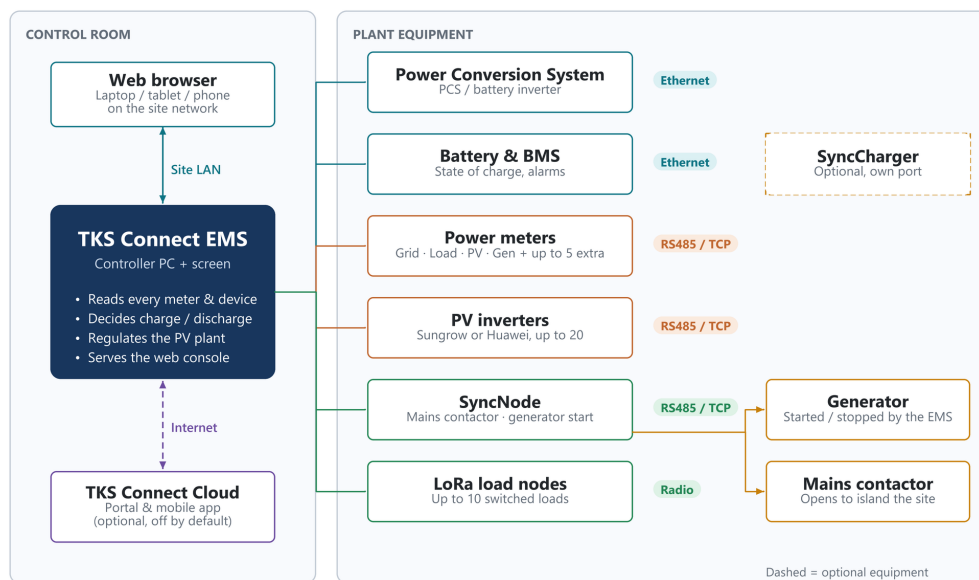


TKS Connect EMS

User Manual

Installation, configuration and operation of the TKS Connect battery energy storage and PV plant controller



SOFTWARE	DOCUMENT	REVISION	DATE
TKS Connect EMS 8.1	User Manual	1.0	October 2026

For site owners, operators, electricians and commissioning engineers.

Document information

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About this document

This manual explains what the TKS Connect EMS does, how to set it up for a site, what every reading and setting on its screens means, and how to operate and look after it day to day. It describes the behaviour of the software, not how it is programmed. Where a screen differs slightly between the web console and the local EMS window, the web console is described, because it is the main interface.

Screens, values and diagrams in this manual are illustrations. The values shown are examples only and are not recommendations for any particular site. Every site must be set up by a competent person using the equipment manufacturers' data and the site's own electrical drawings.

Network addresses, communication register details and the master PIN are deliberately not printed in this manual. They are recorded on the site record sheet (Appendix B) held by the site owner and by TKS Solar Group.

Conventions used in this manual

Convention	Meaning
Configuration	Text in this style is a label, tab, button or setting exactly as it appears on screen.
Bold	An important word or value.
kW, kVA, kVAR	Real, apparent and reactive power.
SOC	Battery state of charge, in per cent.
"At once" / "On restart"	Whether a setting takes effect as soon as it is saved, or the next time the EMS starts (see Section 5.12).

Safety and information notices are shown like this:

DANGER

A hazard that will cause death or serious injury if not avoided.

WARNING

A hazard that could cause injury, damage to equipment or loss of supply.

CAUTION

A situation that could cause the plant to behave unexpectedly or lose data.

NOTE

Useful background information.

TIP

A practical hint that saves time.

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1 Introduction

1.1 What the TKS Connect EMS is

The TKS Connect EMS is the controller that runs a battery energy storage system (BESS) and, where fitted, a solar PV plant and a standby generator. It runs on a small industrial PC in the control cabinet. Every few seconds, all day and without anyone present, it reads what the site is drawing, what the solar is producing, what the grid is doing and how full the battery is, and decides what the plant should do next.

Everything it does comes out as a small number of instructions to the plant: **charge** the battery at so many kilowatts, **discharge** it at so many kilowatts, **hold** at zero, **turn the solar down**, **island the site**, **call the generator**, or **switch a load**. Most of this manual is about what makes the EMS choose one of these over another, and how you tell it what you want.

1.2 What it can do

Capability	What it means for the site
Battery charging	Keeps the battery within safe bands: force charges when low, bulk charges, floats near full and stops at end of charge. Can charge only from solar surplus.
Tactics (tariff schedule)	A weekly schedule of up to 8 windows a day, each charging, discharging, following the load or exporting, so the battery works a time-of-use tariff.
Off-grid mode	Opens the mains contactor and runs the site islanded on battery and solar for up to two windows a day.
Peak shaving	Holds the site's demand from the grid under a ceiling you set, by discharging the battery during peaks.
PV regulation	Turns the solar inverters down when the site cannot use, store or export what they make, and sets their power factor.
Generator management	Starts the generator when the battery is low and stops it when recovered; limits solar while the generator runs.
Load management	Up to ten radio-linked loads (LoRa nodes) shed and restored on battery level.
SyncCharger	Optional chargers switched on and off on battery level, with a gentle ramp.
Monitoring	Live readings on the cabinet screen, in any browser on the site network, and optionally in the TKS Connect cloud portal and mobile app.
Self-protection	Plain-language fault reporting, automatic recovery restarts and a safe mode that stops endless restart loops.

1.3 Who this manual is for

- **Site owners and operators** — Chapters 4 to 6 (using the console and controls), 7 to 11 (what the plant does and why), 24 (routine checks) and 25 (troubleshooting).
- **Electricians and commissioning engineers** — additionally Chapters 2 and 3 (safety and system), 12 to 19 (each function in depth), 22 (every setting) and 23 (commissioning procedure).

The manual assumes you are comfortable working around low-voltage switchgear and batteries, and with using a web browser. It does not assume any knowledge of software or programming.

1.4 Supported equipment

Equipment	Supported options	Notes
Power Conversion System (PCS)	Huawei Series Sinexcel 500K Sinexcel 30P	One model per site. The Huawei Series has its battery behind the PCS, so no separate BMS is configured and the plant runs on SOC only.
Battery management system (BMS)	SYL (default) Pylontech (high-voltage)	A Pylontech battery reports SOC and alarms but cannot be stopped remotely; some status readouts stay blank.
Power meters	Schneider Chint 3-phase Chint 1-phase	Grid, load, PV and generator meters, plus up to 5 additional meters.
PV inverters	Sungrow Huawei	Up to 20 inverters read and regulated.
SyncCharger chargers	Sungrow Huawei	Optional; on a port of their own.
SyncNode	TKS SyncNode controller	Mains contactor, grid detection and generator start.
LoRa load nodes	TKS LoRa nodes	Up to 10 switched loads.
Generator	Any set with a remote start input	Started via the SyncNode or its own control port.

1.5 The three ways to use the EMS

Interface	Where	Best for
Web console	Any browser on the site network, and full screen on the controller's own monitor.	Day-to-day operation, monitoring, configuration. This is the main interface.
EMS window	On the controller PC itself.	Specialist local screens such as data export, and access when the network is unavailable.
TKS Connect cloud	Web portal and Connect mobile app, anywhere with internet.	Remote monitoring, alerts and (if enabled) remote control.

2 Safety

The EMS controls equipment that stores and converts large amounts of energy. Read this chapter before installing, configuring or working on any part of the plant.

DANGER — Automatic operation

The EMS can start the PCS, open or close the mains contactor, call the generator and switch loads **on its own, at any time, with nobody at the screen**. A plant that is idle now may start in the next few seconds because a schedule opens or the battery level changes.

Never rely on the EMS being idle. Isolate and lock off at the equipment before working on it.

2.1 General safety rules

- Only competent, authorised persons may install, commission or maintain the plant.
- Follow the PCS, battery, inverter and generator manufacturers' safety instructions. They take precedence over this manual.
- Battery systems remain energised even when the PCS is stopped and the mains is disconnected. DC conductors can carry dangerous energy at all times.
- Use **Maintenance mode** (Chapter 6) to stop the PCS before work, then isolate and lock off physically. A software stop is **not** an isolation.
- Do not change settings you do not understand. A wrong value can over-charge, deep-discharge or overload equipment, or drop the site's supply.
- Keep the master PIN restricted to people who are authorised to change how the plant runs.

2.2 Operations that can interrupt supply

These operations change how the site is supplied. The web console always asks for confirmation before sending them:

Operation	Effect
PCS stop	Stops the battery inverter. On an islanded site, this drops the supply.
Off grid / System off grid / Off grid now	Opens the mains contactor and runs the site on the battery.
Grid off	Opens the mains contactor (or turns SyncChargers off where fitted).
BMS stop	Opens the battery contactors.
Start generator	Calls the generator and stops the PCS.
SyncNodes off	Switches every load node off.
Restart EMS, Maintenance mode, Reboot controller	Interrupts control for a short period.

WARNING — Off-grid windows

Off-grid operation runs everything downstream of the mains contactor on the battery and PV alone. Size off-grid windows against what the battery can actually carry, and make sure essential loads can tolerate a transfer.

WARNING — Generator charging

An incorrect generator charge rate can overload and damage the generator. Set the Gen Charge Rate within the generator's rating (Chapter 14).

2.3 Before working on the plant

1. Tell the site operator and anyone relying on the supply.
2. Sign in with the master PIN and press **Maintenance mode** on the BESS Controls tab. This stops the PCS and restarts the EMS.
3. Switch off tactics and off-grid mode if the work will take longer than a few minutes, so a schedule does not try to restart the plant.
4. Isolate and lock off the PCS, battery, PV and generator at their own isolators as required by the work.
5. Prove dead before touching any conductor.
6. After the work, remove locks, restore settings, and confirm on the Dashboard that readings are normal before leaving.

3 System Overview

3.1 System architecture

The EMS is a controller PC with a screen, mounted in the control cabinet. It has no power contacts of its own: everything it does, it does by instructing another piece of equipment over a communication link. Figure 1 shows what it is connected to.

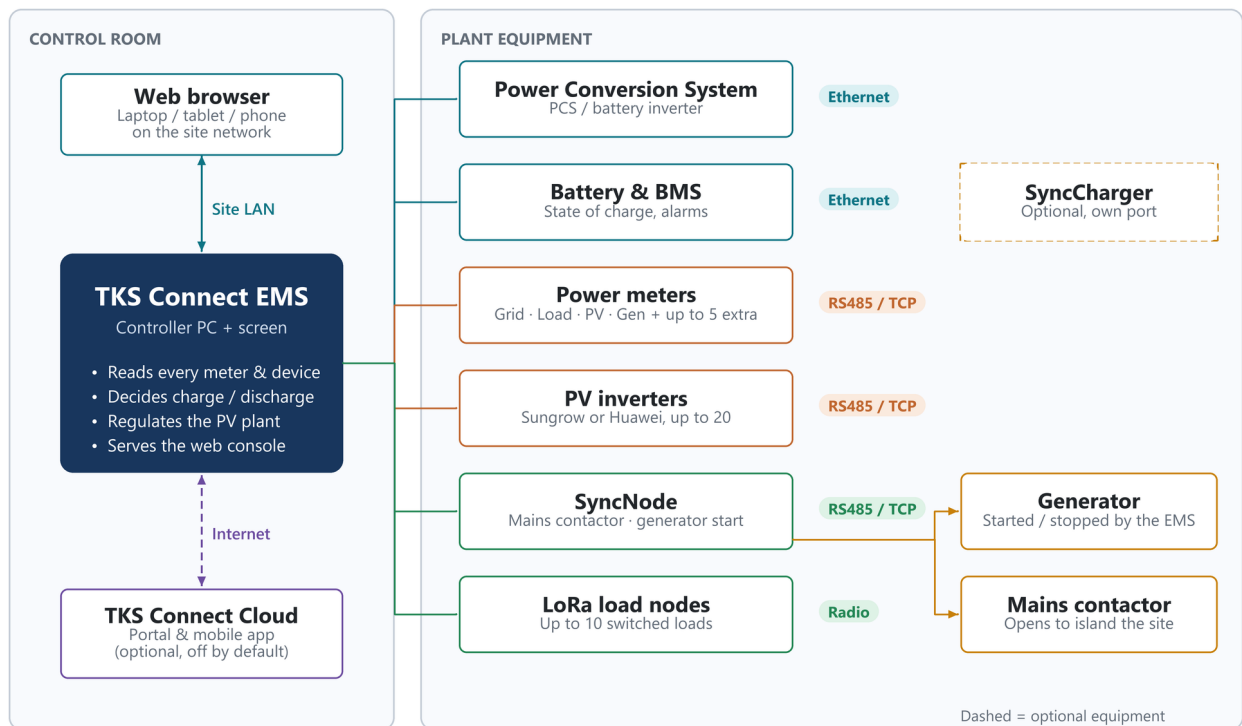
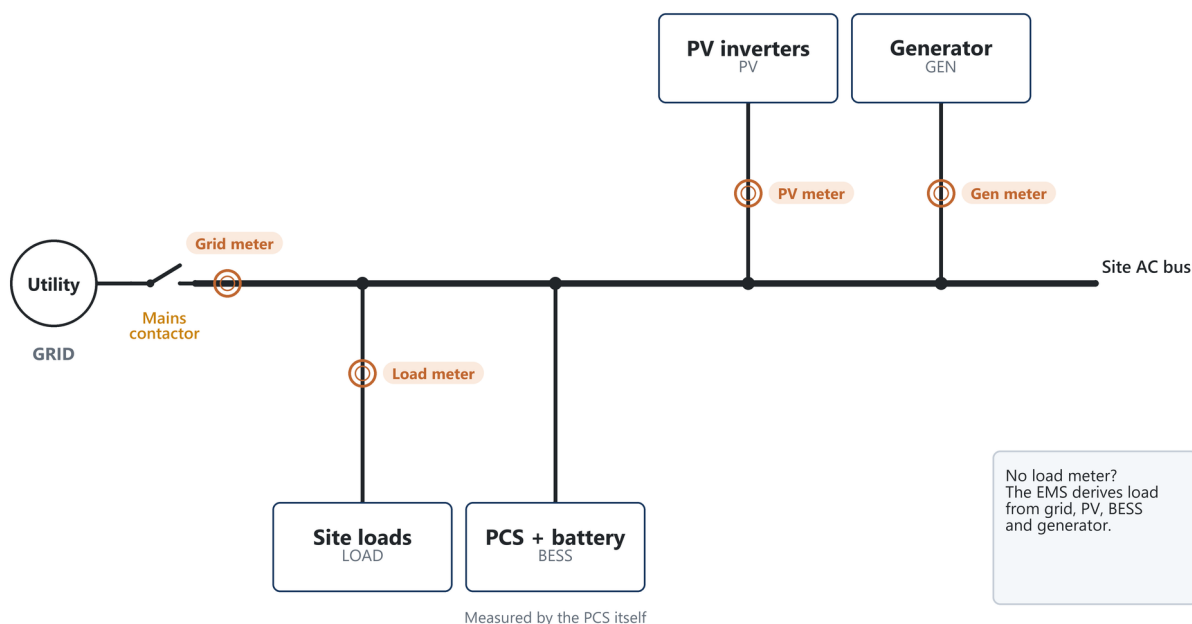


Figure 1 System architecture — the EMS controller and the equipment it reads and controls.

3.2 Electrical arrangement and metering points

All decisions are made from the readings of a few meters. Figure 2 shows where each meter measures on a typical site. Getting the current transformers (CTs) on the right conductors, on the right phases and the right way round is the single most important commissioning task.

SIMPLIFIED SINGLE-LINE — WHERE THE METERS MEASURE



Positive grid = import from utility. Positive BESS = battery charging.

Figure 2 Simplified single-line diagram showing the metering points. Your site's drawings are the authority for actual terminals and routes.

