SUN MOBILITY	**QA -Test report**	**DOC NO: ENG-ME-347**
	Single Phase Battery Swap Station (mQIS)	

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Date created	09th July
Date last update	16th July

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1.Overview:

- Project Name: Single Phase Battery Swap Station (mQIS)
- Report start Date: 07/07/2025
- Report Prepared by: Srinidhi MS
- Test Period: (7th July– 14th July)
- CCU Code Version: 7.1.0Ver
- Version/Build Tested: *https://gitlab.sun-mobility.in/blinston/ccu/-/tree/214-single-3phasestation*
- OS Version:22.04
- Station number: 86

2.Purpose:

This report summarizes the test results for the single-phase configured mQIS station. The aim is to confirm the system's correct functionality, stability, and safety under single-phase operation conditions.

3. Objective:

To evaluate the behavior, performance, and fault handling of the mQIS station after modifying its power input from three-phase to single-phase. Testing ensures the station operates as intended in a customer environment using a single-phase 220V, 60Hz power supply.

4. Feature Overview:

This system is a **Battery Pack Swapping Station** designed to manage power distribution, charging, and safety in a controlled manner.

Key features include:

- **Three-Phase Power Input (R, Y, B)** converted to **Single Phase** and distributed to multiple chargers & HVAC.
- **Residual Current Circuit Breakers (RCCBs)** protect the charging lines and HVAC system from earth faults and leakage currents.
- **Multiple Chargers** supply power to battery packs, with each charger line protected individually.
- **HVAC System** for temperature control, also protected by RCCB.
- **Measurement & Monitoring System** (Energy meter with RS485 communication) tracks power usage and system status.
- **Control and Protection Units** ensure safe and reliable operation through breakers and monitoring relays.

This setup guarantees operational safety, overload protection, and continuous power delivery for battery charging and environmental control.

4.Test cases:

Test Case ID	Test Case Description	Preconditions	Steps to Execute	Expected Result	Status Pass/Fail
SP_TC_001	Verify station boots up correctly with single-phase supply	Station powered OFF, single-phase connection completed	1. Power ON the station 2. Waiting for the system to boot.	System powers ON without error. UI loads successfully	**Pass**
SP_TC_002	Verify station detects Single Phase input correctly	Station is powered off, 1P AC supply available	1. Connect 1P supply to station 2. Power on the station 3. Observe station detection logic	Station should detect Single Phase supply, and the UI should show '1P Station' in the Admin Window.	**Pass**
SP_TC_003	Verify detection logic on station restart	Station powered on with either 1P or 3P supply	1. Restart station 2. Monitor detection logic 3. Verify station type display	Station should correctly re-identify phase type after reboot as per the phase connections done.	**Pass**
SP_TC_004	Verify UI reflects correct station type after detection	Station powered on with known supply type	1. Observe advanced screen UI after detection logic runs	UI should display correct station type (1P or 3P)	**Pass**
SP_TC_005	Verify PLC 2 A6 pin status on Single Phase station	Station is configured for 1P and powered on	1. Measure voltage at PLC2 A6 pin 2. Compare with expected logic	PLC2 A6 pin should be Low (0V DC)	**Pass**
SP_TC_006	Verify mismatch alert when EM detects 1P, but PLC shows 3P	Station powered with 1P, PLC2 A6 forced to High	1. Simulate mismatch condition by tweak the switch in the station which is connected to UVOV and PLC 2 A6 PIN. 2. Observe UI and logs	Mismatch alert should appear in UI and be logged in CNC/Kibana	**Pass**

SP_TC_007	Verify correct alarm logging for mismatch	Mismatch condition has already raised	1. Open CNC/Kibana 2. Check station-level alert log	Logs should contain timestamp, EM detection, and PLC detection values	**Pass**
SP_TC_008	Verify alerts do not spam when mismatch is sustained	Mismatch between EM and PLC sustained over time	1. Keep mismatch condition active 2. Monitor UI and alert history	Only one alert is raised and maintained: no repeated alerts	**Pass**
SP_TC_009	Verify RCCB_2 trip logic without HVAC dependency	Station powered on, charger groups 4–6 and 10–12 are OFF	1. Disable chargers 4–6 and 10–12 2. Observe RCCB_2 trip status	RCCB_2 should be marked as tripped even if HVAC is ON	**Pass**
SP_TC_010	Verify RCCB_2 does not trip when HVAC is off but chargers are OK	HVAC turned off, all chargers in group 4–6, 10–12 are ON and communicating	1. Observe RCCB_2 trip status	RCCB_2 should not be declared as tripped	**Pass**
SP_TC_011	Verify false RCCB_2 trip when all chargers disabled	All chargers in groups 4–6 and 10–12 turned OFF/disabled, HVAC is ON	1. Disable charger groups 4–6, 10–12 2. Monitor RCCB_2 status	RCCB_2 is marked as tripped due to communication loss, even if HVAC is fine	**Pass**
SP_TC_012	Verify swap operation is not blocked in Single Phase	Station running on 1P input	1. Attempt to perform a BP swap 2. Monitor system behavior	Swap should proceed successfully if no other blocking faults	**Pass**
SP_TC_013	Verify that the station detects Single Phase correctly based on EM and PLC2 A6 pin	Station powered OFF. 1P supply connected.	1. Connect Single Phase[1Phase] AC input 2. Power ON the station 3. Wait for detection to complete 4. Observe UI and CNC	UI and CNC should display '1P Station' without any alarms	**Fail**
SP_TC_014	Verify detection logic works after station restart	Station powered with known 1P or 3P input	1. Restart station 2. Observe detection status on UI and CNC	Station should retain and display correct	**Pass**

