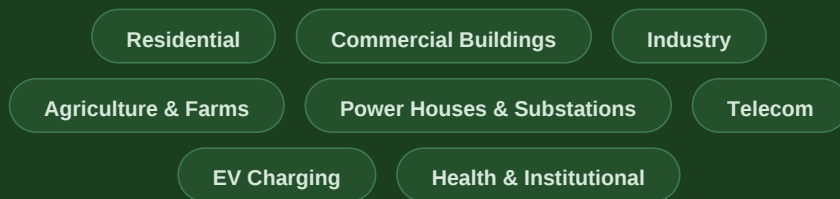




Solar + Battery Energy Storage Solutions for Ethiopia

Designed, supplied, installed and supported for Ethiopian operating conditions



1,600-1,900

kWh per kWp per year

Typical Ethiopian PV yield

50-58

ETB per kWh

Cost of diesel generation at 180 ETB/litre

5.8

ETB per kWh

Typical blended EEU commercial tariff

AKLIL TRADING PLC | A MinAye Group Company

Energy solutions, project development and equipment supply | Addis Ababa, Ethiopia

Sales team edition | Revision 1 | July 2026 | Indicative information - all systems sized by site survey

ክላሊል ትራዲንግ

Three forces are changing the economics

Grid availability

Outages are frequent, seasonal and long. On one Akilil-surveyed commercial farm the grid was unavailable for 887 hours over eleven recorded months - roughly one hour in ten - concentrated in the Aug-Nov rainy season.

The load does not stop when the feeder does.

Diesel economics

At 180 ETB per litre and a typical 0.28-0.32 litres per kWh, generator energy costs 50-58 ETB per kWh before servicing, oil, filters and refuelling logistics. Fuel prices rose 49% in January 2026.

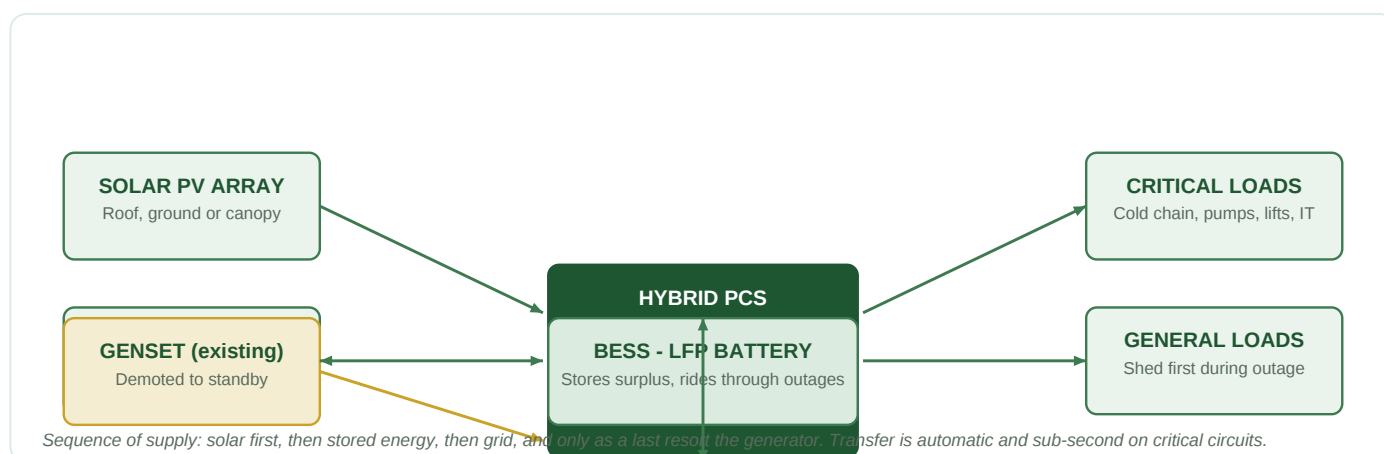
Diesel is now roughly nine times the cost of grid energy.

Solar resource

Ethiopia has among the strongest solar resources of any grid-connected market, delivering 1,600-1,900 kWh per installed kWp each year across most of the highlands with modest seasonal variation.

Generation is predictable and requires no fuel supply chain.

How a hybrid system is arranged



How to position this with a client - read before your first visit

Against diesel the case is overwhelming and you should lead with it. Against the subsidised EEU tariff, energy cost savings alone give a long payback - do not build your pitch on beating the grid tariff. Sell reliability, protection of production value, avoided generator capital and servicing, and freedom from fuel logistics. Where a client has no outages and no generator, be honest that the case is weaker and size PV only.