3.3 What each part does

Part	Its job	What the EMS does with it
PCS (battery inverter)	Moves power between battery and AC bus; can form an island.	Commands charge/discharge power, start/stop, grid-tied or off-grid mode; reads AC/DC values and faults.
Battery & BMS	Stores energy and protects the cells.	Reads SOC, voltage, current and alarms; can close or open the battery contactors.
Grid meter	Measures import/export at the connection point.	Main input for regulation, protection, peak shaving and auto tactics.
Load meter	Measures what the site consumes.	Used for load following. If absent, load is derived.
PV meter	Measures solar output.	Solar figure for charging and regulation. Can be replaced by the sum of the PV inverters.
Generator meter	Measures generator output.	Required for generator PV regulation.
PV inverters	Convert solar DC to AC.	Regulated down when needed; power factor set; temperatures, DC inputs and faults read.
SyncNode	Interface unit for the mains contactor, grid presence and generator start.	Opens/closes the mains, detects grid loss, starts/stops the generator.
LoRa nodes	Radio-switched loads.	Shed and restore loads on battery level.
SyncCharger	Inverter-based chargers on their own port.	Switched on/off on battery level with a ramp.

3.4 Site types

The first setting made on any site is the **System Type**:

System Type	Use it for	Effect
BESS	Sites with a battery and PCS (with or without PV and generator).	All battery functions, the PCS card and BESS pages are active.
Grid-Tied	PV-only sites with no battery, where the EMS regulates the solar plant.	Battery-related tiles and the PCS card are hidden; PV regulation and metering work as normal.

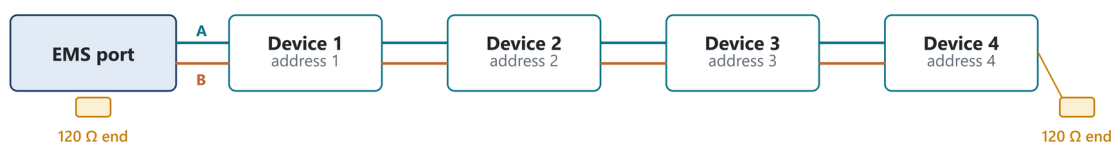
3.5 Communication links

The controller talks to the plant over up to four kinds of link. Nearly every commissioning problem, and a good share of later faults, are on one of these links rather than in the equipment at either end.

Link	Medium	Devices on it
Plant network	Ethernet	PCS and BMS, each on its own fixed network address. Also the site LAN for browsers and the internet connection for the cloud.
Power meter line	RS485 (or TCP on a TCP/IP site)	Grid, load, PV, generator and additional meters on one daisy chain.
PV inverter line	RS485 (or TCP)	The PV inverters, addressed 1 upwards.
SyncNode line	RS485 / serial (or TCP)	The SyncNode: mains contactor, grid detection, generator.
Optional lines	Serial	LoRa gateway, a dedicated generator port, a SyncCharger port.

Getting an RS485 line right

CORRECT — DAISY CHAIN, TERMINATED AT BOTH ENDS



Same speed on every device · one unique address each · A to A, B to B the whole way

INCORRECT — STAR / SPURS, SWAPPED PAIR, DUPLICATE ADDRESS

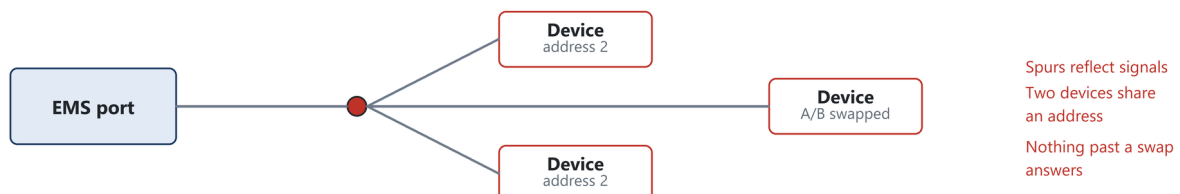


Figure 3 RS485 wiring — correct daisy chain (top) and the common mistakes (bottom).

RS485 lines fail in the same few ways. If a device will not answer, check these before suspecting the device:

1. **Polarity** — A and B swapped anywhere on the chain stops everything beyond that point answering.
2. **Daisy chain, not a star** — each device wired in and out to the next. Spurs work on a bench and fail on a long cable.
3. **Termination** — terminate at both ends of the chain, and only at the ends.
4. **Unique addresses** — every device needs its own address, and the address set in the EMS must match the one set on the device.
5. **Same speed** — every meter on the meter line must use the same baud rate as the EMS setting.

TIP

A device that reads **nothing at all** is usually wiring, address or speed. A device that reads **plausible but wrong** numbers is usually the wrong meter type selected, or CTs on the wrong phase or the wrong way round. The EMS cannot tell a wrong reading from a real one, so it will act on both.

The plant network

Give the controller a fixed network address so that browsers can always find it, and keep the PCS and BMS on fixed addresses that match the settings in the EMS. Record all addresses on the site record sheet (Appendix B), not in this manual.

4 Getting Started and Access

4.1 Start-up

When the controller PC starts, the EMS starts automatically. A start-up screen shows while it loads; it then connects to the plant, begins reading, and (on a normally configured site) opens the web console full screen on the controller's own monitor. Only one copy of the EMS can run at a time; if a second copy is started it takes over from the first.

NOTE

A brand-new installation starts **blank**: meters, cloud and optional functions are all off, and nothing is controlled until an installer configures it. This is deliberate, so a new controller never reports faults for equipment that is not fitted.

4.2 Interface mode

The EMS runs in one of two interface modes, set on the EMS settings screen under **EMS Interface**:

Mode	Behaviour
TCP (web) — standard	The EMS window is kept out of the way and the same information is served as a web console on the site network. The controller's monitor shows the web console full screen.
HMI	The classic EMS window is shown on the controller's monitor and operated by touch or mouse. The web console is not served.

4.3 Opening the web console from another device

1. Connect your laptop, tablet or phone to the site network.
2. Open a web browser and type the controller's address (from the site record sheet) into the address bar. If the site uses a web port other than the standard one, add it after a colon.
3. The PIN pad appears, or the plant view if you are on the controller itself.
4. Enter your PIN and press **Enter**.

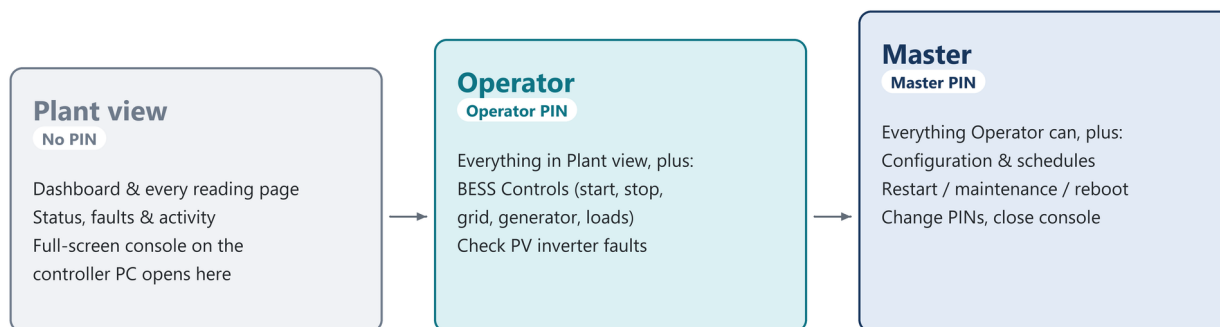
TIP

On the controller, the **BESS Controls** tab has a **This PC** group with a **Copy console address** button. Use it to find the exact address to type on other devices.

CAUTION

If the web port is changed, Windows must be told to allow it. Use **Reserve web port** (This PC group, master PIN, Windows asks for administrator approval), then restart the EMS. Until then the console only answers on the controller itself.

4.4 Access levels and PINs



Five wrong PIN entries lock that device out for five minutes. A signed-in session lasts up to 12 hours.

Figure 4 The three access levels.

Level	How	Can	Cannot
Plant view	No PIN (controller screen only)	See every reading page, Status, faults and activity.	Send commands or change settings.
Operator	Operator PIN	Everything in Plant view, plus the BESS Controls commands and the PV inverter fault check.	Change settings, restart, reboot, maintenance mode.
Master	Master PIN	Everything, including Configuration, the tactics and off-grid schedules, restarts, maintenance mode, reboot, changing PINs and closing the full-screen console.	—

PIN facts	
Format	4 to 10 digits, numbers only. The operator and master PIN must be different.
Default operator PIN	1123 — change it at handover.
Master PIN	Issued by TKS Solar Group at commissioning and recorded on the site record sheet. It is not printed in this manual.
Wrong entries	Five wrong PINs lock that device out for five minutes.
Session length	A signed-in browser stays signed in for up to 12 hours, then asks again.

WARNING — Change PINs at handover

New controllers ship with default PINs that are the same on every controller. Anyone on the site network who knows them can switch the site. Change **both** PINs before handover and record them securely.

4.5 Changing a PIN

1. Sign in with the master PIN.
2. Open **Configuration** → **EMS Interface** → **Access PINs** (or the Access PINs panel on the EMS settings screen).
3. Enter the **current master PIN** — it is always required, even when you are already signed in as master.
4. Enter the new operator and/or master PIN and save. The change takes effect immediately.

Forgotten master PIN: a recovery procedure exists but requires physical access to the controller. Contact TKS Solar Group support with the site name; the procedure is not published.

4.6 The full-screen console on the controller

In TCP mode the controller's own monitor shows the web console full screen at start-up, in Plant view. Anyone at the cabinet can watch the plant; pressing **Login** shows the PIN pad for operator or master access, and **Back to plant view** returns without signing in.

- **Close web console** asks for the **master PIN**. If the browser is closed any other way, the EMS reopens it automatically within seconds.
- To reopen it after closing, use the TKS icon in the Windows hidden icons (system tray) and choose to open the web console full screen.
- Signing out on the controller returns to Plant view rather than the PIN pad.

4.7 Reaching the EMS window

Some local functions (for example data export) are on the EMS window. In TCP mode the window is hidden; bring it up in any of these ways:

- **BESS Controls** → **This PC** → **Show EMS window** (master PIN, on the controller only).
- The TKS icon in the Windows hidden icons → **Show EMS window**, or double-click the icon.
- The keyboard shortcut **Ctrl + Alt + Shift + E** on the controller.

The settings and configuration screens on the EMS window still ask for the master PIN.

5 The Web Console

The web console is the main interface to the EMS. It shows the same plant whether you are at the cabinet or on a phone in the yard, and every setting can be changed from it. It refreshes about once a second.

5.1 Screen layout

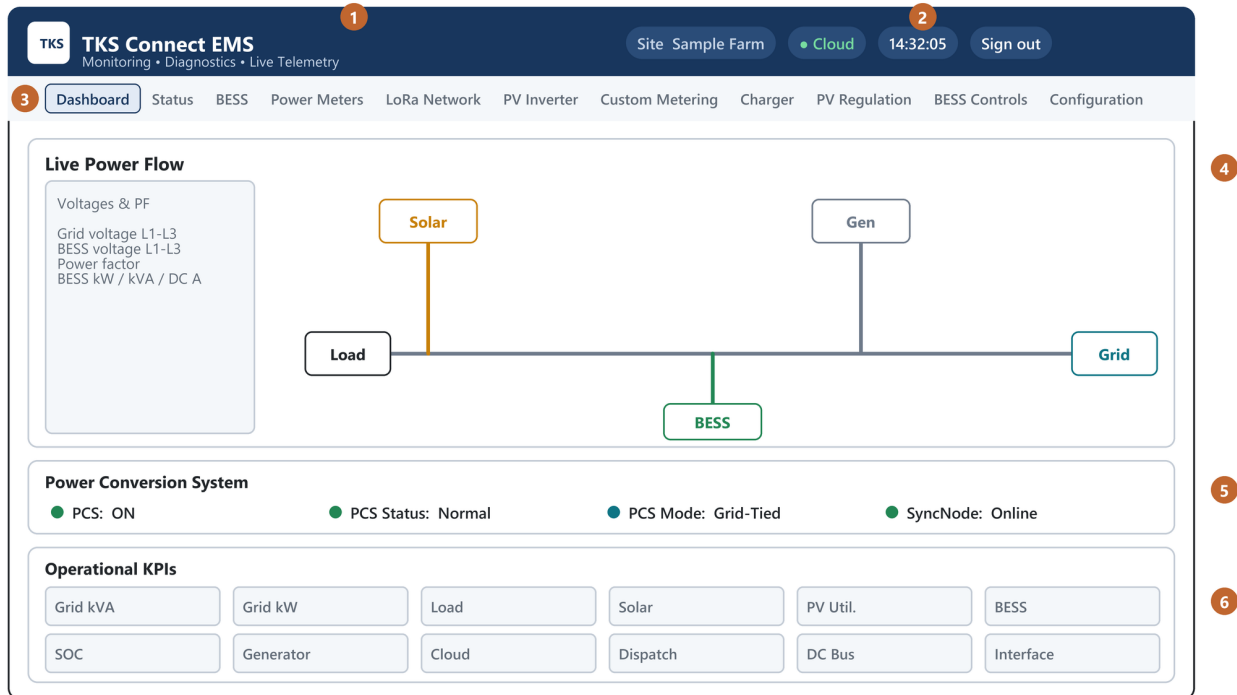


Figure 5 Web console layout. (1) Brand and title, (2) top-bar indicators and sign-in buttons, (3) tab bar, (4) live power flow, (5) PCS status card, (6) KPI tiles.

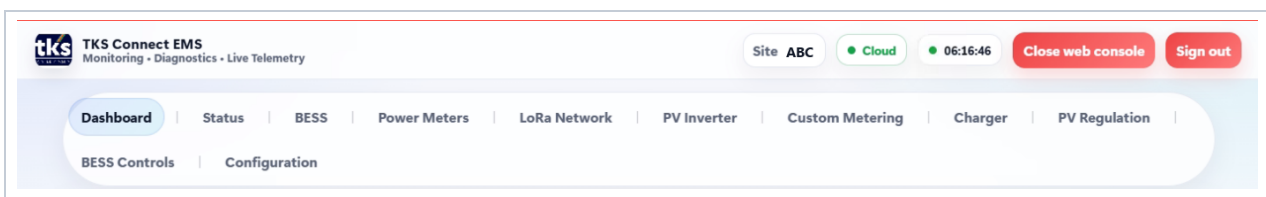


Figure 6 The top bar and tabs on a live site, signed in on the controller's full-screen console (site name masked).

Top-bar item	Meaning
Site	The site name set in Monitoring → Site Location ("Not named" if not set).
Cloud lamp	Green "Cloud" = connected; red "No cloud" = cloud set up but not connected; grey "No cloud site" = cloud not set up.
Clock	The time of the last reading . If the clock stops, the controller has stopped taking readings — the numbers on screen are no longer live.
Login / Sign out	Sign in to a higher level, or sign out.
Close web console	Only on the controller's full-screen console; needs the master PIN.

If the EMS has entered safe mode (Chapter 20), a red bar across the top names the cause and offers **Clear counter & restart** to a master user.

The tabs

Tab	Shows	Level needed
Dashboard	Live power flow, voltages, PCS status and KPIs.	Plant view
Status	System health, links, SyncNode log, faults and activity.	Plant view
BESS	PCS and battery detail.	Plant view
Power Meters	Every enabled meter reading by reading.	Plant view
LoRa Network	Load nodes and their state.	Plant view
PV Inverter	Each inverter's output, temperature, DC inputs and fault check.	Plant view (check: Operator)
Custom Metering	The additional meters.	Plant view
Charger	SyncCharger state, set-up and communication.	Plant view (commands: Operator)
PV Regulation	Live regulation level, status and load-vs-yield trend.	Plant view
BESS Controls	All plant commands.	Operator
Configuration	Every setting, grouped and searchable.	Master

5.2 Dashboard

Live Power Flow

The power-flow mimic shows the site as a busbar with the load, solar, generator, grid and battery connected to it. Moving dashes show which way power is flowing; a breaker drawn open means that branch is disconnected; a faded symbol means that equipment is not fitted.



Figure 7 Live Power Flow on a running site. The grid is importing 150.10 kW, solar is producing 10.56 kW and the site load is 160.62 kW; the battery is almost idle at 64 % SOC. The generator branch is drawn open (red) because the set is not running.