				detection after restart	
SP_TC_015	Verify Chargers MCB 7,8,9+HVAC is OFF	Station powered OFF. 1P supply connected.	1. Disable charger groups 7,8,9 + HVAC 2. Monitor RCCB_3 status	RCCB_3 is marked as tripped due to communication loss, even if HVAC is fine	**Pass**
SP_TC_016	Verify Chargers MCB.1,2,3,13,14,15 is OFF	Station powered OFF. 1P supply connected.	1. Disable charger groups 1,2,3,13,14,15, 2. Monitor RCCB_1 status	RCCB_1 is marked as tripped due to communication loss, even if HVAC is fine	**Pass**
SP_TC_017	Ensure HVAC energy consumption is included correctly in the report.	Station powered ON. 1P supply connected.	1. Insert Battery for 3 Docks. 2. Charge the BPs from 0 % to 100% 3. Verify 3 BPs charging How much % Energy Consumed. 4. Verify 1 Hvac Energy Consumed while charging from 0% to 100% 3 BPs along with HVAC. Verify This in **SPEM-PERIODIC-METRICS**	The 3 BPs Charging Energy + HVAC Running is = to Total Energy Consumed. Or Total Energy Consumed in this duration is subtracted with Hvac Energy. We should get 3 Bps Charging Energy	**Pass**

SP_TC_018	Verify mismatch alarm when EM detects 1P and PLC detects 3P	Connect 1P supply. Manually set PLC 2 A6 to High (simulate 3P)	1. Simulate mismatch by tweeking the switch from 1P to 3 P. 2. Observe UI and CNC alarms 3. Check alert timestamp and content	UI and CNC should raise a mismatch alarm and log details in Kibana	**Pass**

SP_TC_019	Verify successful battery swap operation	At least one charge and one empty battery available	1. Authenticate user 2. Initiate battery swap 3. Insert empty battery 4. Receive charged battery	Battery swap completes without any failure; all steps function correctly	**Pass**
SP_TC_020	Verify charging starts for inserted battery	Station powered ON, battery inserted into charging dock.	1. Insert battery into charging dock 2. Observe UI or LED status	Charging begins; correct status (e.g., "Charging", % progress) is displayed	**Pass**
SP_TC_021	Verify UI response under normal load	Station powered ON	1. Navigate through main UI screens or HMI menus in Admin window 2. Switch between tabs (e.g., battery status, Main window, Main to Admin Window, logout etc)	All UI screens load quickly; no lag, freezing, or crash observed.	**Pass**
SP_TC_022	Verify Energy Meter Data Accuracy for Single-Phase Input.By Validate energy consumption reported by the meter when charging 1, 2, and 3 chargers simultaneously. [Validate that the energy meter accurately	Station Powered On	1. Authenticate user 2. Initiate battery swap 3. Insert empty battery, enter 3 Bps one by one [0%]Bps. 4. Monitor the Charge from [0 % to 100%] for all the 3 BPs Kwhr in "ENERGYMETER-PERIODIC-METRICS"	1.Charging Begins 2.Shows the correct BP Status from [IM, CC, CE] 3.Shows the Correct Charging % Progress in Admin Window. 4.Verify the Correct Charging Status in Kibana [ENERGY-PERIODIC-MATRIX] sunmccu-data.metrics.importActiveEnergy. 5.Verify theE.**METER** KWHr is Matching with Kibana Data	**Pass**

	records energy consumed during charging with single-phase power.]				

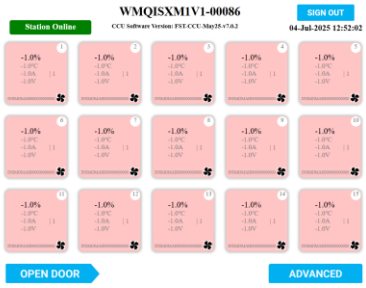
SP_TC_023	Validate alert system during operation	Station powered ON	1. Perform swap and charging operations 2. Monitor screen/logs for warnings	No unexpected alerts are shown system behaves as expected	**Pass**
SP_TC_024	Test Sequential Charging of 15 Battery Packs. [Validate charger and station behavior while sequentially charging 15 Battery Packs.]	Station Powered On	1.Insert the 15 Discharged BP's. 2.Observe the Charging Process. Current, Voltage, frequency etc. In the BP-PERIODIC-MATRICS in Kibana. 3.Check the Parameters R-Y Phase Voltage, Y-B Phase Voltage, B-R Phase Voltage, Avg Phase-Phase Voltage, Phase R-N, Phase Y-N, Phase B-N, Avg L-N. R Current, Y Current, B Current, Avg Current, KW R, KW Y, KW B in Kibana & CNC.	We have used 3 - 4 Bps for Observing the charging in 3 different rows with 3 BPs. Note: There will be a limitations in the Station Power and restriction in the Neutral Current. So, only 1 no. Charger.RCCB can be changed - total 3 chargers at station level and other charger functions will be ON.	**NE**