01



Residential

Homes, villas, apartments and compounds

THE CHALLENGE

Households carry load-shedding daily. Generators are noisy, need fuel queuing and constant attention, and are rarely started for short cuts - so lights, refrigeration, water pumping and internet simply stop. Voltage swings on restoration damage electronics and appliances.

RECOMMENDED CONFIGURATION

- Rooftop PV, typically 3-20 kWp
- Single or three-phase hybrid inverter
- LFP lithium battery, 5-40 kWh usable
- Automatic changeover, no generator needed
- Essential-loads sub-board for longer autonomy
- Mobile app monitoring for the owner

WHAT IT DELIVERS

- Silent, automatic backup with sub-second transfer
- Refrigeration, lighting, Wi-Fi, TV and borehole pump stay live
- Stored solar carries the evening peak and night
- No fuel purchase, storage or theft risk
- Surge and voltage protection for sensitive electronics
- Adds resale value to the property

INDICATIVE SIZING

Essential-loads package 5 kWp / 10 kWh. Whole-villa package with borehole and air conditioning 15-20 kW / 30-40 kWh.

Akil reference: 16 kW / 32 kWh whole-residence system specified for a senior group residence, Addis Ababa.

02



Commercial Buildings

Offices, hotels, retail, mixed-use and high-rise towers

THE CHALLENGE

Lifts, fire pumps, building management systems, server rooms, kitchens and cold rooms cannot ride through an outage, and tenants increasingly write uptime into their leases. Diesel plant rooms occupy lettable floor area and impose noise, fumes and fuel deliveries in dense urban settings.

RECOMMENDED CONFIGURATION

- Rooftop, canopy and facade PV, 50-500 kWp
- Three-phase PCS with grid-parallel operation
- LFP battery, 100-1,000 kWh
- Integration with existing genset and ATS
- Peak shaving to reduce maximum demand charges
- Metering per tenant or per riser where required

WHAT IT DELIVERS

- Uninterrupted lifts, pumps, security and data rooms
- Generator demoted to rare standby duty
- Lower maximum demand and reduced tariff exposure
- Quiet operation suitable for hotels and residences
- A credible green-building credential for leasing
- Phased installation floor by floor without shutdown

INDICATIVE SIZING

Mid-rise office 200 kWp / 400 kWh. Hotel with cold kitchen and lifts 150-300 kWp / 300-600 kWh. Scales linearly with floor plate.

03



Industry & Manufacturing

Processing, food and beverage, textiles, plastics, cement and pharmaceuticals

THE CHALLENGE

An unplanned stop can ruin a batch, damage tooling and idle a shift. Large motor restarts trip the incomer, power factor penalties accumulate, and expansion is blocked because the utility cannot release additional capacity on the existing connection.

RECOMMENDED CONFIGURATION

- PV 200 kWp to 2 MWp on roofs and yards
- PCS 250 kW to 2 MW, grid-parallel
- LFP battery 500 kWh to 4 MWh
- Peak shaving and load-step support for motor starts
- Power factor correction and harmonic filtering
- Priority circuits for process-critical lines

WHAT IT DELIVERS

- Ride-through that protects batches and tooling
- Reduced maximum demand and penalty charges
- Expansion capacity without a grid reinforcement
- Substantial diesel displacement on long outages
- Improved power quality across the plant
- Measurable energy data for ISO and buyer audits

INDICATIVE SIZING

Medium plant 500 kWp / 1 MWh. Cold store or continuous process line 1 MWp / 2 MWh. Sizing driven by measured demand, never connected load.

04



Agriculture & Farms

Flower and horticulture farms, irrigation schemes, dairy, packhouses and cold chain

THE CHALLENGE

Farms sit far down rural feeders and receive the worst reliability in the country. Irrigation pumps, cold rooms, greenhouse climate control and packhouse lines all stop together, and product value is lost in hours. Diesel dominates operating cost and depends on tanker deliveries over poor roads.

RECOMMENDED CONFIGURATION

- Ground-mount or greenhouse-roof PV, 100 kWp to 1 MWp
- PCS 100-1,000 kW with pump soft-start capability
- LFP battery 200 kWh to 2 MWh
- Cold-chain and irrigation priority circuits
- Genset retained for rare multi-day events
- Remote monitoring across dispersed compounds

WHAT IT DELIVERS

- Harvest value protected at the cold chain
- Predictable, schedulable pumping and irrigation
- Large and immediate diesel savings
- Fewer fuel deliveries and less on-site fuel theft
- Lower noise and emissions near growing areas
- Supports export buyer sustainability requirements

INDICATIVE SIZING

Mid-size farm 500 kWp / 800 kWh-1 MWh. Irrigation-led scheme sized on pump duty cycle and dam or reservoir buffering.