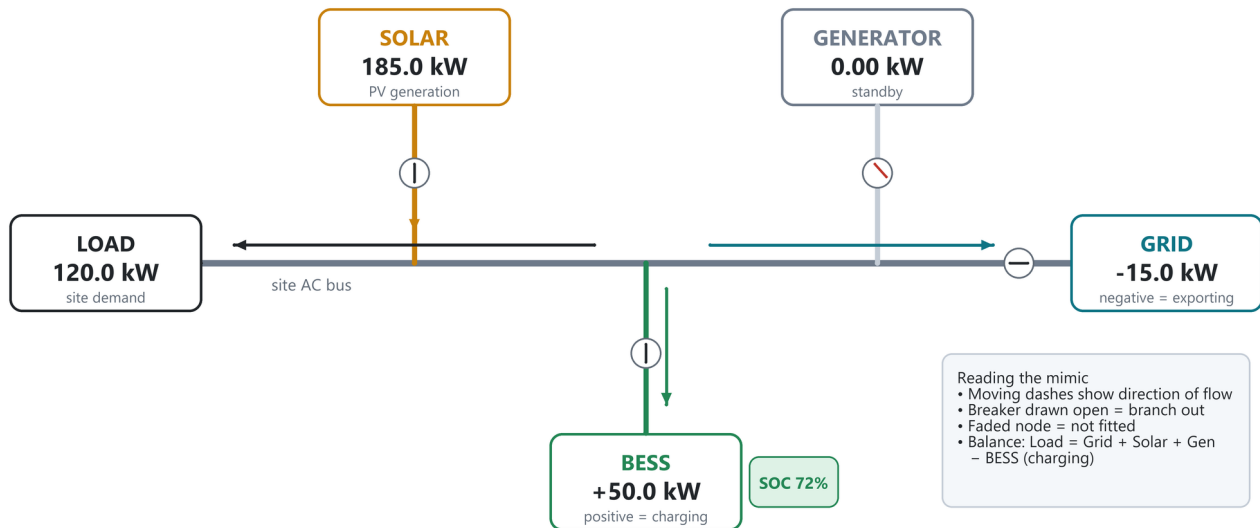


Figure 8 Reading the live power flow, with the sign conventions used throughout the EMS.

Reading	Positive (+) means	Negative (–) means
Grid	Importing from the utility	Exporting to the utility
BESS	Battery charging	Battery discharging into the site
Load	Site consumption (always a demand)	—
Solar / Gen	Generation	—

TIP

Quick sanity check: with the battery idle and no generator, **Grid ≈ Load – Solar**. If not, a CT is on the wrong conductor or the wrong way round. Fix this before setting anything else.

Voltages & PF side panel

Item	Meaning
Grid Voltage L1 / L2 / L3	Phase voltages at the grid meter. Shown in red if outside 215–250 V.
BESS Voltage L1 / L2 / L3	AC line voltages at the PCS output. Shown in red if outside 380–435 V.
Power Factor — Grid / BESS	Power factor at the grid meter and at the PCS.
BESS kW / kVA / DC Amps	PCS real and apparent power, and the battery DC current.

Power Conversion System card

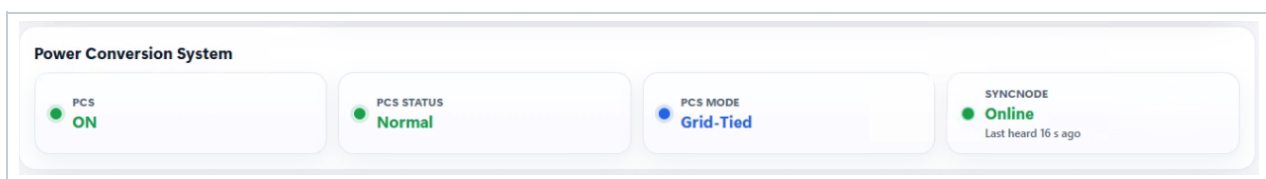


Figure 9 The Power Conversion System card: PCS running, no fault, grid-tied, and the SyncNode heard 16 seconds ago.

Tile	Values	Meaning
PCS	ON / OFF	Whether the PCS is running.
PCS Status	Normal / Fault	Whether the PCS reports a fault (see BESS tab for detail).
PCS Mode	Grid-Tied / Off-Grid	Whether the PCS follows the grid or forms an island.
SyncNode	Online / Offline / Waiting	The SyncNode sends a heartbeat about once a minute. Online = heard within 90 seconds; Offline = not heard for longer; Waiting = just started. "Last heard" shows how long ago.

The card is hidden on Grid-Tied sites, which have no PCS.

Operational KPIs

Tile	Meaning
Grid kVA	Apparent power at the grid connection.
Grid kW	Real power at the grid connection: import (+) / export (-).
Load	Site demand in kW.
Solar	PV generation in kW.
PV Utilization	How much of the load solar is covering: $PV \div Load$, capped at 100 %. The badge shows AUTO (PV meter), PLANT (summed from the inverters) or NO METER.
BESS	Battery power: charge (+) / discharge (-).
SOC / DC BUS	Battery state of charge in %, or the DC bus voltage when the plant runs in voltage mode.
Generator	Generator output in kW, or "Not fitted".
Cloud	Connected / Disconnected / Not set up.
Dispatch	Automatic or Manual — whether the battery is on the automatic logic and schedules, or held at the manual Dispatch Rate (the last Automatic / Manual dispatch command). The line below shows the operating mode (Grid-Tied / Off-Grid).
DC Bus	Battery voltage and current.
Interface	The EMS interface mode (TCP).

5.3 Status

The first place to look when something is wrong. The top of the page summarises health; below it are the SyncNode communication log, the fault list and the activity log, most recent first.

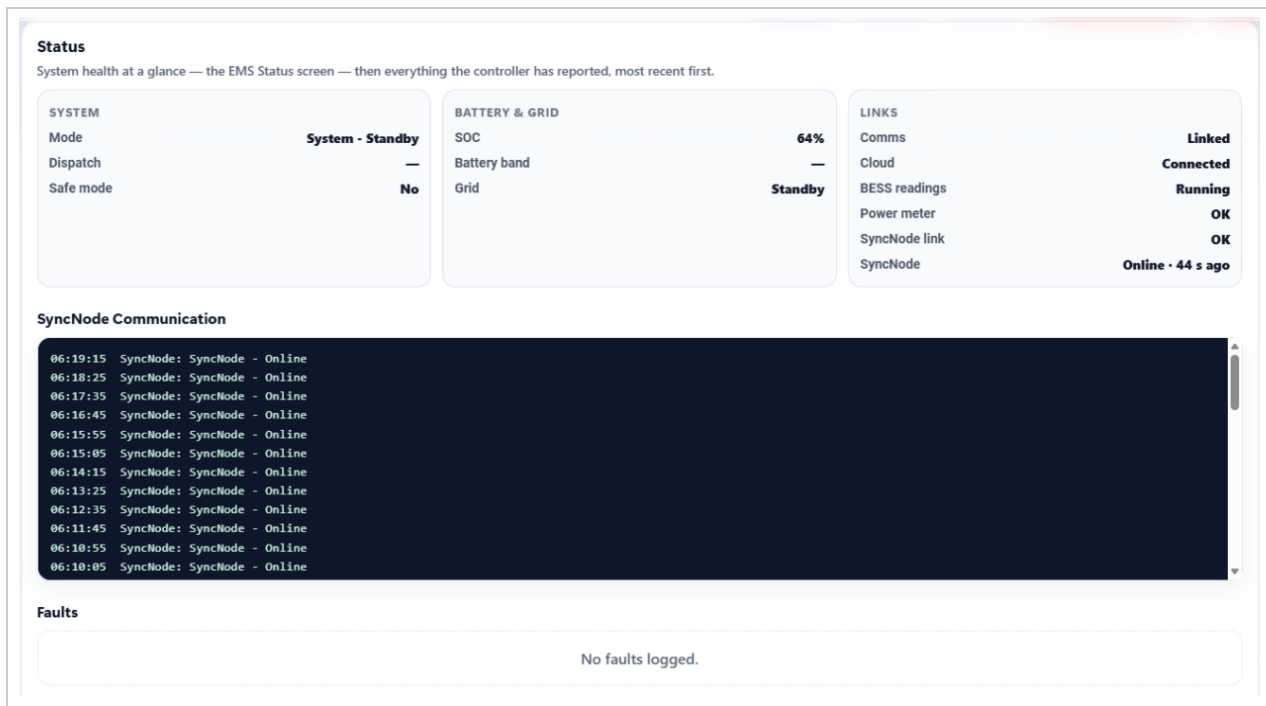


Figure 10 The Status tab on a healthy site: all links OK, the SyncNode heartbeat arriving about every 50 seconds, and no faults logged.

Item	Values	Meaning
Mode	e.g. System - Standby	The overall system state, as shown on the EMS screen.
Dispatch	Automatic / Manual	Automatic logic and schedules, or manual dispatch (Chapter 8).
Safe mode	No / cause	Whether the EMS has stopped after repeated fault restarts.
SOC (or DC bus)	% or V	The control level the EMS is using.
Battery band	text	Which charging band the battery is in (force, bulk, float, full).
Grid	Connected / Disconnected / Standby	The grid state reported by the SyncNode.
Comms	Linked / No link	Communication with the PCS and BMS.
Cloud	Connected / Disconnected / Not set up	Cloud link state.
BESS readings	Running / Stopped	Whether battery and PCS readings are being taken.
Power meter	OK / Error	Whether the meters are answering.
SyncNode link	OK / Not connected	Whether the SyncNode port is open.
SyncNode	Online / Offline / Waiting	Heartbeat state, with time since last heard.

Faults are written in plain language and name the device and what to check, for example “Communication lost with the grid meter (address 3) — check the RS485 wiring and the meter’s address.” A repeating fault is logged once, not every second; it is logged again only if the reason changes, the device recovers, or ten minutes pass. When a device recovers, “Communication restored” appears in **Activity**.

5.4 BESS

The PCS and battery in detail.

PCS item	Meaning
Status / Activity	Running or stopped, and what the PCS is doing (for example idle, charging, discharging).
Mode / Type	Grid-tied or off-grid, and the PCS model in use.
Fault	Normal, or the fault the PCS reports.
AC L1 / L2 / L3, AC A1 / A2 / A3	AC voltages and currents per phase.
Real power / Apparent / Reactive	kW, kVA and kVAr at the PCS.
Power factor	PCS power factor.
DC power / DC current	Battery-side power and current.

Battery item	Meaning
Status	The BMS state (blank for a Pylontech battery, which does not report it).
SOC (or DC bus)	State of charge, or DC bus voltage in voltage mode.
Pack voltage / DC current	Battery voltage and current.

5.5 Power Meters

Every enabled meter, reading by reading. Use this page at commissioning to confirm each CT is on the right circuit, the right phase and the right way round.

Meter	Readings shown
Grid Meter	Real power, apparent, reactive, power factor, L1/L2/L3 voltage, line-to-neutral and line-to-line voltage, A1/A2/A3 current, neutral and main current.
Load Meter	Real power, apparent, reactive, power factor, A1/A2/A3, neutral and main current.
Solar Meter	Real power and current. Titled "Solar (PV inverters)" when the solar figure comes from the inverters instead of a meter.
Generator Meter	Real power.

5.6 LoRa Network

The total LoRa load, the number of nodes, and a row per node with its name, reading and state (ON or OFF). See Chapter 17.

5.7 PV Inverter

Plant totals across the top — **AC output**, **DC input**, **Reporting** (how many inverters answered) and **Hottest** (highest internal temperature and which inverter) — then one card per inverter with AC out, DC in, temperature and a table of its DC inputs (MPPTs on Sungrow, PV strings on Huawei) with voltage, current and power. A red banner appears if an inverter fault is being reported. The fault check and its history are at the bottom of the page; see Chapter 13.

5.8 Custom Metering

Totals (voltage, current, real power) and a row per additional meter with its name, V, A and kW. A red banner shows if a custom meter is not responding. See Section 16.5.

5.9 Charger

Shown when a SyncCharger is fitted (Chapter 18).

Card	Items
State	Chargers on/off (or “Not driven yet”), the output level being sent, and whether they are held by the controls or running automatically.
Setup	Port, make, number of chargers fitted and the cap.
Thresholds	The live control level, “on at or below” and “off at or above”.
Ramp	Shown only while ramping up: progress towards the cap and the step size.
Communication	One row per charger: the level last sent and OK / Fault / Not connected.

Chargers on and **Chargers off** send the same commands as Grid On / Grid Off (operator PIN). A command holds until the battery level next crosses the start or stop threshold.

5.10 PV Regulation

Live solar regulation: what the PV plant is being held to, and how site load and PV yield are tracking. If regulation is not enabled, a banner says so and the figures stay blank.

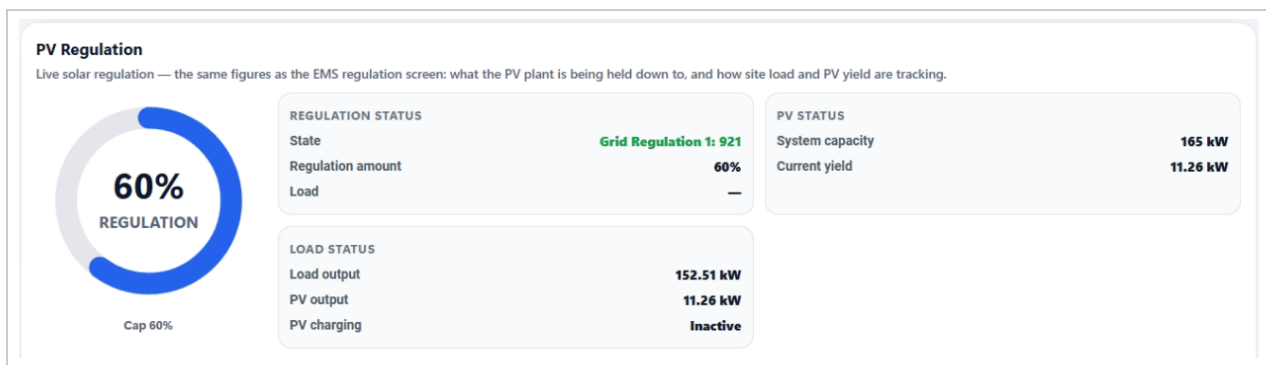


Figure 11 PV Regulation on a grid-tied site. The inverters are held at 60 %, which is also the PV Inverter Cap, so the cap is what limits output here. The state line names the method and inverter being worked on.

Item	Meaning
Regulation gauge	The level the PV inverters are being given, as a percentage of their rated output, with the PV Inverter Cap shown beneath (“No cap set” if none).
Regulation Status — State	What regulation is doing right now (for example “Grid Regulation”, “Low Load”, “Open Gate”, “Full Regulation”).
Regulation amount / Load	The current level and the load figure it is working from.
PV Status	System capacity and current yield.
Load Status	Load output, PV output, and whether PV is charging the battery.
Generator Status	Generator state and output, PV output and PV mode (hidden if no generator).

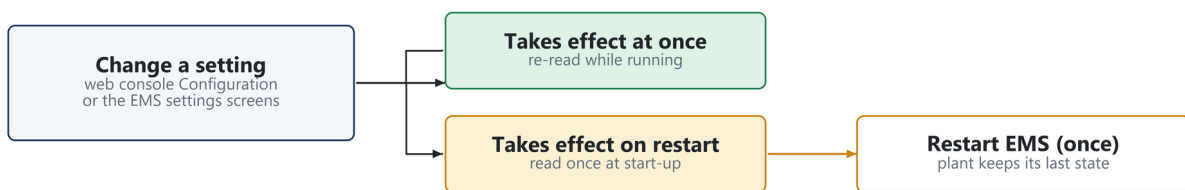
Item	Meaning
Load vs yield trend	Site load (amber) and PV yield (green) over roughly the last 30 minutes. The trend is built while the page is open, so it starts empty.

5.11 BESS Controls

The plant commands, grouped as on the EMS controls screen. Fully described in Chapter 6.

5.12 Configuration

Every setting in the EMS, grouped in the order of the EMS settings screens, with a search box that finds any setting by name. The setting groups are listed down the left; choose one to edit its settings.



Tip: make all the changes you need, then restart once. The web console shows a banner when a restart is pending.

Figure 12 When a setting takes effect.

- Changes **save straight away** when you leave a field or flip a switch — there is no separate Save, except for the Tactics editor which has its own.
- Settings marked **on restart** are read once when the EMS starts. After changing one, a banner offers **Restart EMS now** or **Later**. Make all your changes first, then restart once.
- Restarting the EMS does not disturb the plant: the PCS keeps doing what it was last told for the few seconds the EMS takes to come back.
- Values outside a setting's allowed range are refused with an explanation.
- Some settings are locked when they do not apply — for example the BMS settings and voltage control with a Huawei Series PCS. The reason is shown beside the setting.
- If cloud control is enabled, values sent from the TKS Connect portal can overwrite local charging and regulation settings (Chapter 19).

