



Case Study

Jinko ESS SunTera Solution of Grid-Forming Hybrid Microgrid

2.5MW/5.015MWh Li-ion BESS Project
A Poultry Processing Facility in the Middle East

Project Overview

A coastal poultry processing facility in the Middle East, near Chekka (corrosion class C5) runs a six to eight hour night shift peaking at approximately 1.3 MW. With the 1 MVA EDL utility connection available only a few hours per day, the plant ran on six diesel generators (4,050 kVA, DEIF controllers) and a 656 kWp rooftop PV plant, with high fuel cost and PV output limited by genset minimum loading.

Jinko ESS delivered a 5.015 MWh SunTera G2 liquid-cooled container with a 3 MVA PCS skid (configured at 2.5 MW) in grid-forming VSG mode as the site's voltage and frequency reference, plus a new 1,360 kWp PV plant taking installed PV to approximately 2 MWp. Coordinated by the DEIF power management system, the plant now runs on PV and battery for most of the day, with generators starting automatically only at low battery SOC.

5.015 MWhSunTera G2 liquid-cooled
BESS**3 MVA / 2.5 MW**

PCS skid, VSG grid-forming

2,016 kWp

PV installed (656 + 1,360 kWp)

4,050 kVA

Diesel gensets, backup only

Commissioning: August 2026. Location: Chekka district, Middle East .

Site Conditions and Load Profile

The facility runs one production shift per day, historically starting at 01:00. During production hours the load is 1,600 to 1,700 A in winter and 1,800 to 2,000 A in summer, which corresponds to roughly 1.0 to 1.3 MW at 400 V. After the shift, the load steps down to 900 to 1,100 A for about four hours and then to 500 to 800 A (approximately 0.3 to 0.5 MW) for the rest of the day. On non-production days the load remains between 500 and 1,200 A. Estimated daily consumption is in the range of 16 to 17 MWh on a summer production day.

Two features of this profile shaped the design. First, the peak occurs before sunrise, so a storage system large enough to carry the shift on stored PV energy was needed. Second, the client agreed that after the installation of PV and BESS the production start could be shifted by up to four hours (from 01:00 to 04:00), which moves a larger part of the shift into daylight and reduces the energy that has to be cycled through the battery.

Parameter	Value
Facility	Poultry processing plant and farm zone, Chekka district, Middle East
Grid connection	EDL 1 MVA, 11/0.4 kV Dyn11 (Z = 5.5%), limited daily availability
Diesel generation	6 units: 5 x 700 kVA + 1 x 550 kVA, 0.8 PF (4,050 kVA), DEIF controllers
LV switchboard	Switchgear 1: 400 Vac, 3ph+N, 50 Hz, 3,200 A, 50 kA
Peak load	2,000 A summer / 1,700 A winter production shift, approx. 1.0 to 1.3 MW
Base load	500 to 800 A (approx. 0.3 to 0.5 MW) outside production hours
Load power factor	0.8 to 0.9 (mixed inductive load: refrigeration, motors, processing)
Ambient	0 to 35 C, altitude 50 m, coastal C5 corrosion class, outdoor installation

Table 1: Site conditions

The Solution

The single line diagram below shows the overall system. All sources are connected on the 400 V busbar of Switchgear 1: the six generators, the EDL transformer, two outgoing load feeders and one 3,200 A "PV+ESS" incomer. Behind this incomer, the existing AC combiner (upgraded to 4,000 A) collects the 656 kWp rooftop PV (PV Area 1, eight Sungrow SG110CX inverters) and connects to a new AC combiner room installed next to the BESS. The new combiner (400 V, 3,200 A, 15 kA/3 s) receives the PCS output through a 4,000 A ACB, the 1,360 kWp farm-zone PV (PV Area 3) through a 2,500 A ACB, and has a spare 2,500 A incomer for the future 585 kWp PV Area 2.