Akil reference: MinAye Flowers Phase 1 - 500 kWp PV, 250 kW PCS, 836 kWh LFP; 887 outage hours recorded over eleven months; modelled diesel savings ETB 5.7-6.8 million per year.

05



Power Houses & Substations

Generation stations, transmission and distribution substations, switchyards and control rooms

THE CHALLENGE

Station DC systems must operate protection, control, SCADA, breaker closing and emergency lighting without exception - including when the station itself is dark. Ageing battery banks and chargers are a hidden and poorly documented risk, and capacity is often assumed rather than tested.

RECOMMENDED CONFIGURATION

- Station battery banks in 2V and 12V formats
- VRLA AGM and OPzV tubular gel options
- 110 VDC and 220 VDC systems to specification
- Matched float and boost battery chargers
- Correct terminal, rack and interconnection design
- Auxiliary PV for station service supply

WHAT IT DELIVERS

- Compliant standby autonomy for protection and control
- Capacity verified by test, not assumed
- Type-tested chargers with alarm and monitoring outputs
- Correct physical and terminal interface at handover
- Documented commissioning records for the utility
- Local warranty administration and spares

INDICATIVE SIZING

Specified per station duty cycle and autonomy requirement. Terminal type, rack layout and charger rating confirmed against the existing installation before order.

Aklil reference: Akilil supplies station batteries and battery chargers into Ethiopian Electric Power procurement.

06



Telecom & Off-Grid Infrastructure

Base stations, microwave repeaters, rural water schemes and remote facilities

THE CHALLENGE

Off-grid and bad-grid tower sites run generators almost continuously, requiring repeated refuelling over difficult terrain. Fuel theft is routine, generator failure takes sites down, and ageing VRLA banks cycle poorly at high ambient temperature so autonomy collapses long before end of nominal life.

RECOMMENDED CONFIGURATION

- 48 VDC LFP rack modules, 5-30 kWh
- PV 1-10 kWp on tower or ground frame
- Hybrid controller with genset auto-start
- Deep-cycle tolerant, wide temperature range
- Remote monitoring with state-of-charge telemetry
- Theft-resistant enclosure and mounting

WHAT IT DELIVERS

- Refuelling trips cut sharply, in many cases eliminated
- Site availability improves and truck rolls fall
- Long cycle life under daily deep discharge
- Stable performance at high ambient temperature
- Remote visibility of true remaining autonomy
- Same architecture serves water and border facilities

INDICATIVE SIZING

Typical single-carrier BTS 5 kWp / 15 kWh. Multi-tenant or fully off-grid tower 10 kWp / 30 kWh with genset retained as backup.

07



EV Charging Infrastructure

Public charging hubs, forecourts, fleet depots and multi-storey facilities

THE CHALLENGE

DC fast charging requires a step change in connected capacity. Grid reinforcement is slow, expensive and sometimes simply unavailable, while coincident charging peaks attract punishing demand charges. Ethiopia's imported EV fleet is growing far faster than public charging is being built.

RECOMMENDED CONFIGURATION

- Battery-buffered charging architecture
- BESS 200 kWh to 1 MWh behind the meter
- DC fast chargers 60-240 kW, AC units alongside
- PV canopy over the forecourt or top deck
- Buffer charged off-peak, discharged on demand
- Payment, access control and usage reporting

WHAT IT DELIVERS

- Fast charging without a new substation or feeder upgrade
- Connection cost and demand charges sharply reduced
- Deployable where the grid could not otherwise support it
- Works through outages, unlike an unbuffered charger
- Suits multi-storey and urban forecourt formats
- Early position in a market with very little provision

INDICATIVE SIZING

Urban hub with two 120 kW DC chargers 400-600 kWh buffer. Fleet depot sized on overnight dwell time and vehicle count.

08



Health & Institutional

Hospitals, clinics, laboratories, universities, government campuses and water utilities

THE CHALLENGE

Vaccine and blood cold chain, operating theatres, oxygen plants and laboratory equipment cannot tolerate interruption, and standby generators have a habit of failing at precisely the moment they are called. Institutional budgets are also acutely exposed to fuel price movements.