Chapter 22 lists every setting, its range and when it takes effect.

6 BESS Controls

The **BESS Controls** tab sends commands to the plant. It needs the operator PIN; the EMS group needs the master PIN. Commands that could drop the site ask for confirmation first. Commands reach the plant within about ten seconds.

GOOD TO KNOW

Commands are queued and carried out one at a time in a fixed order, so a command from the screen and one from the cloud arriving together are carried out in a known order rather than colliding. Expect a short delay before the plant responds.

Group	Command	What it does
PCS	PCS start	Starts the PCS.
	PCS stop [confirm]	Stops the PCS.
	Grid tied	Puts the PCS in grid-tied mode.
	Off grid [confirm]	Puts the PCS in off-grid (island-forming) mode.
	Local manual	Hands the PCS to local control at the PCS itself.
	Remote	Hands the PCS back to the EMS.
BMS	BMS start	Closes the battery contactors.
	BMS stop [confirm]	Opens the battery contactors (not available on Pylontech).
Grid	Grid on	Closes the mains contactor — or turns SyncChargers on where fitted.
	Grid off [confirm]	Opens the mains contactor — or turns SyncChargers off where fitted.
SyncNodes	SyncNodes on	Switches every node on.
	SyncNodes off [confirm]	Switches every node off.
	Regulation on	Releases the node regulation.
	Regulation off	Holds the nodes at their limit.
System	System grid tie	The full sequence back to grid: mains in, PCS grid-tied.
	System off grid [confirm]	The full sequence to island: mains out, PCS off-grid.
	Grid tie now	Switches to grid-tied on the next PCS read.
	Off grid now [confirm]	Switches to off-grid on the next PCS read.
	Start generator [confirm]	Calls the generator and stops the PCS.
	Stop generator	Releases the generator.
	Automatic dispatch	Hands the battery back to the automatic logic and schedules.
	Manual dispatch	Holds the battery at the Dispatch Rate (Chapter 8).
	Enable PV	Allows PV generation.
	Disable PV	Curtails PV generation.

Group	Command	What it does
EMS (master)	Restart EMS [confirm]	Restarts the EMS to apply saved settings. The plant is not touched.
	Bind Connect [confirm]	Ties this copy of TKS Connect to this controller (licensing).
	Maintenance mode [confirm]	Stops the PCS and restarts the EMS. Use before working on the plant.
	Reboot controller [confirm]	Restarts the whole controller PC.

6.1 This PC

At the bottom of BESS Controls, the **This PC** group provides the same actions as the TKS icon in the Windows hidden icons:

Button	Available	What it does
Copy console address	Anywhere (operator)	Copies the web console's address to the clipboard.
Close web console	On the controller	Closes the full-screen console (master PIN).
Show EMS window	On the controller (master)	Brings up the EMS window.
Reserve web port	On the controller (master)	Allows the console to answer on the site network after a port change (Windows asks for admin).
Shut down TKS Connect	On the controller (master)	Stops the EMS completely. Nothing is controlled or logged until it is started again.

WARNING

After **Shut down TKS Connect** the plant keeps its last state but nothing is monitored or controlled: no schedules, no protection logic, no generator start. Restart it as soon as possible, or restart the controller PC.

6.2 Licensing — Bind Connect

Each copy of TKS Connect is tied to its controller. If the EMS reports that it must be bound ("Bind TKS Connect"), sign in as master and press **Bind Connect**, or contact TKS Solar Group if the controller hardware has been replaced.

7 How the EMS Makes Decisions

Several functions can want the battery to do different things at the same moment: a schedule says discharge, peak shaving says discharge harder, the charging logic says the battery is low. Only one can be in charge, so they are ranked. The highest one that applies right now is in charge, and the others wait. This ranking is the answer to almost every “why is the battery doing that?”

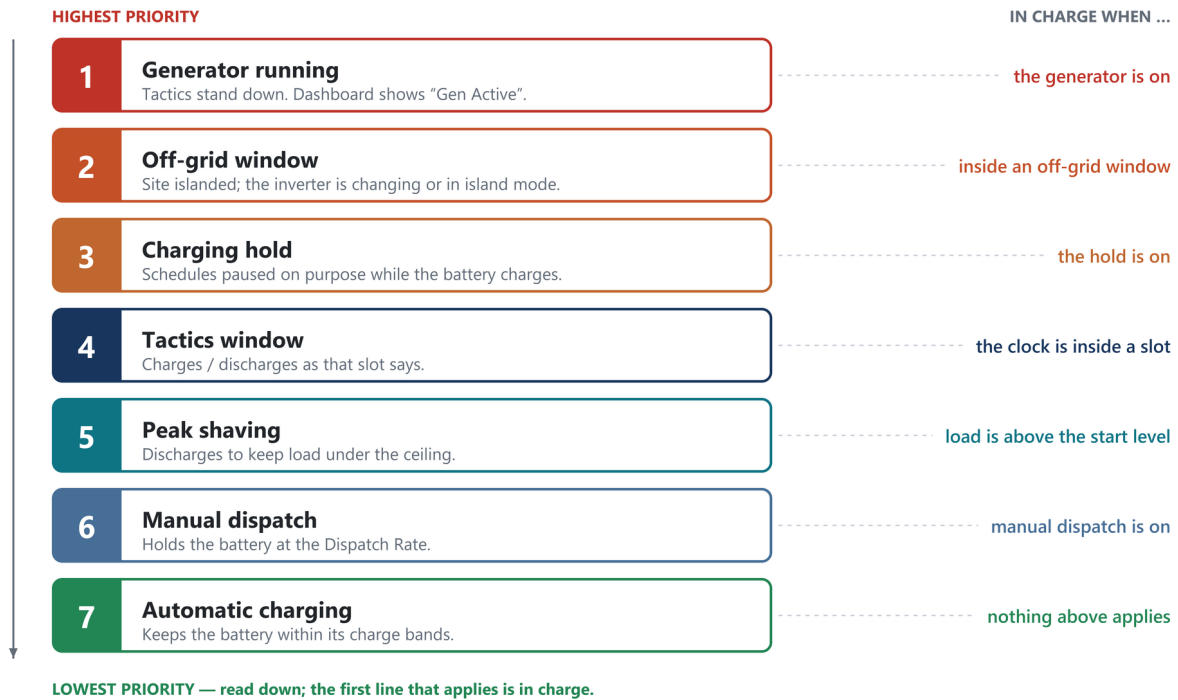


Figure 13 Dispatch priority — read from the top; the first line that applies is in charge.

Rank	Function	When it is in charge	Indication on the EMS screen
1	Generator running	The generator has been started.	Gen Active
2	Off-grid window	Inside an off-grid window, or while changing mode.	Off Grid Mode Active
3	Charging hold	A deliberate hold that pauses schedules.	—
4	Tactics window	Tactics enabled, day enabled, slot enabled and the clock inside it.	Tactics Active
5	Peak shaving	Enabled and the site load above Start Shaving Above.	—
6	Manual dispatch	Manual dispatch switched on.	Manual Dispatch Active
7	Automatic charging	None of the above.	Battery band on the Status tab

Whatever is in charge also brings the PCS back to rest when it finishes, so the plant is never left running on an instruction nobody is maintaining.

7.1 Control by SOC or by voltage

Every battery level in the EMS — end of charge, force charge, float, generator start and stop, peak shaving, regulation start and stop, load node levels, charger levels — is compared against one **control level**. Normally that is the battery's state of charge in per cent. The **Control By** setting can change it to the battery (PCS DC bus) voltage instead.

Control By	Levels are read as	Use when
Battery state of charge (%)	Per cent SOC	Standard. The BMS reports a reliable SOC.
Battery voltage (V)	Volts	The battery has no reliable SOC reading (for example some lead-acid or retro-fit systems).

CAUTION

When you change Control By, every screen relabels its levels (% becomes V), but the **numbers you entered do not convert**. Re-enter every battery level in the new unit straight away. Rates stay in kW. A Huawei Series PCS always runs on SOC.

7.2 Using the ranking to diagnose

When the plant is not doing what you expect, start at the top of Figure 7 and work down. A schedule that appears to be ignored is nearly always because the generator is running, an off-grid window is still open, or the charging hold is on. The indications on the EMS screen, the PCS Mode tile and the Status tab usually say which.

8 Battery Charging and Dispatch

Automatic charging is what the EMS falls back to when nothing above it in the ranking applies. It works in bands against the control level.

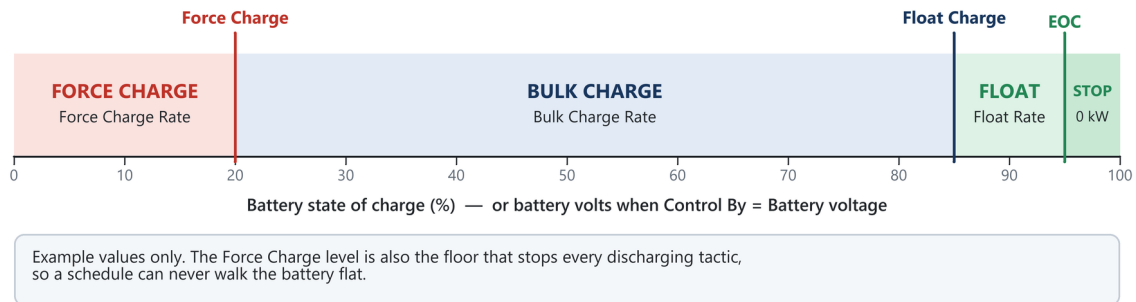


Figure 14 The charging bands. Each band has its own rate.

Setting	Unit	What it does
Force Charge	% (or V)	Below this level the battery is always charged at the Force Charge Rate. It is also the floor : every discharging tactic stops here.
Force Charge Rate	kW	Charge rate while below Force Charge.
Bulk Charge Rate	kW	Charge rate in the normal (bulk) band.
Float Charge	% (or V)	Above this level charging drops to the Float Rate.
Float Rate	kW	Gentle charge rate near full.
EOC (end of charge)	% (or V)	Charging stops at this level and the battery is held at 0 kW.
Autocharge Enable	on/off	Enables automatic charging.

TIP

Keep the order **Force Charge < Float Charge < EOC**. Leave a few per cent between them so the battery does not hop between bands on small SOC movements.

8.1 Charging only from PV

With **Only PV Charge** on, the EMS charges only while PV generation is above **Minimum PV** (kW), so the battery fills from solar surplus rather than from the grid.

8.2 Charging from the generator

While the generator runs, the EMS charges at the separate **Gen Charge Rate** instead of the bulk rate, so the charging load can be sized to the generator rather than the grid (Chapter 14).

8.3 Manual dispatch

With **Manual Dispatch** on (Configuration → Dispatching, or the **Manual dispatch** command), the EMS holds the battery at the fixed **Dispatch Rate**: positive to charge, negative to discharge. It sits below tactics and peak

shaving in the ranking, so a scheduled window still takes precedence. Use **Automatic dispatch** to hand back to the automatic logic.

CAUTION

Manual dispatch keeps going until it is switched off. A forgotten manual discharge will run the battery down to the protection limits of the PCS and BMS.

8.4 Worked example

Battery level	Band	What the EMS does (example settings: Force 20 %, Float 85 %, EOC 95 %)
12 %	Force charge	Charges at the Force Charge Rate, even from the grid. Any discharging tactic is suspended.
55 %	Bulk	Charges at the Bulk Charge Rate (if no higher-ranked function is in charge).
88 %	Float	Charges at the Float Rate.
96 %	Full	Holds at 0 kW. Auto-grid tactics may now export (Chapter 9).

9 Tactics — The Weekly Schedule

Tactics is the weekly dispatch schedule: **seven days, eight slots per day**, each slot with its own window, mode and rate. It is how a site trades a time-of-use tariff — charge when power is cheap, hold through the shoulder, discharge into the peak, and do something different at the weekend.

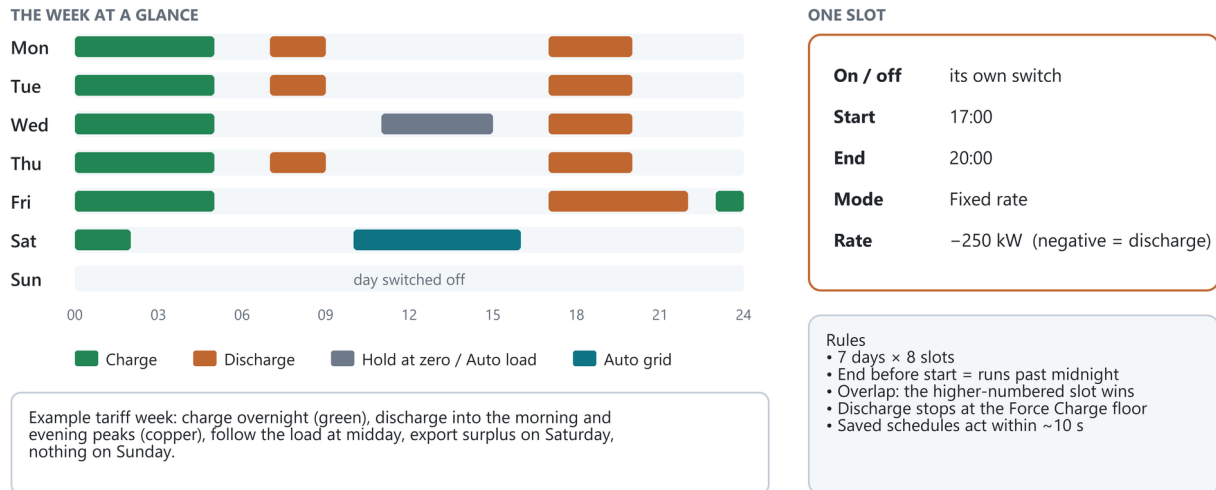


Figure 15 The tactics week and the anatomy of a slot.

9.1 Slot modes

Mode	What the window does
Fixed rate	Holds the PCS at the slot's rate. Positive charges and stops at EOC. Negative discharges and stops at the Force Charge floor (then force charges). Zero holds at 0 kW.
Auto load	Follows the site load one-for-one so the grid sees (close to) nothing. Force charges at the floor rather than following the load into an empty battery. The rate box is ignored.
Auto grid	Until the battery is full, follows the load. Once it is full, exports the share of the grid reading set by PV Regulation Amount (%). The rate box is ignored.

9.2 Rules

- A slot runs only if **Tactics is enabled**, its **day is enabled**, the **slot is enabled**, and it has a valid start and end.
- An end earlier than the start runs **through midnight** and belongs to the day it started on.
- Where two slots cover the same time, the **higher-numbered slot wins**. The editor flags overlaps, because one of the two windows is then doing nothing.
- The **floor** is watched continuously, not just when a window opens, so a schedule can never walk the battery flat.
- A window opens or closes within about **ten seconds** of its time, and a saved schedule acts within the same ten seconds. No restart is needed.
- Switching Tactics off keeps the whole week as entered; switching it back on restores it.
- While the generator runs, or an off-grid window is open, tactics stand down (Chapter 7).

9.3 Editing the schedule in the web console

1. Sign in as master and open **Configuration** → **Tactics**.
2. Read the live line at the top: "Dispatching now — ...", "On, but no slot is open", or "Tactics are switched off". Use the master switch to enable or disable tactics for every day.
3. Check *The week at a glance*: one track per day, midnight to midnight, coloured by what each slot does (charge, discharge, hold at zero, auto grid, auto load). Overlapping slots are highlighted.
4. Choose a day tab. Switch **Run tactics on <day>** on.
5. For each slot you need: switch it on, enter **Start** and **End** (24-hour hh:mm), choose the **Mode**, and for Fixed rate enter the **Rate** in kW (negative to discharge). The sentence beside each slot says in plain words what it will do, for example "17:00 to 20:00 — discharge at 250 kW, force charging at the floor".
6. Use **Copy to all days**, **Copy to Mon–Fri** or **Copy to Sat/Sun** to repeat a day, or **Clear this day** to start again.
7. Press **Save**. Nothing reaches the controller until you do; the whole week is saved in one go, so the plant never runs on a half-entered schedule.