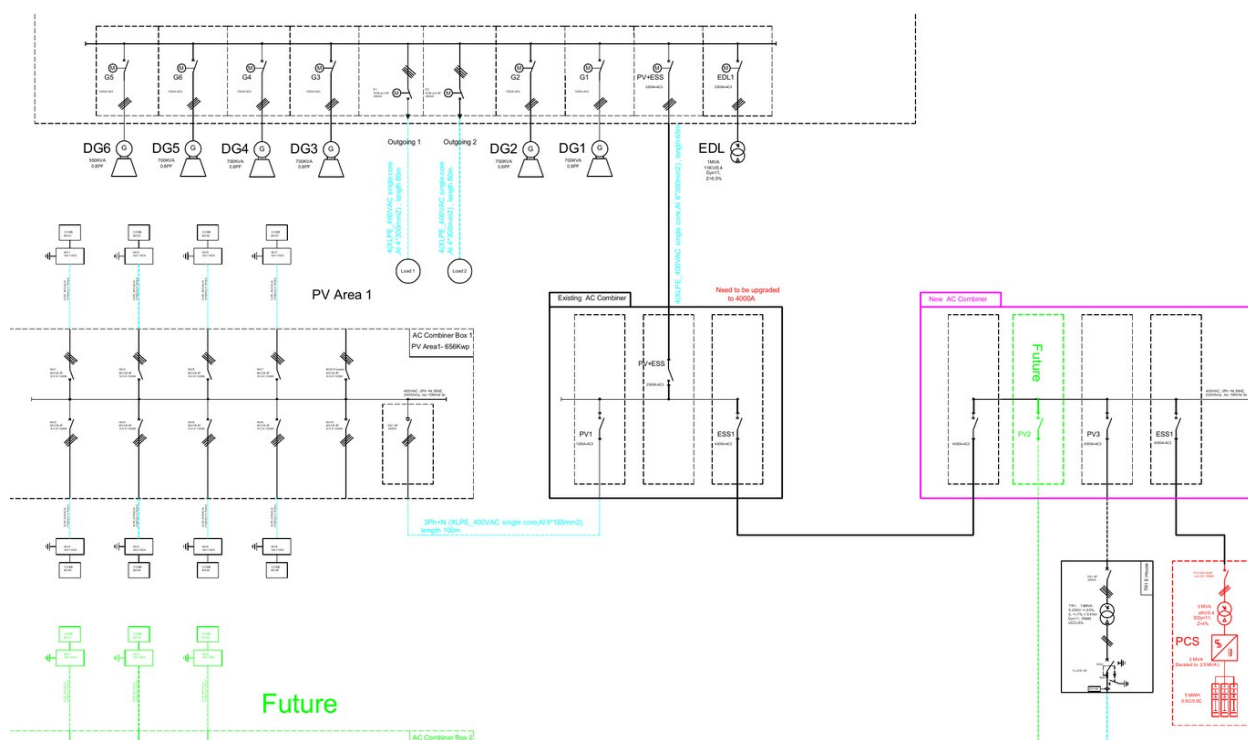


Fig. 1: Single line diagram of the hybrid microgrid

System Configuration

Parameter	Value
Battery container	Jinko SunTera G2, 20 ft, 5.015 MWh, LFP 314 Ah cells, 12 battery racks, liquid cooling, integrated FSS (aerosol plus water pipe interface), 44 t max gross weight
PCS skid	3 MVA integrated PCS skid, configured at 2.5 MW (0.5C), two PCS units at 690 V with integrated double-split winding transformer 0.4/0.69-0.69 kV, LV output 400 V via 4,000 A ACB
Control mode	Grid-forming VSG (virtual synchronous generator), frequency droop 2%, voltage droop 5%, target 50.00 Hz / 690 V
DC system	1,500 V DC class, battery string voltage approx. 1,377 V at 57% SOC
Power management	DEIF PMS controlling PCS, generators (DEIF genset controllers) and PV plants; island detection, DG start/stop and load sharing
PV Area 1 (existing)	656 kWp rooftop, 8 x Sungrow SG110CX, AC combiner box 1, 2,500 A
PV Area 3 (new)	1,360 kWp farm zone, Sungrow SG125CX, AC combiner box 3, TR2 1.6 MVA 5-20 kV/0.41 kV, 500 m 11 kV Al 35 mm2 cable, TR1 1.6 MVA E-house at plant
PV Area 2 (future)	585 kWp, 6 x Sungrow SG110CX, spare 2,500 A incomer in new AC combiner
Interconnection	New AC combiner 400 V / 3,200 A to Switchgear 1 via 4 x (8 x 300 mm2 Al) XLPE, 65 m
Layout	Outdoor concrete foundations, PCS skid and BESS container side by side with 2.4 m access clearance, MV/LV transformer bay and combiner room, space reserved for a second 5.015 MWh container