SP_TC_025	Verify Energy Consumption Data During Battery Swap. [Confirm swap energy consumption data is accurately logged and reported.]	Station Powered On	1. Authenticate user 2. Initiate battery swap 3. Insert empty battery,and take out full BP. 4. Monitor the Kwhr in "ENERGYMETER-PERIODIC-METRICS"	1.Charging Begins 2. Shows the correct BP Status from [IM, CC, CE] 3. Shows the Correct Charging % Progress in Admin Window. 4. Verify the Correct Charging Status in Kibana [ENERGY-PERIODIC-MATRIX] sunmccu-data.metrics.importActiveEnergy. 5. Verify the E**. METER KWHr** is Matching with Kibana Data	**Pass**

SP_TC_026	Verify system behavior when main power is OFF, UPS is running, and battery is not charging.	The system is connected to a Single-Phase UPS. Main power supply is turned OFF. UPS is actively supplying power to the system (running on battery). Battery is not charging (simulated fault or real scenario). The system/station is powered ON through UPS. Previously charged BPs (Battery Packs) are loaded in the dispenser.	Verify main power status Confirm UPS is running and powering the system. Check battery charging status in UPS software/interface. Try dispensing a BP Observe system stability over time (e.g. 15-30 mins). Monitor system alerts or logs	Main power should be detected as OFF System should remain ON, powered by UPS. Battery should show Not Charging. System should allow dispensing from already charged BPs System remains ON and functional until UPS battery drains. Alert for "Battery not charging" or "Running on battery" should be triggered	**Pass**

5.Test Results:

The Single-Phase Station building deployed and after the build deployment the Admin UI Status & Power Bit Status of the Station is mentioned below.



Note:

Energy meter phases:
R-phase(A), Y-phase(B), B-phase(c)

In Kibana we are verifying by this.
Sunmccu-recordtype is ENERGYMETER-**PERIODIC-METRICS**

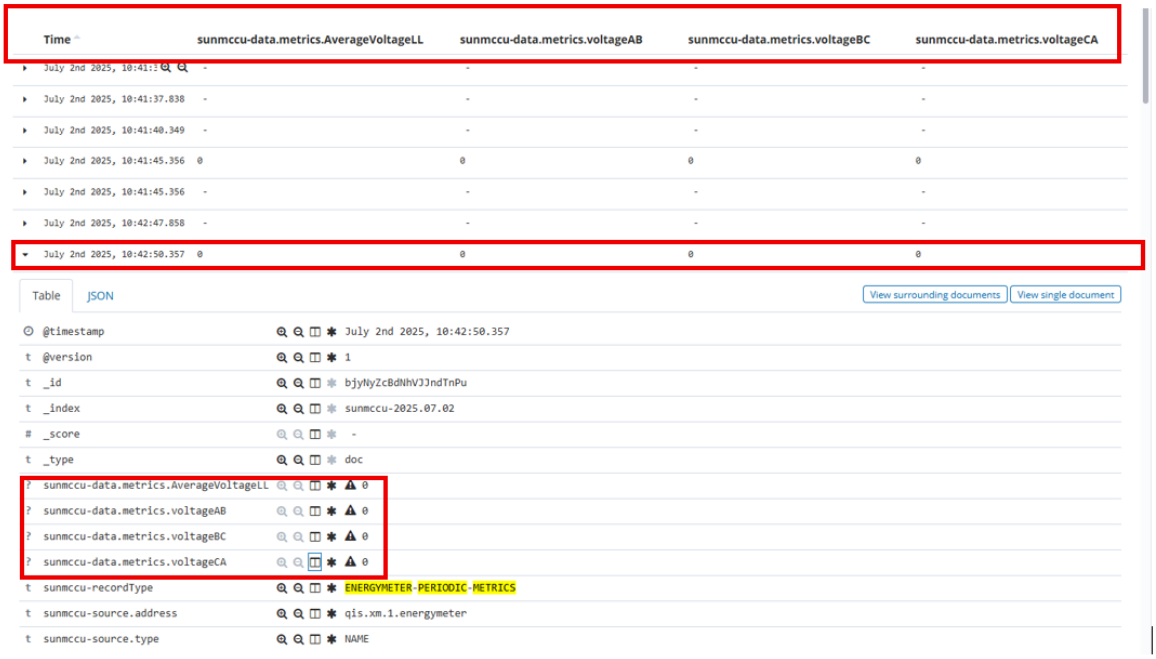
Req_01: Read Line to Line Voltage in the EM

Verified the R-Y Phase Voltage, Y-B Phase Voltage, B-R Phase Voltage & Avg Phase-Phase Voltage, when No load duration in the Single-Phase station.