TIP

Plan in this order: the cheap charging window first, then the expensive peaks, then anything in between. Check the week view for gaps and overlaps before saving.

9.4 Example tariff week

Days	Slot	Start	End	Mode	Rate
Mon–Fri	1	00:00	05:00	Fixed rate	+150 kW
Mon–Fri	2	07:00	09:00	Fixed rate	–200 kW
Mon–Fri	3	11:00	15:00	Auto load	—
Mon–Fri	4	17:00	20:00	Fixed rate	–250 kW
Sat	1	10:00	16:00	Auto grid	—
Sun	—	—	—	day switched off	—

NOTE

Sites upgraded from the older four-window schedule have their four windows copied onto all seven days automatically (weekends off unless weekends were enabled). Nothing needs re-entering.

10 Off-Grid Mode

Off-grid mode opens the mains contactor and runs the site islanded on the battery and PV, on a daily schedule of up to **two windows** — for example a morning and an evening island, or one long overnight island.

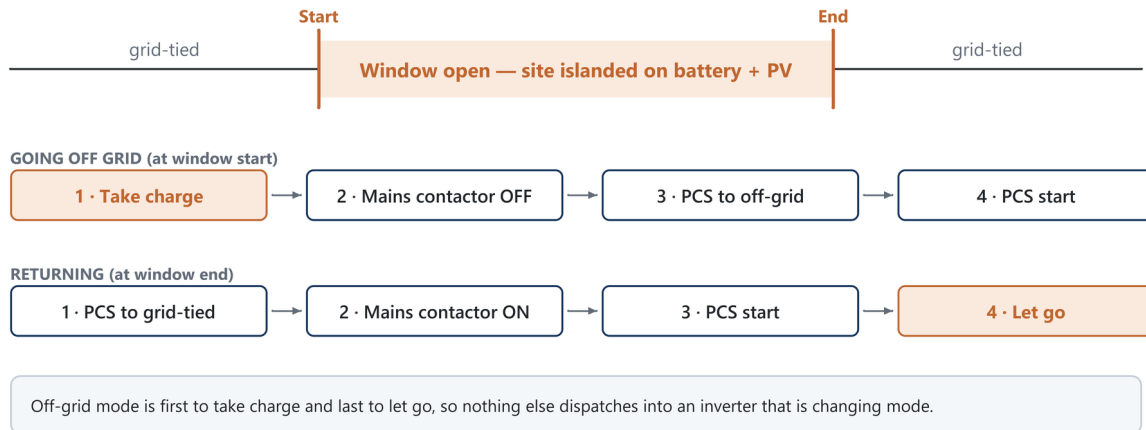


Figure 16 The off-grid sequence at the start and end of a window.

10.1 Settings

Setting	What it does
Enable Off-Grid Mode	Turns the daily off-grid windows on or off.
Window 1 Start / End	The first daily window (24-hour hh:mm).
Window 2 Start / End	The second daily window. Leave blank to use one window only.

10.2 How it behaves

- Windows open and close within about **a minute** of their time — deliberately slower than tactics, because switching the mains contactor is a mechanical operation.
- Two windows that run into one another (for example 06:00–09:00 and 09:00–12:00) are treated as one long island, not a return to grid and straight back out.
- An end earlier than the start runs through midnight.
- While off-grid mode holds the plant, tactics, peak shaving and manual dispatch stand down.
- If the EMS restarts while the site is islanded, it recognises that when it comes back. If the window has closed in the meantime, it brings the site back to grid.

WARNING

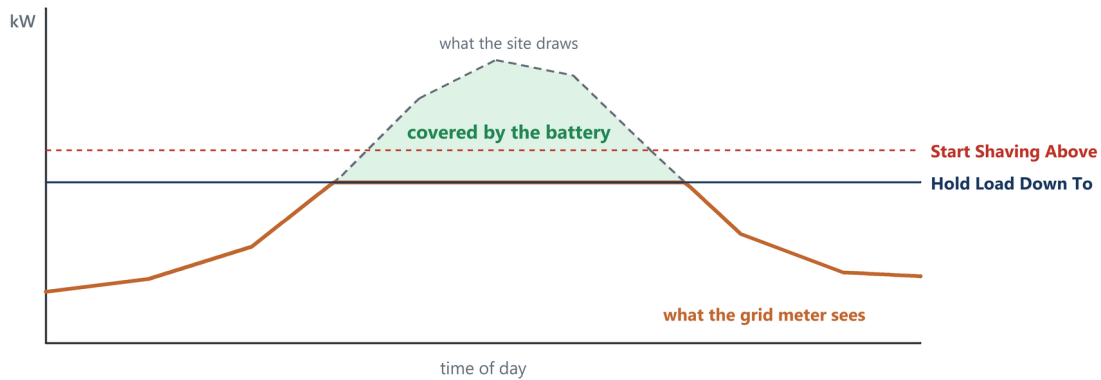
Off-grid mode drops the utility supply to everything downstream of the mains contactor. Make sure the battery can carry the load for the whole window, that the PV regulation is set up for off-grid operation (Chapter 12), and that site users know when islanding happens.

10.3 Manual islanding

To island or reconnect outside the schedule, use the System commands on BESS Controls: **System off grid** / **System grid tie** for the full sequence, or **Off grid now** / **Grid tie now** to switch on the next PCS read.

11 Peak Shaving

Peak shaving puts a flat top on the site's demand from the grid. While the load is above a ceiling you set, the battery supplies whatever is drawn above it, so the meter never sees the peak — which is what a demand charge is billed on.



Shaving begins when load reaches Start Shaving Above and continues until load is back down to the ceiling, or the battery falls to Give Up Below.

Figure 17 Peak shaving holds the metered demand at the ceiling while the battery covers the excess.

11.1 Settings

Setting	Unit	What it does
Peak Shaving	on/off	Enables peak shaving.
Start Shaving Above	kW	Site load at which shaving starts. Small excursions over the ceiling are left alone until the load reaches this. Never set it below the ceiling.
Hold Load Down To	kW	The ceiling the grid demand is held down to.
Give Up Below	% (or V)	Battery level at which shaving stops. A demand charge is cheaper than a flat battery.

11.2 How it behaves

- Shaving engages when load reaches **Start Shaving Above** and continues until load is back down to **Hold Load Down To**. Two different numbers stop the PCS switching on and off around a single threshold.
- The battery supplies exactly the difference between the load and the ceiling: more as the peak grows, less as it passes, nothing once the load is back under the ceiling.
- When it lets go, it brings the PCS back to rest.
- All three values take effect as soon as they are saved, so a ceiling can be moved while a peak is happening.
- Shaving is rank 5: a generator, an off-grid window, the charging hold or a tactics window all take precedence.

11.3 Worked example

A site has a 400 kW demand charge threshold. Settings: Start Shaving Above **420 kW**, Hold Load Down To **400 kW**, Give Up Below **30 %**.

Site load	Battery	Grid sees	Why
380 kW	0 kW	380 kW	Below the start level — not shaving.
415 kW	0 kW	415 kW	Over the ceiling but below the start level — not worth shaving yet.
450 kW	–50 kW	400 kW	Shaving: battery covers 450 – 400.
410 kW	–10 kW	400 kW	Still above the ceiling — shaving continues.
395 kW	0 kW	395 kW	Back under the ceiling — shaving stops, PCS returns to rest.

12 PV Regulation

When the PV plant is producing more than the site can use, the battery can store and the grid connection may accept, something has to give. PV regulation turns the solar inverters down — by as much as needed and no more — so the plant stays within what the connection, the battery and any generator allow.

12.1 Regulation levels and the PV Inverter Cap

The EMS gives the inverters a **regulation level** on a scale where **1000 = 100 % of rated output** (so 700 = 70 %, 80 = 8 %). The web console shows levels as percentages. The **PV Inverter Cap** is the highest level any regulation method, command or cloud instruction may ever send:

- A site needing 500 gets 500; a site needing 850 with a cap of 700 gets 700.
- **0 means no cap.** The maximum value is 1100.
- The cap applies in every mode (grid-tied, export, generator, low load, off-grid, the controls and the cloud) and takes effect within a few seconds of being changed. It does not apply to SyncChargers.

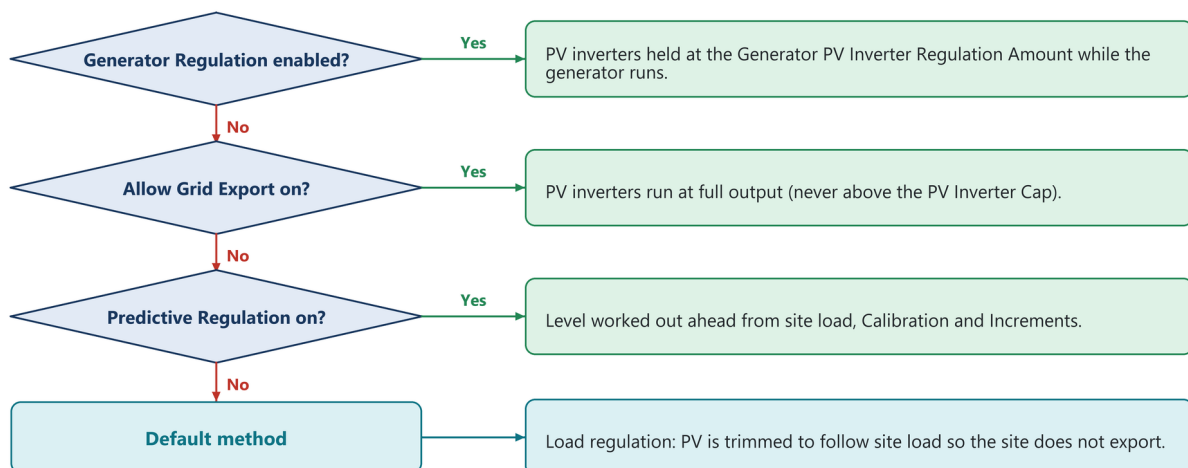
TIP

Use the cap for export limits, inverter derating or a weak connection, so that no mode can ever drive the inverters above what the site is allowed.

12.2 Grid-tied regulation

While the PCS is grid-tied (or on a Grid-Tied site with no PCS), the EMS chooses one regulation method in the order shown in Figure 12.

GRID-TIED PV REGULATION — WHICH METHOD IS USED



Every level sent is limited by the PV Inverter Cap. The power factor is written on every regulation run.

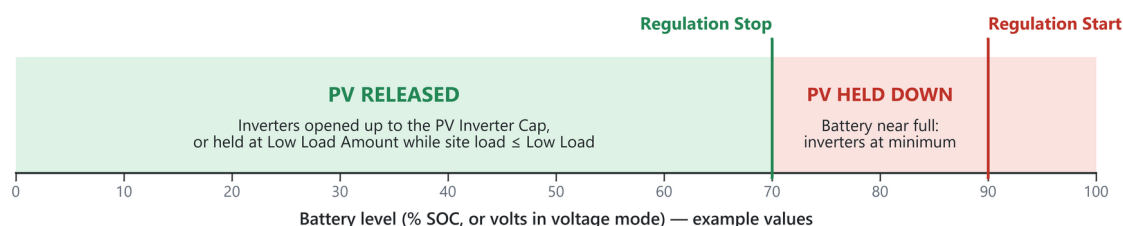
Figure 18 How the grid-tied regulation method is chosen.

Method	Behaviour
Generator regulation	While a generator meter shows the generator producing, the PV inverters are held at the Generator PV Inverter Regulation Amount so the set is not pushed into reverse power (Chapter 14).

Method	Behaviour
Export allowed	With Allow Grid Export on, the inverters run at full output (up to the cap); surplus goes to the grid.
Predictive	The level is worked out ahead from site load, scaled by Calibration and adjusted in steps of Increments when the grid import approaches zero. Suits sites with fast-moving cloud.
Load regulation (default)	PV is trimmed to follow site load (and battery charging) so the site does not export.

12.3 Off-grid regulation

While islanded there is no grid to absorb surplus PV. The EMS regulates on the battery level instead:



While islanded there is no grid to absorb surplus PV. Once the battery is above Regulation Stop the inverters are held right down so the battery is not over-charged; at or below Regulation Stop they are released again. Keep Regulation Start at or above Regulation Stop.

Figure 19 Off-grid PV regulation against the battery level.

Battery level	Site load	PV inverters
Above Regulation Stop	any	Held right down ("Full Regulation") so the battery is not over-charged.
At or below Regulation Stop	Above Low Load	Released up to the PV Inverter Cap ("Open Gate").
At or below Regulation Stop	At or below Low Load	Held at the Low Load Amount ("Low Load"), so a small load is not swamped by full PV output.

12.4 Regulation settings

Setting	What it does
Enable / Disable	Turns PV regulation on.
PV Inverter Type	Sungrow or Huawei. Every level means the same thing on either make. Restart after changing.
PV Inverter Regulation Amount	How many PV inverters (addressed 1 upwards, up to 20) the EMS reads and regulates.
PV Inverter Cap	Highest level ever sent (Section 12.1). 0 = no cap.
Grid Size	The rated size of the grid connection / PV plant in kW, recorded for reference.
Allow Grid Export	Permit surplus PV to be exported. Leave off on sites with no export agreement.
Predictive Regulation	Use the predictive method (Section 12.2).

Setting	What it does
Increments	Step size the predictive method moves the inverters in. Smaller tracks more closely but moves more often.
Calibration	The load figure that corresponds to full inverter output, used to scale the predictive method; a trim for when the metering and the inverters do not quite agree.
Regulation Start % / Stop %	Battery levels for off-grid regulation (Section 12.3). Keep Start at or above Stop.
Low Load (kW) / Low Load Amount	Below Low Load, hold the inverters at Low Load Amount (a level) rather than chasing a small, jumpy load.
PV Regulation Amount (%)	The share of the grid reading an Auto grid tactics slot exports once the battery is full (Chapter 9).
Voltage Difference	A special operating method in which normal automatic charging stands aside and regulation drives the battery. Only switch on if the site was commissioned for it.
PV Inverter PF settings	Power factor for the inverters (Chapter 13).
PV inverter DC inputs	Which MPPTs or strings each inverter has (Chapter 13).

CAUTION

With no generator, no export and no predictive method selected, the inverters follow the load. If the load meter or derived load is wrong, so is the PV output. Verify metering before enabling regulation.

12.5 Disable PV / Enable PV

The **Disable PV** and **Enable PV** commands on BESS Controls curtail or allow PV generation by hand, for example during maintenance.

13 PV Inverters: Power Factor, DC Inputs and Faults

13.1 Inverter power factor

On every regulation run the EMS also writes a power factor to the PV inverters. Grid-tied and off-grid operation are set separately, each to Auto or Manual.

Setting	Auto	Manual
PV Inverter PF — Grid-Tied	Follows the grid meter's power factor.	Uses PV Inverter PF — Grid-Tied Manual.
PV Inverter PF — Off-Grid	Holds 0.8.	Uses PV Inverter PF — Off-Grid Manual.

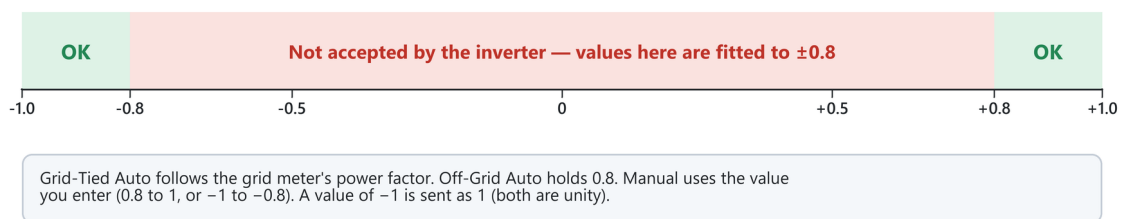


Figure 20 Power factor values the inverters accept.

The inverters accept 0.8 to 1 or -1 to -0.8. A manual value outside that range is refused when you enter it. Auto values outside it are fitted to the nearest accepted value (for example 0.5 is sent as 0.8). Changes take effect on the next regulation run, without a restart.

13.2 DC inputs and temperature

The PV Inverter page shows each inverter's internal temperature and the voltage, current and power on each DC input — **MPPTs** on Sungrow inverters, **PV strings** on Huawei. Readings refresh about every 30 seconds per inverter, and only while the EMS is polling the inverters (regulation enabled, or solar taken from the plant).