Table 2: Main equipment

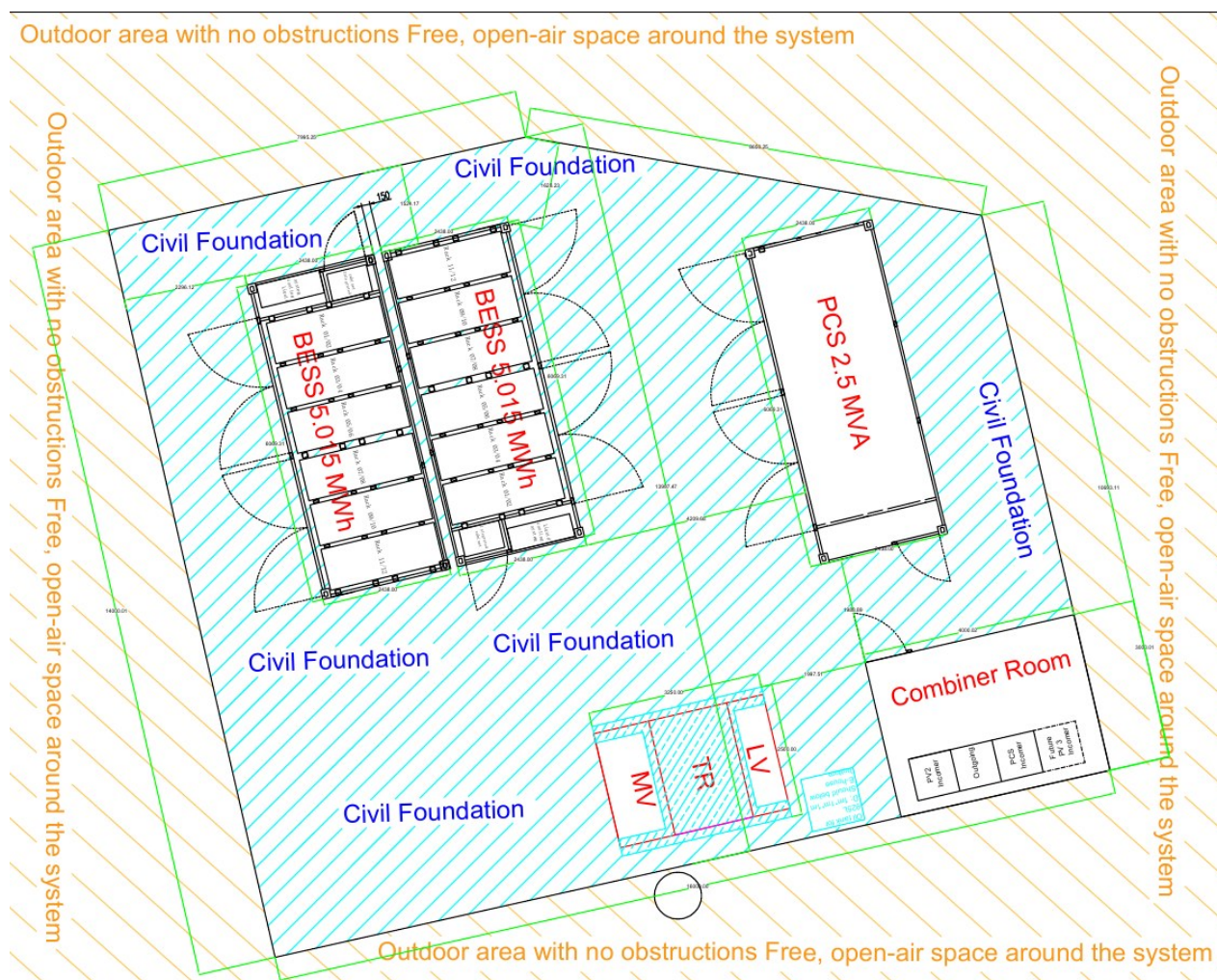


Fig. 2: Site layout of the BESS area (PCS skid, SunTera container with provision for a second unit, MV/LV transformer and combiner room)

SunTera G2 Battery Container

The SunTera G2 is a 20 ft liquid-cooled container integrating 12 battery racks with 314 Ah LFP cells, the battery management system, liquid cooling unit, fire suppression system and auxiliary distribution. Liquid cooling keeps the cell temperature spread below 5 K in all operating conditions, which is the main contributor to cell consistency and calendar life. During commissioning the cell temperature range was 23 to 25 C and the maximum cell voltage spread was 5 mV (3,307 to 3,312 mV) at 57% SOC.

The BMS has a three-level architecture (BMU per pack, BCU per rack, SCU per container) communicating over CAN and Modbus TCP, with hard-wired dry contacts to the PCS for emergency shutdown. The fire suppression system combines aerosol extinguishing inside the racks with temperature and smoke detection, and a DN65 external water pipe interface for the fire brigade. The container is rated for outdoor installation with a C5 corrosion coating for the coastal site.



Fig. 3: SunTera G2 5.015 MWh container



Fig. 4: PCS skid, TR1 E-house and SunTera container

PCS Skid

The PCS skid is a 3 MVA integrated station containing two PCS units and a double-split winding step-up transformer. Each PCS unit operates at 690 V on its own transformer winding, and the 400 V secondary connects to the new AC combiner. For this project the skid is configured at 2.5 MW to match the 0.5C rating of the battery. Both PCS units run in VSG mode and share the load with the generators when these are online. The skid design is the same as Jinko's standard on-grid product line, which shortened delivery compared with a customised 400 V solution.