R-Y Phase Voltage	0	415.8900146
Y-B Phase Voltage	0	415.019989
B-R Phase Voltage	0	412.4200134
Avg Phase-Phase Voltage	0	414.9056091

Kibana Data:

Single Phase Station data for the 4 parameters



Time	sunmccu-data.metrics.AverageVoltageLL	sunmccu-data.metrics.voltageAB	sunmccu-data.metrics.voltageBC	sunmccu-data.metrics.voltageCA
July 2nd 2025, 10:41:37.838	-	-	-	-
July 2nd 2025, 10:41:40.349	-	-	-	-
July 2nd 2025, 10:41:45.356	0	0	0	0
July 2nd 2025, 10:41:45.356	-	-	-	-
July 2nd 2025, 10:42:47.858	-	-	-	-
July 2nd 2025, 10:42:50.357	0	0	0	0

Table JSON — View surrounding documents — View single document

@timestamp	July 2nd 2025, 10:42:50.357	
@version	1	
_id	bjyNyZcBdNhVJJndTnPu	
_index	sunmccu-2025.07.02	
_score	-	
_type	doc	
sunmccu-data.metrics.AverageVoltageLL	0	
sunmccu-data.metrics.voltageAB	0	
sunmccu-data.metrics.voltageBC	0	
sunmccu-data.metrics.voltageCA	0	
sunmccu-recordType	ENERGYMETER-PERIODIC-METRICS	
sunmccu-source.address	qis.xm.1.energymeter	
sunmccu-source.type	NAME	

Remaining Parameters verification: Single Phase Station [Without load]

Parameter, V	Single Phase Station	Three Phase Station
Phase R-N	215.8999939	237.3200073
Phase Y- N	215.4700012	240.1100006
Phase B - N	216.0200043	240.2700043
Avg L-N	216	239.1849976

Kibana Data:

Time	sunmccu-data.metrics.voltageAn	sunmccu-data.metrics.voltageBn	sunmccu-data.metrics.voltageCn	sunmccu-data.metrics.voltageLn
July 1st 2025, 16:09:43.288	231.76	231.73	232.07	231.85
July 1st 2025, 16:09:45.746	-	-	-	-

R Current	7.056	6.372550011
Y Current	7.23085022	6.466050148
B Current	7.190050125	6.41960001
Avg Current	7.177726269	6.422489643

Kibana Data:

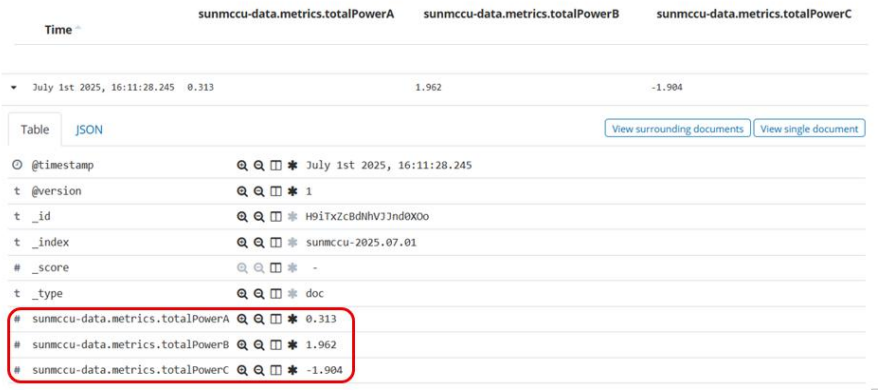
Time	sunmccu-data.metrics.currentA	sunmccu-data.metrics.currentB	sunmccu-data.metrics.currentC	sunmccu-data.metrics.currentL
July 1st 2025, 16:09:43.288	-	-	-	-
July 1st 2025, 16:09:45.746	-	-	-	-
July 1st 2025, 16:09:48.245	3.403	2.756	2.271	2.81

Table JSON View surrounding documents View single document

@timestamp	July 1st 2025, 16:09:48.245
@version	1
_id	xNiSxZcBdNhVJJndSkzK
_index	sunmccu-2025.07.01
_score	-
_type	doc
sunmccu-data.metrics.currentA	3.403
sunmccu-data.metrics.currentB	2.756
sunmccu-data.metrics.currentC	2.271
sunmccu-data.metrics.currentL	2.81

KW R	1.514472008	1.503019333
KW Y	1.555931091	1.548882961
KW B	1.556220055	1.540566206

Kibana data:



Detection Logic for 1P and 3P Stations:

Req_02: Detection Logic for the Single Phase

If the Station Energy Meter Value for Line-to-Line Voltage is 0V AC – 50VAC, then the Station is Single Phase Station.

Req_03: Station Types

The RCCB_2 Trip Detection Logic, as defined above, shall be implemented uniformly for both single-phase stations and three-phase stations.

STATION HEALTH AND SERVICES STATUS	
GRID POWER	ON
EM COMM	OKAY
PLC1 COMM	OKAY
PLC2 COMM	OKAY
HVAC COMM	OKAY
UPS COMM	OKAY
TPH1 COMM	NOT_OKAY
TPH2 COMM	NOT_OKAY
CCU COMM	OKAY
INTERNET COMM	OKAY
RLB DOOR STATUS	CLOSE
HVAC DOOR STATUS	OPEN
PHASEASTATUS	OK
PHASEBSTATUS	OK
PHASECSTATUS	OK
MCCB STATUS	OK
CONTACTOR STATUS	OK
RCCB1 STATUS	OK
RCCB2 STATUS	OK
RCCB3 STATUS	OK
UVOV STATUS	OK
SPEM COMM	OKAY
HVAC FAULT	NA
1/3 PHASE CONFIG	1

PLC Control Logic Updates:

The Changes made in the PLC Control Logic:

The A6 pin shall be reassigned to detect the signal from the UVOV connectors to support Single-Phase Station detection logic.
Corresponding alerts, alarms, and faults associated with this pin shall be redefined to align with the new Single-Phase Station functionality.
Existing alarms/faults associated with Leakage Earth Detection on PLC2-A6 shall be revised or disabled.