Tell the EMS which inputs each inverter actually uses, so unused inputs are not shown as faults:

1. Open **Configuration** → **Regulation**; the DC inputs card is at the end of the group.
2. For each inverter, enter the inputs in use (for example 1,2,4) or a count (3 means inputs 1 to 3).
3. Or press **Auto** to detect them: the EMS reads every input on its next pass and counts an input as connected only if it shows voltage **and** a non-zero current.

TIP

Run Auto in good daylight with every inverter on and producing. An input with voltage but no current is reported as "not counted". If nothing live is found, the previous list is kept. Auto gives up after three minutes.

An inverter with no inputs set shows "MPPTs not set" or "PV strings not set"; it still shows AC output and temperature.

13.3 Checking inverter faults

The EMS does not poll inverter faults continuously. A check runs when someone asks for it:

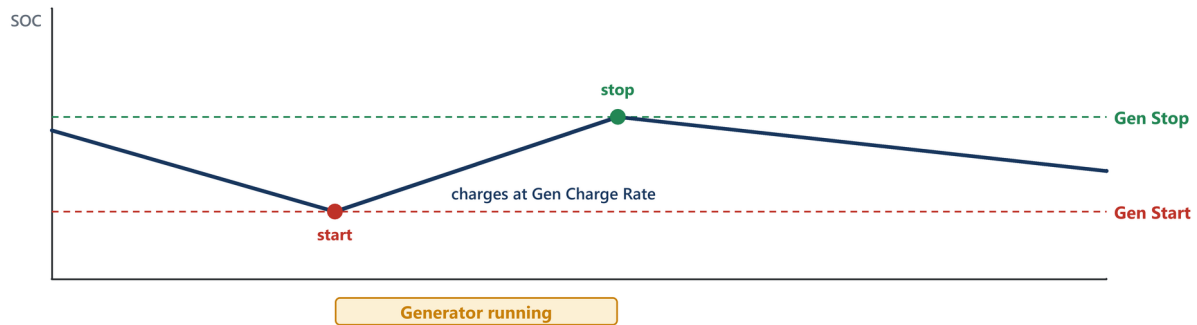
1. Open the **PV Inverter** tab (operator PIN needed to start a check).
2. Press **Check faults**. Each inverter is read the next time the regulation loop reaches it; the note shows which inverters are still awaited.
3. Read the results: one row per inverter with its **state** and any **faults / alarms**, when they started (Sungrow) and when checked.

Result	Meaning
OK	No faults or alarms.
Alarm	A warning-level condition; the inverter may still be producing.
Fault	A fault-level condition; the inverter is likely not producing.
No answer	The inverter did not respond (communications, power or address problem).

Every non-OK result is kept in the **History** list (the most recent 500), since the inverters themselves do not keep a history the EMS can read. **Clear history** needs the master PIN. A check can also be requested from the Connect mobile app when the cloud is connected.

14 Generator

With generator support enabled, the EMS starts the generator when the battery falls to **Gen Start** and stops it when the battery recovers to **Gen Stop**.



The generator will not be started while the grid voltage is at or above Gen Grid Protection.

Figure 21 Automatic generator start and stop.

14.1 While the generator runs

- Tactics stand down entirely; the generator is rank 1 (Chapter 7).
- Charging switches to the **Gen Charge Rate**.
- If generator regulation is enabled, the PV inverters are held back so the set is not pushed into reverse power.

14.2 Settings

Setting	Group	What it does
Generator Enable	Gen Support	Enables automatic generator control.
Gen Start %	Gen Support	Battery level at which the generator is started.
Gen Stop %	Gen Support	Battery level at which it is stopped. Keep well above Gen Start.
Gen Grid Protection (V)	Gen Support	The generator will not start, or keep running, while the grid voltage is at or above this (default 200 V). Stops the set running against a healthy grid.
Remote Generator Control	Gen Support	Start/stop the generator on a port of its own instead of the SyncNode's. Nothing else changes.
Generator Port	Gen Support	The port for Remote Generator Control. If left blank, commands still go out on the SyncNode's port.
Gen Charge Rate (kW)	Generator Regulation	Battery charge rate while the generator runs.
Gen Size (kVA)	Generator Regulation	Rated size of the generator.
Power Factor	Generator Regulation	Generator power factor (0 to 1).
Enable / Disable	Generator Regulation	Enables PV regulation while the generator runs. A generator meter must be fitted.

Setting	Group	What it does
Generator PV Inverter Regulation Amount	Generator Regulation	The level the PV inverters are held at while the generator runs (1000 = full).
Generator PV Inverter Amount / Generator Regulation Amount	Generator Regulation	Supporting values for generator regulation; set as advised at commissioning.

WARNING

An incorrect Gen Charge Rate can overload and damage the generator. Size it so that the battery charge plus the site load stays within the generator's continuous rating.

14.3 Manual generator control

Start generator (confirmation required) calls the generator and stops the PCS; **Stop generator** releases it. Both are on BESS Controls → System.

15 Grid and Load Protection

Five limits guard the grid connection and the site rather than the battery. They work with charging: when the site is close to a limit, charging is pulled back so the battery does not add to the problem.

Setting	Unit	What it guards
Grid Protection	kW	The most the site may draw from (or push to) the grid.
Load Protection	kW	The load above which the EMS treats the site as overloaded.
Grid Threshold	kW	Grid draw at which charging is pulled back.
Grid Recovery	kW	Grid draw the site must fall back to before charging resumes. The gap between Threshold and Recovery stops charging switching on and off repeatedly.
Load Threshold	kW	Site load at which charging is pulled back.

Also related: **DC A – Warning** (Monitoring) is the battery DC current above which the EMS treats the current as too high and warns.

TIP

Set Grid Threshold below the connection's rating with a margin, and Grid Recovery a further 5–10 % lower.

16 Metering

Four named meters — grid, load, PV and generator — each independently enabled, typed and addressed, plus up to five additional meters.

16.1 Meter settings

Setting	What it does
Enable (Start Data / Stop Data)	Turns meter reading on or off.
Grid Meter / PV Meter / Load Meter / Gen Meter	Which meters are fitted.
... Meter Type	Schneider, Chint 3-phase or Chint 1-phase, per meter. The wrong type reads plausible nonsense rather than failing.
... Meter Addr	The meter's address on the meter line (1–247), unique and matching the meter.
Baud Rate	9600, 19200, 38400 or 115200 — the same on every meter on the line.
Read Speed (ms)	Delay between meter reads. Increase on long or noisy lines.
Solar Reading From Plant	Use the total output of the PV inverters as the solar figure instead of a PV meter.

16.2 Load without a load meter

Where no load meter is fitted, the EMS derives the load from the grid, PV, battery and generator readings. Auto-load tactics and regulation follow whichever load figure the site produces.

16.3 Chint 3-phase meters

Chint 3-phase meters report secondary-side values; the EMS reads the meter's own CT and VT ratios and scales to primary values automatically. Make sure the ratios programmed into the meter match the CTs fitted.

16.4 If a meter stops answering

A failed meter is reported once by name and address (for example "the grid meter (address 3)"). After three failed cycles it is retried less often so it does not slow down the healthy meters, and it returns to normal as soon as it answers.

16.5 Additional (custom) meters

Setting	What it does
Enable	Turns the additional meters on.
Amount of Meters	How many (up to 5).
Starting Address	Address of the first; the rest follow consecutively.
Meter Type	Type for all additional meters.
PV / Load / Custom Meter Usage	Which additional meters count towards PV, towards load, or are for information only.
Meter 1–5 Name	Names shown on the Custom Metering page.

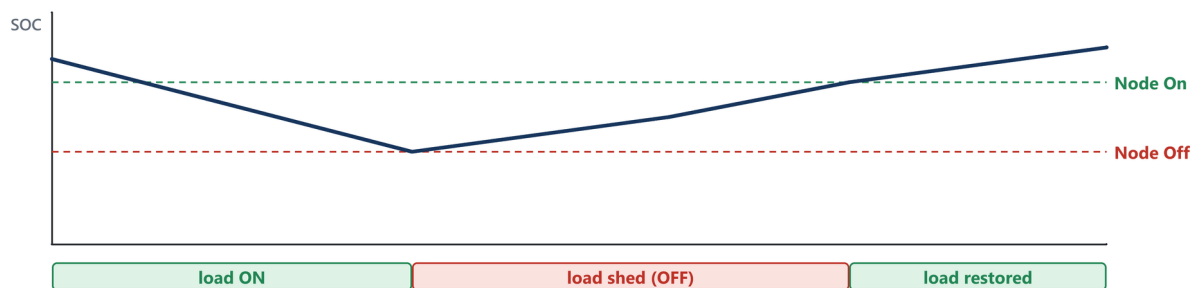
17 SyncNode, LoRa Loads and Grid Detection

17.1 The SyncNode

The SyncNode is the interface between the EMS and the site's mains contactor and generator. It reports whether the grid is present, opens and closes the mains contactor when told, and starts and stops the generator (unless the generator has its own port). It sends a heartbeat about once a minute, shown as Online / Offline on the Dashboard and Status tab, with a live log of its messages on the Status tab.

17.2 LoRa load nodes

LoRa nodes are radio-linked switches for loads that can be shed and restored on battery level — a geyser, a pump, a bank of chargers. Up to ten, each with its own name and pair of levels.



Each node has its own On and Off level; the gap between them stops the load switching back and forth.

Figure 22 A load node switching off at its Off level and back on at its On level.

Setting	What it does
Enable	Turns the LoRa network on.
TCP LoRa	Use a network (TCP) gateway instead of a serial one.
LoRa Amount	Number of nodes (0–10).
LoRa Port	The serial port of the LoRa gateway.
Node n Name	Name shown for the node.
Node n On (%)	Battery level at which the node switches its load on.
Node n Off (%)	Battery level at which it switches the load off. Keep below On.

NOTE

On the EMS window's LoRa page, nodes can also be switched by hand. Using those buttons removes the automatic function for that node until the EMS is restarted.

17.3 Voltage Fallback Switching

Normally the SyncNode alone tells the EMS whether the grid is present. **Voltage Fallback Switching** adds a backstop: if the PCS itself measures **Fallback Voltage** or less on every phase for **20 seconds**, the EMS treats the grid as lost and applies the same off-grid action the SyncNode's grid-loss signal would have triggered. Not available with a Huawei Series PCS.

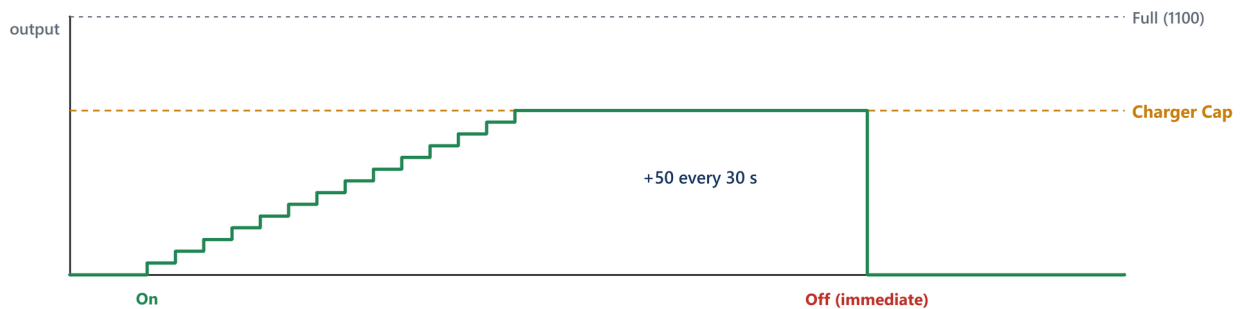
17.4 Radio Link ATS and TCP/IP Site

Setting	What it does
Radio Link ATS	Use a radio link for automatic transfer switching. Only when the site is designed for it.
TCP Communication / TCP/IP / Port1–4	On a TCP/IP site, the SyncNode, meters and inverters are reached over the network through a gateway instead of serial ports. The gateway address and its ports are set here.

18 SyncCharger

A SyncCharger is one or more inverter-based chargers on a port of their own, switched fully on or off on battery level. Fitting one changes what the grid controls do: the plant runs islanded and the chargers take the place of the mains.

- **Grid on** and **System grid tie** turn the **chargers on** instead of closing the mains contactor.
- **Grid off** and **System off grid** turn the **chargers off** instead of opening it.
- The PCS stays off-grid throughout. The PCS commands and the generator are unaffected.
- A SyncNode can still be fitted alongside; it still reports grid presence and still runs the generator.



Turning on ramps up in steps; turning off is immediate. On at or below Charger Start, off at or above Charger Stop.

Figure 23 Charger output ramps up in steps to the cap and switches off immediately.

Setting	What it does
SyncCharger Fitted	Turn on if SyncChargers are fitted. This is what hands the grid controls over.
SyncCharger Port	The port the chargers are connected to.
Charger Type	Sungrow or Huawei (may differ from the PV inverters).
Chargers	How many chargers, addressed 1 upwards.
Charger Start	Chargers turn on at or below this level (% or V).
Charger Stop	Chargers turn off at or above this level. Must be above Start.
Charger Cap	Highest output allowed, out of 1100 (default 1100 = full). Lower it for a small generator or chargers that trip on a hard step.

Turning on ramps up by 50 every 30 seconds until the cap is reached; turning off is immediate. A charger that has never been decided stays off. A Chargers on/off command holds until the battery level next crosses Start or Stop, then automatic control resumes. If the set-up is incomplete (no port, no chargers, or Stop not above Start), the Charger page says which part is missing.

19 Cloud, Mobile App and Notifications

The TKS Connect cloud is optional and **off by default**. While it is off no cloud work runs and nothing about the cloud is reported as a fault, so a site without internet is not buried in cloud errors.

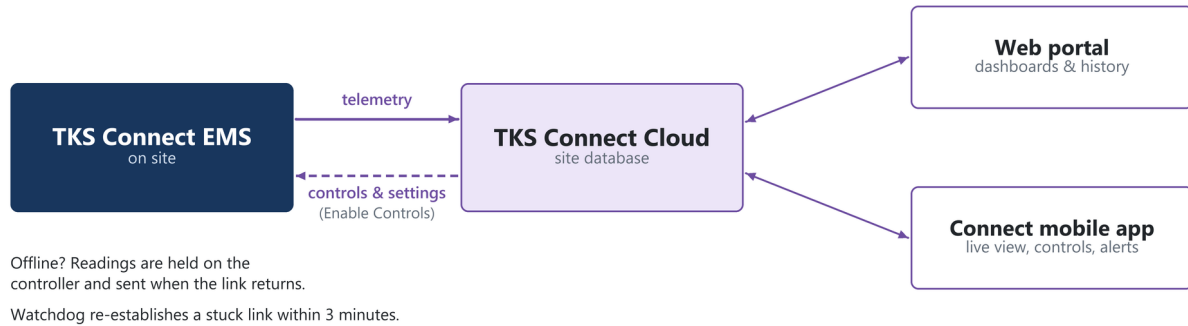


Figure 24 How the EMS, the cloud, the portal and the app relate.

MASTER SWITCH	REMOTE CONTROL	UPLOAD	WATCHDOG
Cloud Connection	Enable Controls	every ~10 s	3 minutes

19.1 Setting up the cloud link

1. Make sure the controller has internet access.
2. On the EMS settings screen → Monitoring, use **Create Portal** with the site name and the cloud credentials supplied by TKS Solar Group. Creating the portal switches Cloud Connection on.
3. Optionally use **Create Controls** to create the remote-control profile, and switch **Enable Controls** on.
4. Check the cloud lamp turns green and the Cloud KPI shows Connected.

19.2 Telemetry

Readings are uploaded to the site's record in the TKS Connect cloud about every ten seconds. When the link is down, readings are held on the controller and sent when it returns, so an outage costs no data. If uploads stop, the watchdog notices within three minutes and re-establishes the link.

19.3 Remote control

With **Enable Controls** on, the plant can be operated from the portal and app: start and stop, grid and off-grid, the tactics schedule, the off-grid windows, load node levels and a restart. The cloud is checked for new instructions about every 30 seconds.

