event as heating or charging resumes.
Ripple control	A one-way signal sent over the network to switch certain loads, commonly water heaters, on or off.
Balance responsible party (BRP)	In the SAWEM Market Code, a licensed or registered generator, distributor or trader accountable for the imbalance of the trading units it designates.
SAWEM	South African Wholesale Electricity Market, being introduced by NTCSA.
SSEG	Small-scale embedded generation: generation connected at a customer's premises.
Take-or-pay	A commitment to pay for an agreed volume whether or not it is used.
Trading Unit, Balancing Group	SAWEM Market Code terms: a Trading Unit is an aggregated construct of production and/or consumption; a Balancing Group is a set of two or more Trading Units designated by a balance responsible party.
Virtual power plant (VPP)	A portfolio of distributed resources that is operated as if it were a single power plant.

Source: GridSync

APPENDIX C

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THE COMPANY AND THE LEAD AUTHOR

About GridSync

GridSync (Pty) Ltd is a South African energy-technology company based in Johannesburg. It is building software and devices that connect the energy equipment in homes and buildings to a single platform for monitoring, control and measurement.

Lead author

Thuba "Lihle" Moyo, Chief Technology Officer, GridSync. Thuba led the drafting of this paper. He is a renewable-energy specialist in the deployment of virtual power plants and flexibility programmes. He served as a technology adviser to the Victorian Government in Australia on the delivery of its virtual power plant, zero-emission vehicle and neighbourhood battery initiatives. He was part of the team behind two Australian demonstrations of how aggregated distributed energy resources can be integrated into electricity markets and networks: AEMO's Project EDGE in Victoria, and Project Symphony in Western Australia. The Africa Finance Corporation's Climate Leadership initiative has recognised his work. He holds an MSc in Renewable Energy, a BSc (Hons) in Physics and an MBA.

Project EDGE tested an off-market marketplace for aggregators of distributed resources and concluded that price-responsive distributed energy is technically feasible. Project Symphony linked about 900 resources across 500 homes and businesses in Perth into a virtual power plant between July 2021 and February 2024.

About this paper

This paper was prepared by GridSync (Pty) Ltd to inform the public discussion on how South Africa can use its surplus electricity. It uses published sources, each of which is cited, and the company's own arithmetic, which is shown in Appendix A. It is not investment, legal or tax advice.

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Contact: Morwesi Ramonyai, Managing Director, GridSync (Pty) Ltd, Johannesburg. **Web:** www.gridsync.co.za

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