Parameter	Contact Status	PLC2 A6 Pin
Single Phase Station	Signal High 0 V DC	PLC2 – A6 = Low

PLC 2 A6 pin Low = 0 Received in the I/O Status

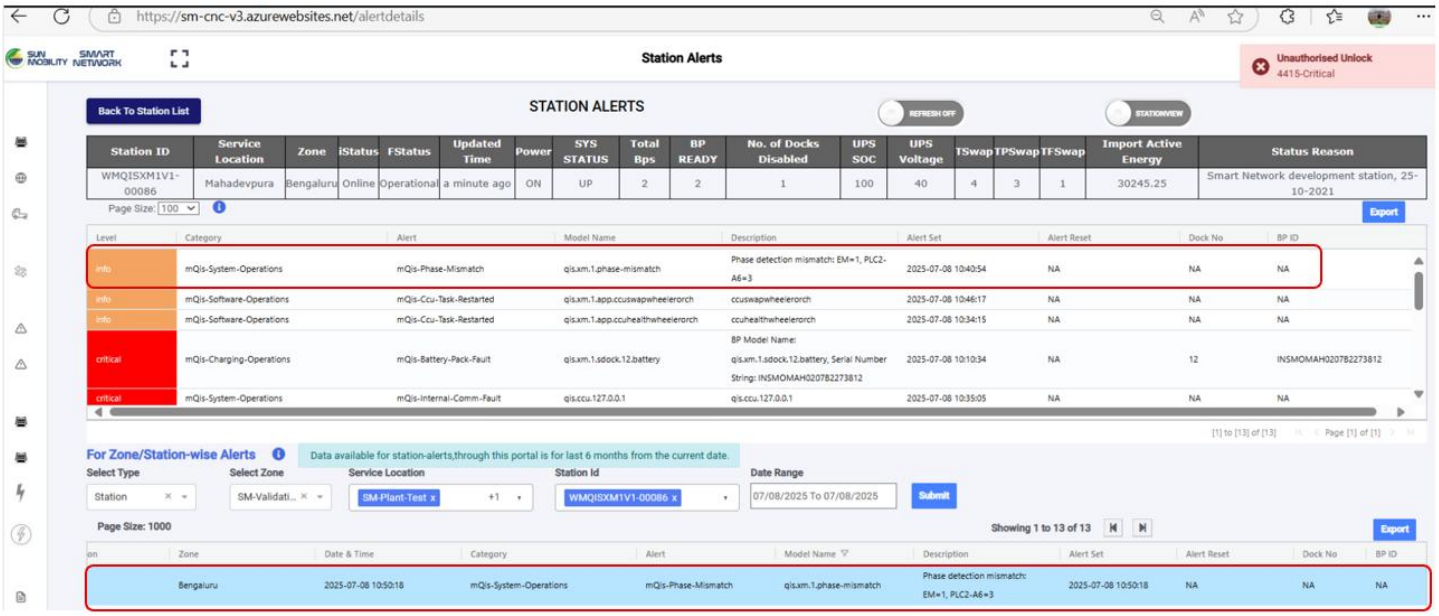
PLC2 I/O Status								
A0	Config Jumper	0	D0	Hooter o/p	-1	R0	MCCB Coil	-1
A1	Emer S/w f/b	1	D1	Dock Lock1 o/p	-1	R1	Dock Dis Relay1	-1
A2	FireEx f/b	1	D2	Dock Lock2 o/p	-1	R2	Dock Dis Relay2	-1
A3	SmokeDet f/b	1	D3	Dock Lock3 o/p	-1	R3	Dock Dis Relay3	-1
A4	Back Door sw f/b	0	D4	Dock Lock4 o/p	-1	R4	Dock Dis Relay4	-1
A5	Ethernet port f/b	1	D5	Dock Lock5 o/p	-1	R5	Dock Dis Relay5	-1
A6	ELR f/b	0	D6	Dock Lock6 o/p	-1	R6	Dock Dis Relay6	-1
A7	MCCB trip f/b	1	D7	Dock Lock7 o/p	-1	R7	Dock Dis Relay7	-1
A8	Contact On f/b	1	D8	Dock Lock8 o/p	-1	R8	Dock Dis Relay8	-1
A9	L.B Relay f/b		D9	Dock Lock9 o/p	-1	R9	Dock Dis Relay9	-1
A10	L.B Mux Relay f/b		D10	Dock Lock10 o/p	-1	R10	Dock Dis Relay10	-1
A11	L.B Fan1 f/b		D11	Dock Lock11 o/p	-1	R11	Dock Dis Relay11	-1
A12	L.B Fan2 f/b		D12	Dock Lock12 o/p	-1	R12	Dock Dis Relay12	-1
A13	HVAC Trip f/b	1	D13	Dock Lock13 o/p	-1	R13	Dock Dis Relay13	-1
A14	WLS f/b	1	D14	Dock Lock14 o/p	-1	R14	Dock Dis Relay14	-1
A15	UV/OV, LVM f/b	1	D15	Dock Lock15 o/p	-1	R15	Dock Dis Relay15	-1
I16	LEL sensor f/b	NA	D16	L.B Main Discahrge Relay	-1			
I17	SPB f/b	NA	D17	L.B Fan1 supply	-1			
I18			D18	L.B Fan2 supply	-1			
IN0			D19	FDSS solenoid o/p	-1			
IN1			D20	SMPS Relay o/p	-1			
12V			D21		NA			
24V			D22		NA			
OVL			D23		NA			
RST			GND		GND			