- Where the cloud sends a value, the cloud wins; where it sends nothing, the value set on site is kept.
- Charging values (autocharge, bulk rate, EOC, force charge and rate, float charge and rate) and regulation values (enable, export, calibration, inverter amount and cap, low load, regulation start and stop, generator regulation) set in the portal **overwrite the local settings** on the next check.
- Nothing on site is changed unless the cloud actually sends something different.

CAUTION

On a cloud-controlled site, a local change to a value that the portal also sets will be overwritten. Make the change in the portal, or clear it there first.

19.4 The Connect mobile app

The app shows live power flow, battery, PV (including inverter temperatures and DC inputs), regulation, SyncNode status and faults, can request a PV inverter fault check, and — with Enable Controls on — operate the plant and edit schedules.

19.5 Notifications

Enable Notifications holds the contacts (one per line) to receive alerts; **Add Number**, **Remove Email** and **Show Numbers** on the Monitoring screen manage the list. **DC A – Warning** sets the battery current that raises a warning.

19.6 Local data storage and export

Create Local Storage and **Test Local Database** (Monitoring) set up and test the controller's own record of readings. On the EMS window's **Data Export** page, choose a start and end and use **Export to Excel** to save readings for a period, or **Display Local Data** to view them.

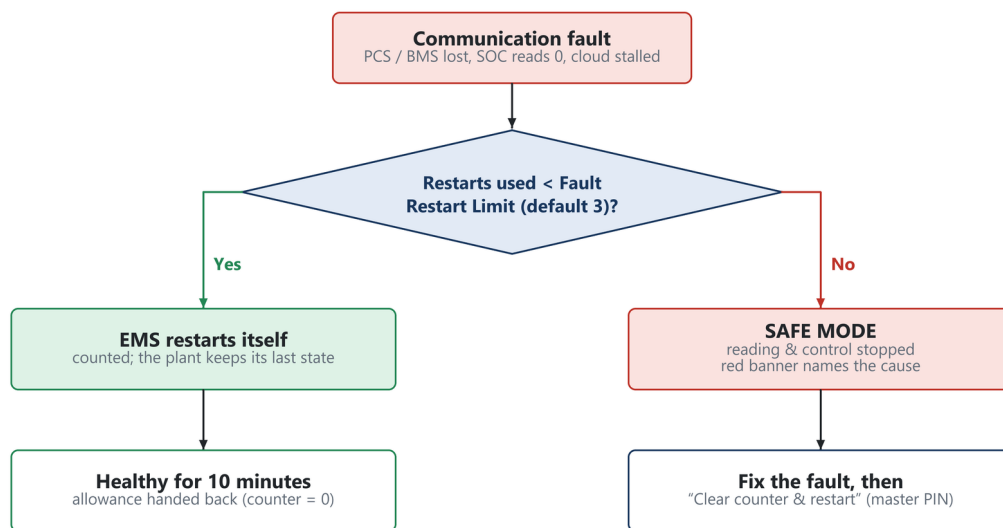
20 Faults, Auto-Restart and Safe Mode

20.1 Fault messages

Faults are reported as one plain sentence a technician at the plant can act on: which device, and what to check. They never show network addresses or internal details. Each fault is logged once rather than repeated every cycle, and a "restored" line appears when the device recovers. Use **Export Faults to Desktop** on the EMS window's Status page to save the list.

20.2 Automatic recovery and safe mode

The EMS restarts itself to recover from a communications fault it cannot read past — PCS or BMS lost, SOC reads 0, cloud stalled. It counts these restarts; when the allowance is used up it stops restarting and enters **safe mode**.



Web console and EMS window stay reachable in safe mode. A limit of 0 disables automatic fault restarts.

Figure 25 Automatic restart and safe mode.

DEFAULT ALLOWANCE	MAXIMUM	DISABLE WITH	ALLOWANCE RESETS
3 restarts	20	0	after 10 min healthy

- In safe mode, all reading, control, schedules and uploads stop. A red banner on the EMS window and the web console names the cause. The web console and EMS window stay reachable.
- Fix the fault, then a master user presses **Clear counter & restart** (web banner, or **Clear Fault-Restart Counter** on the EMS settings screen).
- Once communications have been healthy for ten minutes the counter returns to zero by itself, so occasional blips never accumulate into safe mode.
- Restarts you request (Restart EMS, saving settings, maintenance mode, cloud reboot) are not counted.

WARNING

In safe mode the EMS is **not controlling the plant**. Schedules, generator start and regulation are all stopped. Attend to a safe-mode site promptly.

20.3 Scheduled daily restart

Restart EMS with a **Restart Time** (EMS Restart group) restarts the EMS at the same time each day — useful where a third-party device benefits from a daily clean start. Choose a quiet time outside tactics and off-grid windows.

20.4 Maintenance mode

Maintenance mode (master) stops the PCS and restarts the EMS. Use it before working on the plant, together with physical isolation (Chapter 2).

21 The EMS Window

The EMS window is the local application on the controller. In TCP mode it is hidden (Section 4.7); in HMI mode it is the main screen. Its pages carry the same information as the web console.

Page / button	Contents
Dashboard	Site mimic with Load, Generator, BESS and Grid; indications such as Tactics Active, Manual Dispatch Active and Off Grid Mode Active; cloud status.
Status	Grid and battery status, SyncNode and LoRa communication, system warnings and the fault list; Export Faults to Desktop.
Regulation	Regulation status, load status, PV status and generator status (the web PV Regulation tab).
PCS / BMS	Converter and battery detail (the web BESS tab).
Power Meters	Grid, load and solar meter readings.
LoRa Network	Node readings, manual ON/OFF buttons and node set-up.
PV Inverter	Per-inverter output, Totals, DC / Temp view and Check Faults.
Data Export	Export recorded data to Excel for a date range; display local data.
Login	Sign in with a PIN to reach Settings, Config and Controls.
Settings	Basic Setup, Monitoring and Advanced settings (master PIN).
Config	Charging, Regulation, Dispatching and Tactics (master PIN).
Controls	The plant commands (operator PIN).

NOTE

Some EMS window screens show “Reboot for changes to take effect” — this refers to settings that take effect on restart. Use **Restart EMS**; a full controller reboot is not needed.

22 Settings Reference

Every setting, in the order the Configuration groups appear. **At once** means the setting is acting as soon as it is saved; **Restart** means it takes effect the next time the EMS starts. Battery levels shown as % are read as volts when Control By is set to battery voltage. Network addresses and ports are recorded on the site record sheet, not here.

System Select

Setting	Range / options	Effect	Description
System Type	BESS / Grid-Tied (one only)	Restart	Type of site (Section 3.4).

PCS Select

Setting	Range / options	Effect	Description
System Size	0–100 000 kW	Restart	Rated PCS / system size.
PCS Model	Huawei Series / Sinexcel 500K / Sinexcel 30P	Restart	The PCS fitted. Only one can be selected.

Set IP

Setting	Range / options	Effect	Description
PCS	network address	Restart	Network address of the PCS.
BMS	network address	Restart	Network address of the BMS. Not used with Huawei Series.
BMS Type	SYL (default) / Pylontech (high-voltage)	Restart	Battery management system fitted. Set this first.

Meters

Setting	Range / options	Effect	Description
Enable	on / off	At once	Turns meter reading on or off (Start Data / Stop Data).
Grid Meter	on / off	At once	Grid meter fitted.
PV Meter	on / off	At once	PV meter fitted.
Solar Reading From Plant	on / off	At once	Use the PV inverters' total as the solar reading.
Load Meter	on / off	Restart	Load meter fitted.
Gen Meter	on / off	Restart	Generator meter fitted.
Grid / Load / PV / Gen Meter Type	Schneider / Chint 3 phase / Chint 1 phase	At once	Type of each meter.
Grid / Load / PV Meter Addr	1–247	Restart	Address of each meter on the meter line.

Com Port

Setting	Range / options	Effect	Description
SyncNode Port	port name	Restart	Port the SyncNode is connected to.
Power Meter Port	port name	Restart	Port of the meter line.
PV Inverter Port	port name	Restart	Port of the PV inverter line.
Voltage Fallback Switching	on / off	Restart	Treat the grid as off when the PCS sees no grid voltage.
Fallback Voltage	0–400 V (default 0)	At once	Voltage at or below which a phase counts as off.

Gen Support

Setting	Range / options	Effect	Description
Generator Enable	on / off	Restart	Automatic generator control.
Gen Start %	0–1000	Restart	Level at which the generator starts.
Gen Stop %	0–1000	Restart	Level at which it stops.
Remote Generator Control	on / off	Restart	Generator on its own port.
Generator Port	port name	Restart	Port for Remote Generator Control.
Gen Grid Protection	1–400 V (default 200)	At once	Generator will not start while grid voltage is at or above this.

Monitoring

Setting	Range / options	Effect	Description
Site Location	text	Restart	Site name shown on the dashboard and in the cloud.
DC A – Warning	0–10 000 A	Restart	Battery DC current that raises a warning.
Cloud Connection	on / off	At once	Master switch for all cloud features.
Enable Controls	on / off	Restart	Allow remote control from the cloud.
Enable Notifications	one contact per line	Restart	Who receives alerts.

Add Additional Meters

Setting	Range / options	Effect	Description
Enable	on / off	Restart	Additional meters fitted.
Amount of Meters	0–5	Restart	How many.
Starting Address	1–247	Restart	Address of the first additional meter.
Meter Type	Schneider / Chint 3 phase / Chint 1 phase	At once	Type of the additional meters.
PV / Load / Custom Meter Usage	meter numbers	Restart	What each additional meter counts towards.
Meter 1–5 Name	text	Restart	Display names.

TCP/IP Site

Setting	Range / options	Effect	Description
TCP Communication	on / off	Restart	Reach the field devices over the network via a gateway.
TCP/IP	network address	Restart	Gateway address.
Port1–Port4	1–65535	Restart	Gateway ports for each line.

ATS Mode

Setting	Range / options	Effect	Description
Radio Link ATS	on / off	Restart	Radio-link automatic transfer switching.

Meter Speeds

Setting	Range / options	Effect	Description
Baud Rate	9600 / 19200 / 38400 / 115200	Restart	Speed of the meter line.
Read Speed (ms)	10–10 000 ms	Restart	Delay between meter reads.

LoRa Network

Setting	Range / options	Effect	Description
Enable	on / off	Restart	LoRa load nodes fitted.
TCP LoRa	on / off	Restart	Network gateway instead of serial.
LoRa Amount	0–10	Restart	Number of nodes.
LoRa Port	port name	Restart	Port of the LoRa gateway.

LoRa Nodes

Setting	Range / options	Effect	Description
Node 1–10 Name	text	Restart	Node names.
Node 1–10 On	0–100 %	Restart	Level at which the load switches on.
Node 1–10 Off	0–100 %	Restart	Level at which the load switches off.

EMS Restart

Setting	Range / options	Effect	Description
Restart EMS	on / off	At once	Daily scheduled restart.
Restart Time	hh:mm	At once	Time of the daily restart.
Fault Restart Limit	0–20 (default 3)	At once	Fault restarts allowed before safe mode; 0 disables.

EMS Interface

Setting	Range / options	Effect	Description
Interface mode	TCP / HMI	Restart	Web console or classic screen (EMS settings screen).
Enable Coms Debugging	on / off	Restart	Extra communication logging for diagnosis. Leave off normally.
Port	1–65535	Restart	Web console port. A change needs the port reserved in Windows.
Full-screen web console	on / off	Restart	Open the web console full screen on the controller at start-up.
Access PINs	4–10 digits	At once	Operator and master PINs (current master PIN required).

Charging

Setting	Range / options	Effect	Description
Control By	Battery SOC (%) / Battery voltage (V)	At once	What every battery level is measured in.
EOC	0–1000 % (or V)	At once	Level at which charging stops.
Bulk Charge Rate	0–100 000 kW	At once	Charge rate while bulk charging.
Force Charge	0–1000 % (or V)	At once	Below this the battery is always charged; also the discharge floor.
Force Charge Rate	0–100 000 kW	At once	Rate while force charging.
Float Charge	0–1000 % (or V)	At once	Level at which charging drops to the float rate.
Float Rate	0–100 000 kW	At once	Float charge rate.
Autocharge Enable	on / off	Restart	Automatic charging.
Only PV Charge	on / off	Restart	Charge only from PV surplus.
Minimum PV	0–100 000 kW	Restart	PV needed before PV-only charging starts.

Dispatching

Setting	Range / options	Effect	Description
Manual Dispatch	on / off	Restart	Hold the battery at the Dispatch Rate.
Dispatch Rate	–100 000 to 100 000 kW	Restart	Manual rate; negative discharges.

Tactics

Setting	Range / options	Effect	Description
Weekly schedule	7 days × 8 slots	At once	Edited and saved as a whole week (Chapter 9).

Off-Grid Mode

Setting	Range / options	Effect	Description
Enable Off-Grid Mode	on / off	At once	Daily off-grid windows on or off.
Window 1 Start / End	hh:mm	At once	First window.
Window 2 Start / End	hh:mm (blank = unused)	At once	Second window.

Regulation

Setting	Range / options	Effect	Description
Enable / Disable	on / off	Restart	PV regulation.
PV Inverter Type	Sungrow / Huawei	Restart	Make of PV inverter.
PV Inverter PF – Grid-Tied	Auto / Manual	At once	Auto follows the grid meter.
PV Inverter PF – Grid-Tied Manual	0.8 to 1 or –1 to –0.8 (default 1)	At once	Fixed PF when Manual.
PV Inverter PF – Off-Grid	Auto / Manual	At once	Auto holds 0.8.
PV Inverter PF – Off-Grid Manual	0.8 to 1 or –1 to –0.8 (default 1)	At once	Fixed PF when Manual.
Regulation Start %	0–1000	Restart	Off-grid regulation level (Section 12.3).
Regulation Stop %	0–1000	Restart	Off-grid release level.
Predictive Regulation	on / off	Restart	Predictive method.
Grid Size	0–100 000 kW	Restart	Rated grid connection / PV size, for reference.
Allow Grid Export	on / off	Restart	Permit export of surplus PV.
Increments	0–100 000	Restart	Step size of predictive regulation.
Calibration	0–100 000	Restart	Scaling for predictive regulation.
Low Load	0–100 000 kW	Restart	Load below which the Low Load Amount is used.
Low Load Amount	level (1000 = full)	Restart	Inverter level at low load.
PV Regulation Amount	0–100 %	Restart	Export share for Auto grid tactics.
Voltage Difference	on / off	Restart	Special operating method; only if commissioned for it.
PV Inverter Amount	0–247	Restart	Number of units addressed by the SyncNodes / Regulation on-off commands.
PV Inverter Cap	0–1100 (0 = no cap)	At once	Highest level ever sent to the PV inverters.
PV Inverter Regulation Amount	number	Restart	Number of PV inverters read and regulated.
PV inverter DC inputs	per inverter, or Auto	At once	MPPTs / strings in use (Section 13.2).

SyncCharger

Setting	Range / options	Effect	Description
SyncCharger Fitted	on / off	Restart	Chargers fitted; hands grid controls to the chargers.
SyncCharger Port	port name	Restart	Charger port.
Charger Type	Sungrow / Huawei	Restart	Make of charger.
Chargers	0–247	Restart	Number of chargers.
Charger Start	0–1000 % (or V)	At once	On at or below.
Charger Stop	0–1000 % (or V)	At once	Off at or above.
Charger Cap	1–1100 (default 1100)	At once	Highest output allowed.

Generator Regulation

Setting	Range / options	Effect	Description
Enable / Disable	on / off	Restart	PV regulation while the generator runs (needs a generator meter).
Gen Size	0–100 000 kVA	Restart	Generator rating.
Gen Charge Rate	0–100 000 kW	Restart	Charge rate while the generator runs.
Power Factor	0–1	Restart	Generator power factor.
Generator PV Inverter Amount	number	Restart	Supporting value for generator regulation.
Generator PV Inverter Regulation Amount	level (1000 = full)	Restart	PV level while the generator runs.
Generator Regulation Amount	number	Restart	Supporting value for generator regulation.

Peak Shaving

Setting	Range / options	Effect	Description
Peak Shaving	on / off	Restart	Enables peak shaving.
Start Shaving Above	0–100 000 kW	At once	Load at which shaving starts.
Hold Load Down To	0–100 000 kW	At once	The ceiling.
Give Up Below	0–1000 % (or V)	At once	Battery level at which shaving stops.