Fig. 5: PCS units inside the skid



Fig. 6: Aerial view of the BESS area with the 11 kV link pole

Control Architecture and Operation Logic

The site is operated as an islanded microgrid with the PCS as the grid-forming source. The DEIF PMS supervises the PCS, the six generators and the PV plants and decides which sources are online. The Jinko EMS/SCU handles battery-side supervision (BMS, cooling, FSS) and exposes SOC, chargeable and dischargeable capacity, and power limits to the DEIF system over Modbus TCP.

Operating Modes

- Island, PV and BESS only.** The PCS runs in VSG mode as a voltage source at 400 V / 50 Hz. PV inverters operate as current sources. Surplus PV charges the battery; when PV drops below the load, the battery discharges. All generators stay in "Ready Island, Auto" and remain stopped.
- Island, generators assisting.** When SOC reaches the low limit, the PMS starts one or more generators. The generators run in droop with the PCS at a stable, efficient loading (above their minimum load threshold), while the PCS covers all instantaneous load and PV fluctuations. Once PV is sufficient or SOC recovers above the stop threshold, generators are unloaded and stopped.
- PV curtailment.** When the battery approaches full SOC and PV exceeds the load, the PV inverters receive a reduced active power setpoint so that the battery is not overcharged and the microgrid stays balanced.
- Grid available.** When the EDL supply is present and synchronised, the PCS follows the grid (PQ mode) and the PMS dispatches the battery according to the configured strategy.
- Load shifting.** The production start can be moved from 01:00 to 04:00 so that a larger share of the shift is supplied directly by PV, reducing the energy cycled through the battery and extending its life.