Alarm and Faults

EM Detection	PLC signal Detection	System Behaviour	Action
Single Phase	Single Phase	OK	NA
Single Phase	Three Phase	Contactor Trip (No Charging & No Cooling)	Raise an Alert

When the EM Detected as 1- Phase & PLC Signal Detected as 3-Phase, we received the Alert in CNC and Kibana.

CNC and Kibana data are mentioned below.



Kibana Data:

Time	sunmccu-data.alert-message.text-message	sunmccu-recordType	sunmccu-data.alert-message.modelName	sunmccu-data.alert-message.state	sunmccu-data.alert-message.alertId	sunmccu-txIdKey	@timestamp
July 8th 2025, 10:50:05.512	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751952005-512720	July 8th 2025, 10:50:05.512
July 8th 2025, 10:49:52.728	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951992-728375	July 8th 2025, 10:49:52.728
July 8th 2025, 10:49:40.693	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951980-693740	July 8th 2025, 10:49:40.693
July 8th 2025, 10:49:27.907	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951967-907585	July 8th 2025, 10:49:27.907
July 8th 2025, 10:49:15.870	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951955-870847	July 8th 2025, 10:49:15.870
July 8th 2025, 10:49:15.870	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951955-870847	July 8th 2025, 10:49:15.870
July 8th 2025, 10:49:03.841	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951943-841003	July 8th 2025, 10:49:03.841

RCCB Trip Logic Updates:

RCCB_2

Station (CCU) shall monitor Charger groups 4 to 6 and 10 to 12, along with the HVAC system. If all chargers within these groups fail to communicate and the HVAC status at PLC_2 is unavailable, the CCU shall declare RCCB_2 is tripped.

Req_02: HVAC Communication Dependency

The dependency on the HVAC system communication status shall be removed from the RCCB_2 Trip Detection Logic.

Req_01: RCCB_2 Trip Detection Logic

The CCU shall monitor communication status from the following charger groups:

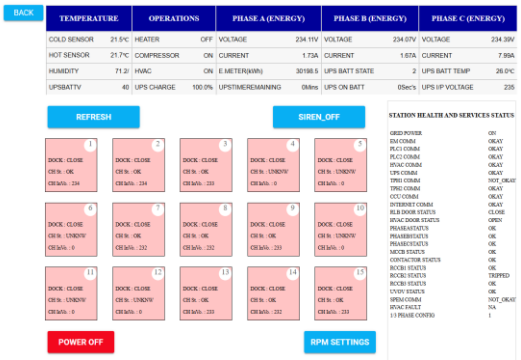
- **Group 4 to 6**
- **Group 10 to 12**

The CCU shall declare RCCB_2 as a trip if all chargers within these groups fail to communicate.

TC_14	Verify RCCB_2 trip logic without HVAC dependency	Station powered on, charger groups 4–6 and 10–12 are OFF	1. Disable chargers 4–6 and 10–12 2. Observe RCCB_2 trip status	RCCB_2 should be marked as tripped even if HVAC is ON		Pass

RCCB 2 Trip:

1. RCCB 2 Manually Chargers MCB's OFF. [Dock 4, 5, 6, 10,11,12 is OFF]
2. In the UI RCCB 2 is a trip. [UI took around 6 minutes approximately to show RCCB 2 Trip in the UI]
3. In the Admin UI RCCB 2 is shown Fail/Unknown.
   Dock 4, 5, 6, 10,11,12 is OFF [Took around 1 minute time to display in Admin window].

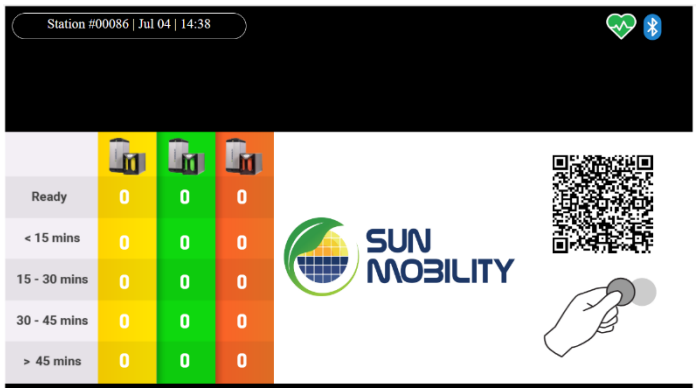


UI Status of RCCB 2

Verification of RCCB_2 does not trip when HVAC is OFF, but Chargers are ON [Chargers 4-6 & 10-12]

TC_15	Verify RCCB_2 does not trip when HVAC is off but chargers are OK	HVAC turned off, all chargers in group 4–6, 10–12 are ON and communicating	1. Observe RCCB_2 trip status	RCCB_2 should not be declared as tripped		Pass