Protection

Setting	Range / options	Effect	Description
Grid Protection	0–100 000 kW	Restart	Grid draw limit.
Load Protection	0–100 000 kW	Restart	Load limit.
Grid Threshold	0–100 000 kW	Restart	Grid draw that pulls charging back.
Grid Recovery	0–100 000 kW	Restart	Grid draw at which charging resumes.

23 Commissioning

Commission in this order. Each step builds on the one before; in particular, settle metering before any control function, because every decision the EMS makes is based on those readings.

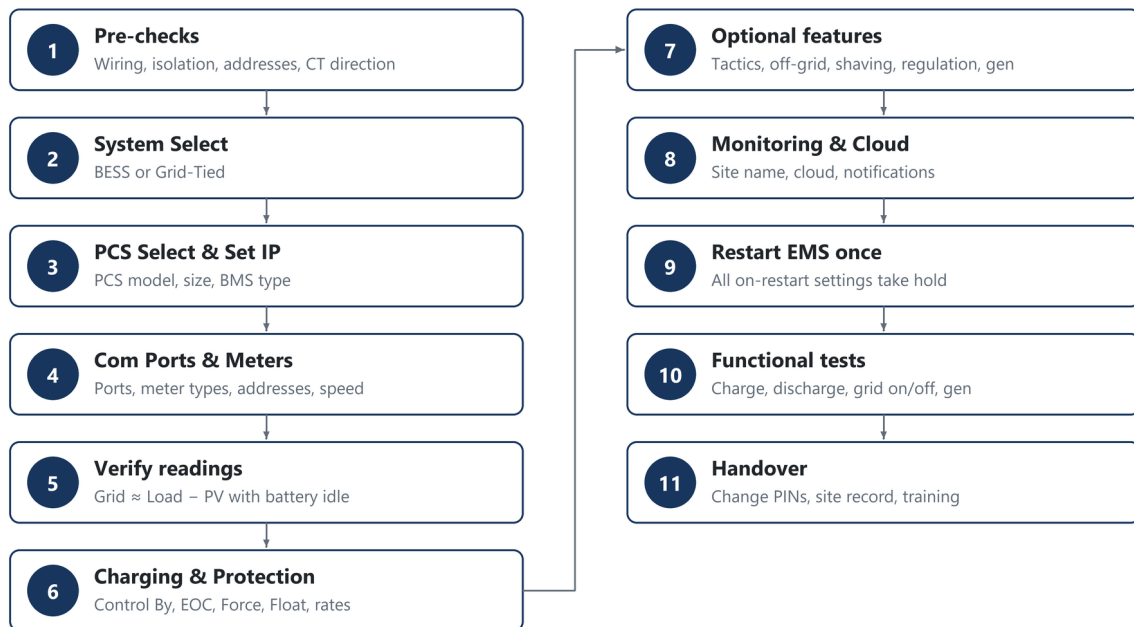


Figure 26 Commissioning sequence.

23.1 Before powering the controller

- Install all equipment per its manufacturer's instructions and the site drawings.
- Check every CT is on the correct conductor and phase, facing the correct direction.
- Set a unique address and the common baud rate on every meter; set inverter addresses 1 upwards.
- Wire RS485 lines as daisy chains with termination at both ends (Section 3.5).
- Set fixed network addresses on the PCS, BMS and controller; record them on the site record sheet.

23.2 Configuration steps

1. **System Select** — BESS or Grid-Tied.
2. **PCS Select** — PCS model and System Size.
3. **Set IP** — PCS and BMS addresses and BMS Type. Get the BMS type right before anything else.
4. **Com Port** — SyncNode, power meter and PV inverter ports.
5. **Meters** and **Meter Speeds** — enable each meter fitted, set type and address; set the baud rate.
6. **Restart the EMS** and verify readings on Power Meters, BESS and PV Inverter. With the battery idle, Grid $\approx$ Load – PV. Compare against a clamp meter.
7. **Charging** — Control By, then Force Charge, Float Charge, EOC and the three rates.
8. **Protection** — grid and load limits.
9. **Optional functions** — Tactics, Off-Grid Mode, Peak Shaving, Regulation (type, amount, cap, PF, DC inputs), Gen Support and Generator Regulation, LoRa, SyncCharger.
10. **Monitoring** — Site Location, cloud portal and controls, notifications.
11. **EMS Interface** — interface mode, web port (reserve it if changed), full-screen console, then **change both PINs**.
12. **Restart the EMS once** so every on-restart setting takes hold.

23.3 Functional tests

Test	How	Expected result	✓
PCS start / stop	BESS Controls → PCS start, PCS stop	PCS tile ON then OFF	
Charge	Manual dispatch at +rate	BESS kW positive, SOC rising	
Discharge	Manual dispatch at –rate	BESS kW negative, grid import falls	
Back to automatic	Automatic dispatch	Dispatch shows Automatic	
Grid off / on	System off grid, then System grid tie	PCS Mode Off-Grid then Grid-Tied; supply maintained	
Generator	Start generator, then Stop generator	Set starts and stops; Gen kW shown	
PV regulation	Enable; watch PV Regulation tab	Level follows load / cap	
Tactics	Create a short test slot	Slot runs within ~10 s	
Loads	SyncNodes off / on	Nodes change state	
Cloud	Check lamp and portal	Connected; data in portal	
Faults	Disconnect one meter briefly	Named fault, then "restored"	

23.4 Handover

- Watch at least one full charge and discharge cycle.
- Remove test slots and set the final schedule.
- Change both PINs and record them, with all addresses and settings, on the site record sheet (Appendix B).
- Walk the site owner through the Dashboard, Status tab and the controls they are allowed to use.

24 Operation and Maintenance

24.1 Routine checks

Interval	Check	Where
Daily	Dashboard readings look sensible; clock is ticking; no safe-mode bar.	Dashboard
Daily	No new faults; SyncNode Online; cloud Connected (if used).	Status
Weekly	Battery cycling as expected against the schedule.	Dashboard, Tactics
Weekly	PV inverters all reporting; hottest temperature normal.	PV Inverter
Monthly	Run Check faults on the PV inverters; review history.	PV Inverter
Monthly	Review the fault and activity logs for repeating issues.	Status
Quarterly	Compare meter readings with a calibrated clamp meter.	Power Meters
Quarterly	Review the tariff schedule against the current tariff.	Configuration → Tactics
Annually	Review PINs and who holds them; export and archive data.	EMS Interface, Data Export

24.2 Changing the schedule or tariff

Edit Tactics in the web console (Chapter 9). Changes act within ten seconds; no restart is needed. On a cloud-controlled site make the change in the portal instead, or it may be overwritten.

24.3 Replacing equipment

- **Meter** — set the new meter to the same address, type and baud rate as the old one.
- **PV inverter** — set the same address; re-run DC input Auto.
- **PCS or BMS** — set the same network address; check PCS Model and BMS Type; restart the EMS.
- **Controller PC** — contact TKS Solar Group; the new controller must be bound (Bind Connect).

24.4 Backing up the configuration

All settings are held with the EMS on the controller, so a site's whole set-up travels with the EMS folder. Ask TKS Solar Group for the backup procedure, and keep the site record sheet up to date as an independent record.

25 Troubleshooting

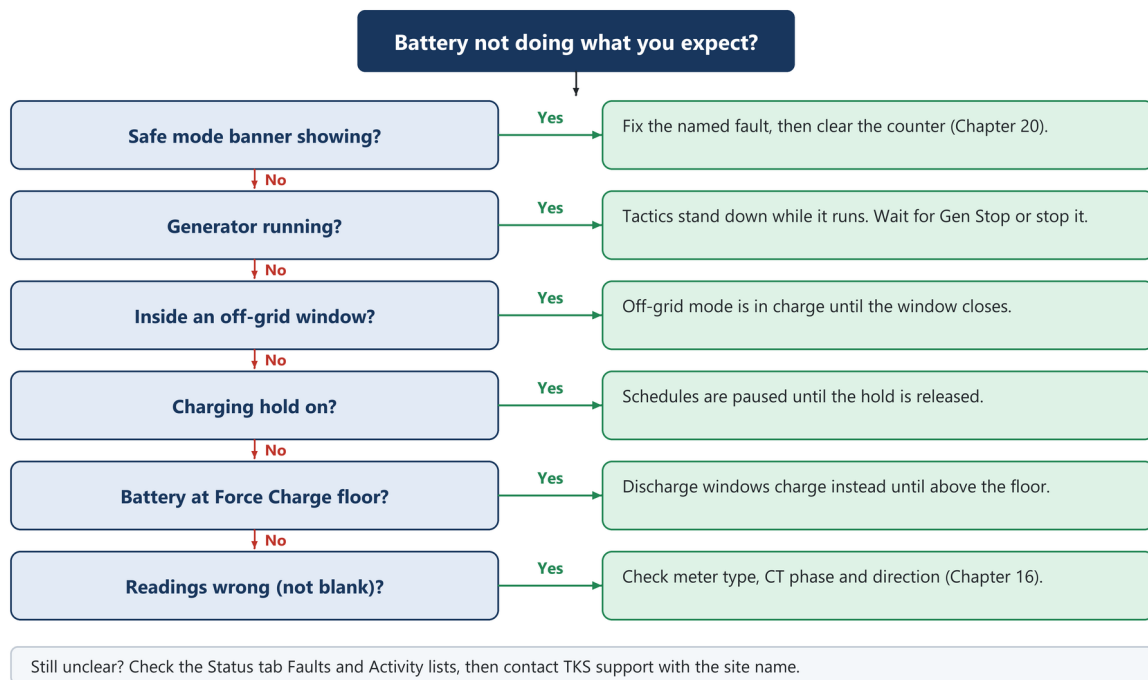


Figure 27 First questions when the battery is not doing what you expect.

Symptom	Likely cause	What to do
Clock on the console has stopped	The EMS has stopped taking readings, or safe mode.	Check for the safe-mode bar and Status faults. Restart the EMS if needed.
Red safe-mode banner	Repeated communications fault.	Fix the named fault; master: Clear counter & restart.
A tactics slot is not dispatching	Higher-ranked function in charge; tactics, day or slot off; invalid times.	Work down Chapter 7. Check switches and the plain-language line beside the slot.
Slot runs at the wrong rate	Auto mode ignores the rate; floor reached.	Check the slot mode and the Force Charge level.
Two slots cover the same time	Overlap.	The higher-numbered slot wins; remove the overlap.
Site will not return from off-grid	A window still covers now (contiguous windows).	Check both windows; use System grid tie if needed.
Peak shaving does nothing	Load below Start Shaving Above; battery below Give Up Below; higher rank in charge.	Check the three values and Chapter 7.
Readings plausible but wrong	Wrong meter type, CT phase or direction.	Check type and CTs (Chapter 16).
A device reads nothing	Wiring, address, baud rate.	Work through Section 3.5.
PV exporting when it should not	Allow Grid Export on, cap too high, wrong load reading.	Check Regulation settings and metering.
PV held down too much	Low cap, Low Load Amount too low, off-grid with full battery.	Check cap and Section 12.3.

Symptom	Likely cause	What to do
Generator will not start	Generator Enable off; grid voltage above Gen Grid Protection; port.	Check Gen Support settings and the SyncNode / generator port.
SyncNode Offline	No heartbeat for over 90 s.	Check SyncNode power and its port; see Status log.
Setting will not stick	Needs restart; cloud overwriting it; locked for the PCS model.	Restart; check cloud control; read the lock reason.
Web console unreachable	Wrong address or port; port not reserved; network.	Use Copy console address on the controller; Reserve web port; check network.
Cloud shows Disconnected	No internet; cloud credentials; link stuck.	Check internet; the watchdog recovers within 3 min; data is buffered.
Charger page: not fully set up	No port, no chargers, or Stop not above Start.	Complete the SyncCharger settings.
Inverter shows “No answer”	Communications or inverter off.	Check inverter power, address and the PV inverter line.
Master PIN forgotten	—	Contact TKS Solar Group support.

25.1 Contacting support

Have ready: the site name, EMS version (shown on the start-up screen and EMS window), a description of what happened and when, and a copy of the Status faults (Export Faults to Desktop). Do not send PINs by email.

Appendix A Glossary

Term	Meaning
ATS	Automatic transfer switch.
Auto grid / Auto load	Tactics slot modes (Chapter 9).
BESS	Battery energy storage system: the battery and its PCS.
BMS	Battery management system: monitors and protects the cells.
Bulk / Float / Force charge	Charging bands (Chapter 8).
CT	Current transformer, used by a meter to measure current.
DC bus	The battery-side DC voltage of the PCS.
EOC	End of charge: the level at which charging stops.
EMS	Energy management system: the TKS Connect controller software.
Grid-tied / Off-grid	Following the utility grid / forming an island without it.
HMI	Human-machine interface: the classic EMS window on the controller.
kW / kVA / kVAr	Real / apparent / reactive power.
LoRa	Long-range radio used by the load nodes.
MPPT	Maximum power point tracker: a DC input on a Sungrow inverter.
PCS	Power conversion system: the battery inverter.
PF	Power factor.
Peak shaving	Holding grid demand under a ceiling with the battery.
PV	Photovoltaic (solar).
PV string	A DC input on a Huawei inverter.
Regulation level	Inverter output setting, 1000 = 100 %.
RS485	Two-wire serial communication bus used by meters and inverters.
Safe mode	State after repeated fault restarts in which the EMS stops controlling (Chapter 20).
SOC	State of charge of the battery, %.
SyncCharger	Inverter-based chargers switched on battery level (Chapter 18).
SyncNode	Interface unit for mains contactor, grid detection and generator.
Tactics	The weekly charge/discharge schedule.

Appendix B Site Record Sheet

Complete at commissioning and keep with the site documentation. Store PINs separately and securely.

Item	Value
Site name	
Site address	
Commissioned by / date	
EMS version	8.1
System Type	
PCS model / size (kW)	
BMS type	
Battery capacity (kWh)	
PV size (kWp) / inverter make / quantity	
Generator size (kVA)	
Grid connection size (kVA)	

Network and communications (keep confidential)

Item	Value
Controller address / web port	
PCS address	
BMS address	
SyncNode port	
Power meter port / baud rate	
PV inverter port	
Generator port (if used)	
SyncCharger port (if used)	
LoRa port (if used)	
Gateway address and ports (TCP/IP site)	

Meters

Meter	Type	Address	CT ratio	Location
Grid				
Load				
PV				
Generator				

Meter	Type	Address	CT ratio	Location
Additional 1–5				

Key settings

Setting	Value	Setting	Value
Control By		PV Inverter Cap	
Force Charge		Allow Grid Export	
Float Charge		Gen Start / Stop	
EOC		Gen Charge Rate	
Bulk / Float / Force rates		Peak shaving values	
Grid / Load protection		Off-grid windows	

Access

Item	Held by
Operator PIN	
Master PIN	
Cloud portal account	

Appendix C Quick Reference

I want to...	Do this
See what the plant is doing	Dashboard: power flow, PCS card, KPIs.
Find out why it is doing it	Chapter 7 ranking; Status tab.
See faults	Status → Faults (and PV Inverter → Check faults).
Start or stop the battery inverter	BESS Controls → PCS start / PCS stop (operator).
Charge or discharge at a fixed rate	Set Dispatch Rate, then Manual dispatch; Automatic dispatch to return.
Island the site now	BESS Controls → System off grid (confirm).
Reconnect to the grid	BESS Controls → System grid tie.
Start the generator	BESS Controls → Start generator (confirm).
Change the tariff schedule	Configuration → Tactics → edit → Save (master).
Limit solar output	Configuration → Regulation → PV Inverter Cap.
Prepare for maintenance	BESS Controls → Maintenance mode, then isolate physically.
Apply on-restart settings	BESS Controls → Restart EMS (master).
Recover from safe mode	Fix the fault → Clear counter & restart (master).
Find the console address	BESS Controls → This PC → Copy console address.
Show the EMS window	This PC → Show EMS window, or Ctrl + Alt + Shift + E.
Change a PIN	Configuration → EMS Interface → Access PINs (current master PIN needed).

DEFAULT OPERATOR PIN	PIN LENGTH	LOCKOUT	SESSION
1123	4–10 digits	5 tries / 5 min	12 hours

TACTICS REACTS	OFF-GRID REACTS	COMMANDS REACH PLANT	CLOUD WATCHDOG
~10 s	~1 min	≤ 10 s	3 min