DEIF PMS Snapshots During Commissioning

The screenshots below are taken from the DEIF PMS supervision screen and from the Jinko PCS/BESS pages of the same system.

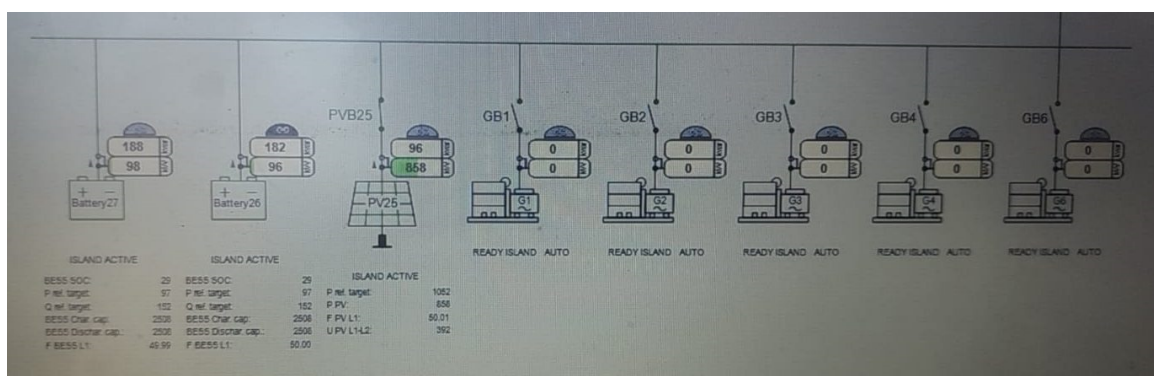


Fig. 7: Island operation on 100% renewable supply: PV producing 858 kW, the two battery clusters discharging 188 kW and 182 kW, all five generators in Ready Island / Auto (stopped), SOC 29%

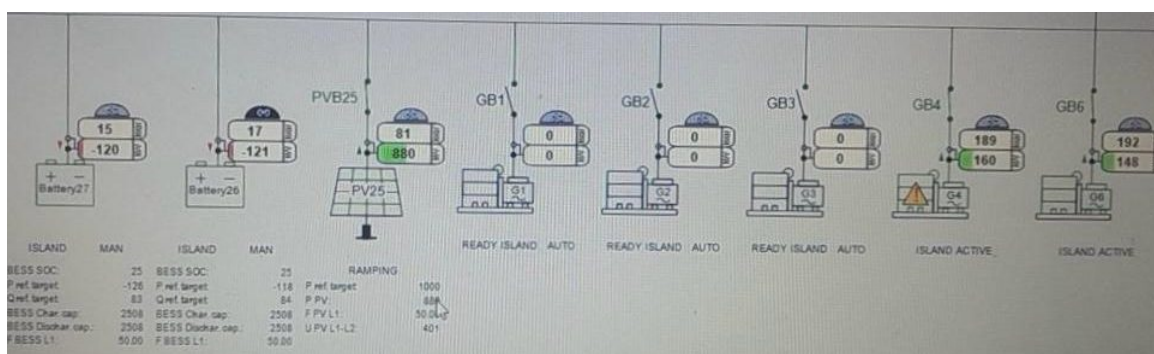


Fig. 8: Generators assisting: PV 880 kW, generators G4 and G6 at 189 kW and 192 kW, battery clusters charging at 120 kW and 121 kW, SOC 15 to 17%

Single Line Diagram

EMS Mode
PMS

Authorized

2026/08/17
10:37:39

Language
中文 English

DEIF

The diagram illustrates a power system configuration with two BESS units, PV1, and Genset. Key data points include:

- Power and Load Metrics:**
 - 692 kW, 0 kvar, 50 Hz, 692 V (Left BESS)
 - 693 kW, 0 kvar, 50 Hz, 693 V (Right BESS)
 - 49.98 Hz, 401 V, 400 kW, 231 kVar (PV1)
 - 1381 kW, 1381 kVar (Genset)
- Status and SOC:**
 - BESS1/1: SOC 57%, BMS Fault Status Normal, BMS Status Charge
 - BESS1/2: SOC 57%, BMS Fault Status Normal, BMS Status Charge
- Other Indicators:**
 - Load 50% (for both BESS units)
 - Load 30% (for PV1)
 - Load 55% (for Genset)

1#ESS

EMS Mode

PMS

Authorized

2026/08/17

10:40:03

Language

中文

English

U_{UV}

691 V

U_{VW}

692 V

PCS_{WU}

693 V

Frequency

50.01 Hz

P

691 KW

Q

0 Kvar

S

-1800 KVA

F Droop

2.0 %

U Droop

5.0 %

Target P (EMS)

0 kW

Target Q (EMS)

0 kvar

Target P (with PID)

0 kW

Target Q (with PID)

0 kvar

Target Frequency

50.00 Hz

Target Voltage

690 V

PCS Mode

VSG

PCS Status

Standby

BMS Status

Standby

BMS Fault Status

Normal

Battery voltage

1376 V

Battery current

0 A

Max Cell Temp.

25 °C

Min Cell Temp.

23 °C

Max Cell Voltage

3312 mV

Min Cell Voltage

3307 mV

Total Charge

13 MWH

Total Discharge

10 MWH

SOC 57 %

SOH 100 %

P Source

U Source

1#PCS

Load 50 %

PCS Operation

Start

Stop

General alarm

Trip protection

Shutdown

Alarm ack

BMS Operation

Power On

Power Off

Alarm ack

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Key Features

Grid-forming BESS as the backbone of the site microgrid

With the PCS operating as a virtual synchronous generator, the site does not depend on a running diesel unit to hold voltage and frequency. Generators become dispatchable backup that can be started, loaded and stopped by the PMS without interruption to the plant. Seamless connection and disconnection of generators is achieved through droop control between the PCS and the DEIF controllers.

Integration with the client's existing DEIF infrastructure

The genset controllers on site were already DEIF units. Rather than replacing them, the Jinko PCS and BESS were integrated into a DEIF PMS so that the client operates the whole plant from a single supervision system while Jinko retains full visibility of the battery through the SCU and cloud platform.

LV integration at MW scale

The 3 MVA PCS skid with an integrated double-split transformer allows a 2.5 MW BESS to be connected on the 400 V busbar through a 4,000 A ACB without a dedicated MV bay, while the farm-zone PV is brought in over an 11 kV link and stepped down at the E-house next to the BESS. This kept the interconnection cost low and reused the existing 3,200 A switchgear.

Designed for the coastal environment

The container and skid are delivered with a C5 anti-corrosion coating for the seaside site, and liquid cooling keeps cell temperatures well within limits during Middle Eastern summers. The layout reserves space for a second 5.015 MWh container, and the new AC combiner already has the incomer for the future 585 kWp PV area.



Fig. 11: Carport PV plant at the facility, with the Chekka coastline in the background

Conclusion

This project demonstrates how a single SunTera G2 container with a grid-forming PCS skid can turn a diesel-dependent industrial site into a PV-led microgrid where generators serve only as backup. The combination of 5.015 MWh of storage, 2 MWp of PV and a coordinated PMS gives the plant stable power around the clock, a substantial cut in fuel consumption and a clear path for expansion. It also shows the value of integrating Jinko ESS equipment into third-party control systems already trusted by the client.

* The report serves as a general overview and is subject to updates by Jinko ESS. Jinko ESS reserves the right to modify the content and holds the final authority in its interpretation.



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