UI Status for RCCB 2:

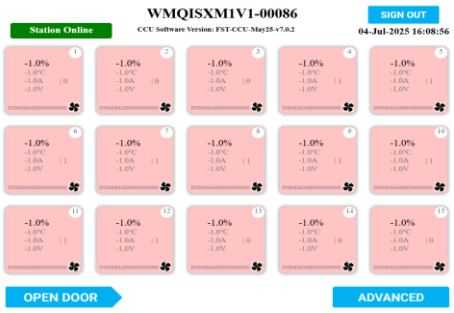


RCCB_1

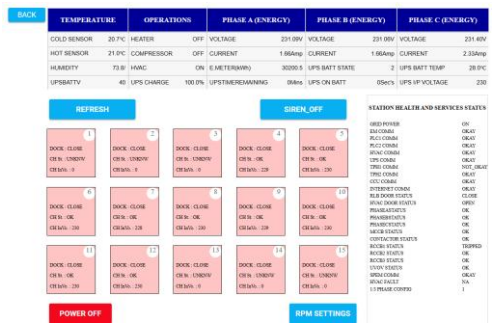
Station (CCU) shall monitor Charger groups 1 to 3 and 13 to 15. If all the chargers within these groups are not communicating, the CCU shall declare RCCB_1 is tripped.

TC_21	Verify Chargers MCB.1,2,3,13,14,15 is OFF	Station powered OFF. 1P supply connected.	1. Disable charger groups 1,2,3,13,14,15, 2. Monitor RCCB_1 status	RCCB_1 is marked as tripped due to communication loss, even if HVAC is fine		Pass

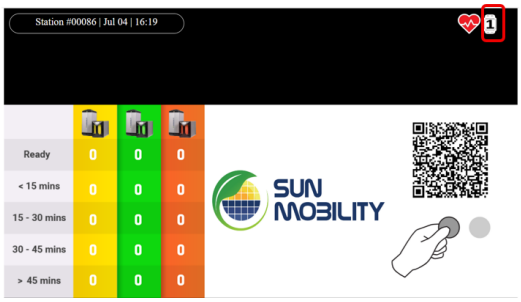
Admin Status:



Admin window:



UI Status: RCCB_1: Turn OFF 1,2, 3, 13,14,15 Chargers MCBs OFF



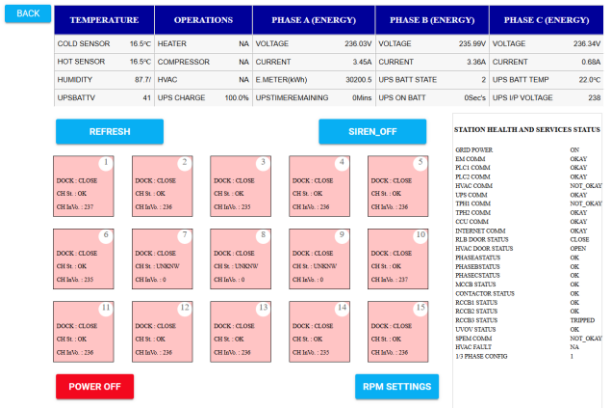
RCCB_3

The CCU shall monitor Charger group 7 to 9. If all the chargers within this group are not communicating, the CCU shall declare RCCB_3 is tripped.

Admin Status:

Admin: RCCB _3 Status Tripped when 7,8,9 +HAVC OFF

TC_17	Verify Chargers MCB 7,8,9+HVAC is OFF	Station powered OFF. 1P supply connected.	1. Disable charger groups 7,8,9 + HVAC 2. Monitor RCCB_3 status	RCCB_3 is marked as tripped due to communication loss, even if HVAC is fine		Pass



UI Status: RCCB_3

CNC Changes & UI Changes

Req_01: Advanced Screen and CNC Changes

UI on the Advanced Screen shall also be updated based on the Detection Logic of the Single-Phase Station and Three Phase Station.

Note: Here in this 1 phase & 3 Phase are not updated

SP_TC_013	Verify that the station detects Single Phase correctly based on EM and	Station powered OFF. 1P supply connected.	1. Connect Single Phase[1Phase] AC input 2. Power ON the	UI and CNC should display '1P Station' without any alarms	Fail		Need to implement in the CNC from SN team.

Components / Service Status	
CCU Comm	OKAY
UPS Comm	OKAY
HVAC Comm	OKAY
PLC1 Comm	OKAY
PLC2 Comm	OKAY
TPH1 Comm	OKAY
TPH2 Comm	OKAY
RLB Status	NOT_OKAY
Mains Power	OKAY
Chargers Comm	NOT_OKAY
RLB Door status	CLOSE
RLB Fan1 signal	NA
RLB Fan2 signal	NA
EnergyMeter Comm	OKAY
HVAC Door status	CLOSE
Water Level Sensor	OKAY
Internet Connection	OKAY
RCCB1 Status	RCCB_OK
RCCB2 Status	RCCB_OK
RCCB3 Status	RCCB_OK

Miss match detection:

Req_01:

Based on the Data of the EM Detection and the PLC Detection for the Single-Phase Station the flowing shall be considered.