RECOMMENDED CONFIGURATION

- PV 20-200 kWp on roofs and covered walkways
- LFP battery 50-500 kWh
- Separated essential and non-essential boards
- Sub-second transfer on clinical circuits
- Temperature-monitored cold chain supply
- Generator retained and automatically supported

WHAT IT DELIVERS

- Clinical services continue without interruption
- Cold chain integrity documented and monitored
- Operating cost stabilised against fuel prices
- Meets donor and programme reliability requirements
- Quiet operation appropriate to wards and campuses
- Same design serves water pumping and treatment

INDICATIVE SIZING

District clinic 30 kWp / 60 kWh. Referral hospital wing 150-200 kWp / 300-500 kWh with clinical circuits separately guaranteed.

Battery chemistry selection guide

Chemistry	Best suited to	Indicative cycle life	Selection notes
LFP lithium	Daily cycling, solar self-consumption, outage ride-through, telecom, EV buffering	6,000+ at 80% DoD	Highest usable energy per square metre and per kilogram. Tolerates partial state of charge. Preferred default for solar-coupled systems.
VRLA AGM	Standby duty - substation DC, UPS, telecom float, switchgear tripping	1,200-1,500 shallow	Proven, sealed, lowest capital cost. Not suited to daily deep cycling. Standard for station battery applications.
OPzV tubular gel	Deep-cycle standby in hot climates, rural and unattended sites	1,500-2,000 at 50% DoD	Better tolerance of high temperature and deep discharge than AGM. Longer design life where cycling is occasional but deep.
Ni-Cd	Extreme duty switchgear and severe temperature environments	Very long service life	Specialist application only. Higher cost and larger footprint; specified where the client standard demands it.

What Aklil delivers

01 Assess Measured load and outage study using meter data and bills - we size on measured demand, never on connected load.	02 Design System sizing, single-line diagram, yield and autonomy modelling, and a written technical proposal.	03 Supply PV modules, mounting, PCS and hybrid inverters, BESS, DC/DC, protection and cabling from vetted manufacturers.	04 Import Aklil holds import licences and letter of credit facilities, with customs clearance and delivery to site.	05 Commission Installation supervision, testing, commissioning certificate and client operator training.	06 Support Warranty administration, spare parts, remote monitoring and scheduled maintenance.
--	---	--	---	--	---

Commercial and warranty terms

Warranty periods, capacity retention guarantees and payment structures are agreed per project and per supplier. Sales staff must quote only the terms confirmed in the current signed proposal for that specific client - do not state warranty length, retention percentage or lead time from memory or from an earlier project.

Five questions to ask on the first visit

- 1 What is the measured peak demand in kW or kVA from the meter or the bill? Connected load will oversize the system badly.
- 2 How many outage hours per month - and what is the longest single event? The longest event sets the battery size.
- 3 What is the current monthly diesel spend, in litres and in birr, and at what price per litre?
- 4 Which loads genuinely cannot stop, and which can be shed? This separates the essential board.
- 5 What roof or ground area is available, and what is its orientation, tilt and shading?

Rules of thumb

PV yield

1,600-1,900 kWh per kWp per year

Roof area

5-7 sq m per kWp flush; 8-10 sq m tilted with row spacing

Genset fuel burn

0.28-0.32 litres per kWh - verify on site

Diesel energy cost

50-58 ETB per kWh at 180 ETB per litre

Usable battery energy

Nameplate kWh multiplied by depth of discharge; LFP typically 90%

Autonomy in hours

Usable kWh divided by average critical load in kW

PCS rating

kVA equals kW divided by power factor - 250 kW at 0.8 pf is 312 kVA, not 315

Handling the five objections you will actually hear

"Solar is cheaper than the grid, prove it"

Do not make this claim. Against the subsidised EEU tariff the energy-cost payback alone is long. Redirect to diesel displacement, avoided downtime and avoided generator replacement, where the numbers are decisive.

"Batteries do not last in this climate"

True of poorly sized lead-acid. LFP is specified for daily cycling with a defined capacity retention guarantee, and correct sizing avoids the deep discharge that kills batteries early.

"We already have a generator"

We do not remove it. We demote it to genuine standby - so fuel, servicing, oil, filters, refuelling logistics and start-failure risk fall away, while the generator remains for rare multi-day events.

"Import and foreign exchange are impossible right now"

Aklil holds import licences and letter of credit facilities, and the group earns foreign exchange through its export operations. Supply capability is a reason to buy from us.

"What happens if it fails after you are paid?"

Commissioning certificate, warranty administered locally by Aklil rather than by a distant factory, trained client operators, held spares and remote monitoring that flags faults before the client notices them

Never commit without a survey

Do not quote a fixed price, a guaranteed payback period or a guaranteed number of autonomy hours before the load and outage study is complete. Give ranges, and put the survey in the diary.