1.If there is **Mismatch** in the EM Detection and the PLC Detection, then CCU shall identify this and Flag this as a Mismatch.

2.The Mismatch Flag shall pop up on the UI, indicating the mismatch and correcting the Switch Signal.

3.The mismatch condition shall be logged and indicated as a station-level alarm in: Kibana dashboards.

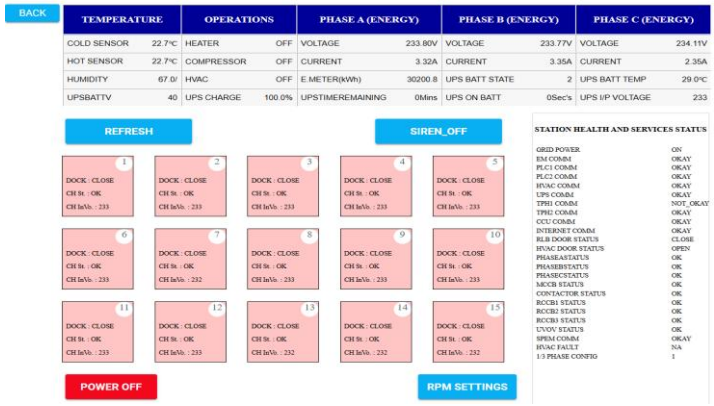
CNC under the Station Alerts section.

The contents of the alarm shall have the Time Stamp, EM Detection Status & PLC Detection Status.

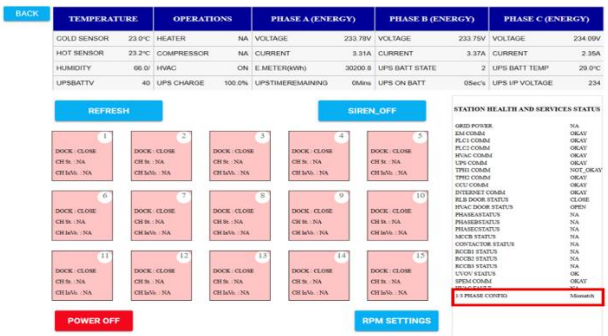
Single Phase 1 = Low:

TC_11	Verify correct alarm logging for mismatch	Mismatch condition already raised	1. Open CNC/Kibana 2. Check station-level alert log	Logs should contain timestamp, EM detection, and PLC detection values		Pass

Initial Status of the Phase In the admin window:

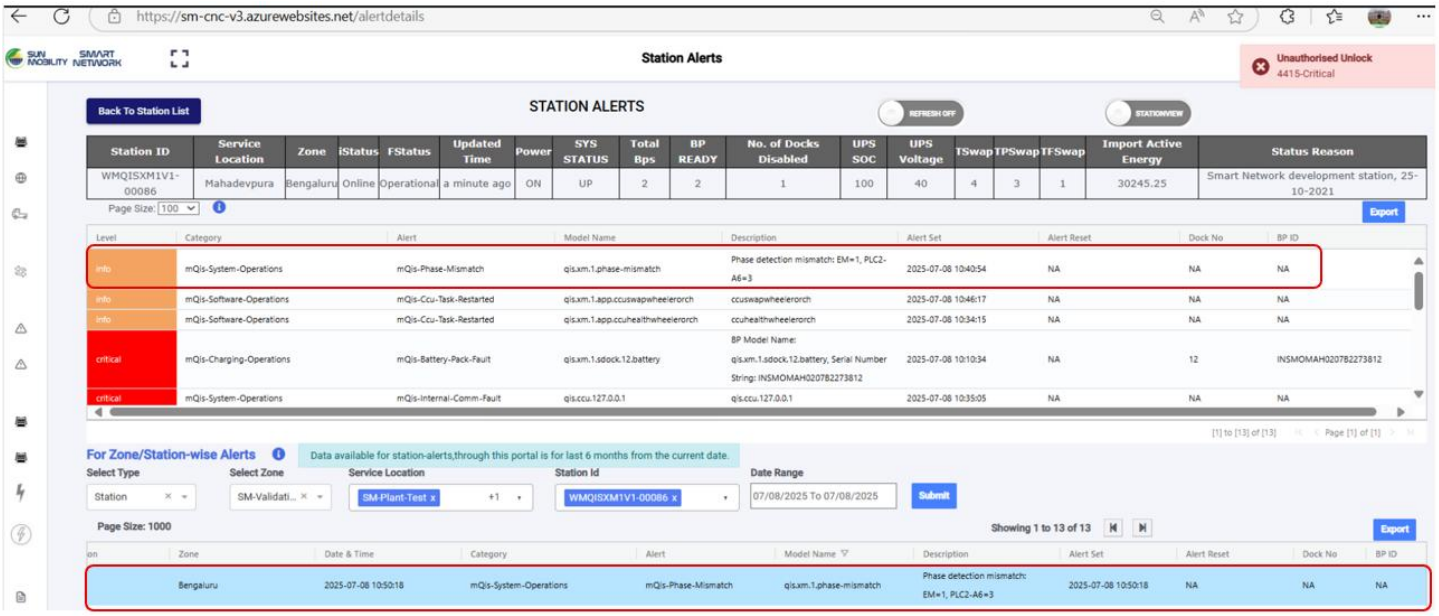


Miss match In the Phase detection Observed:



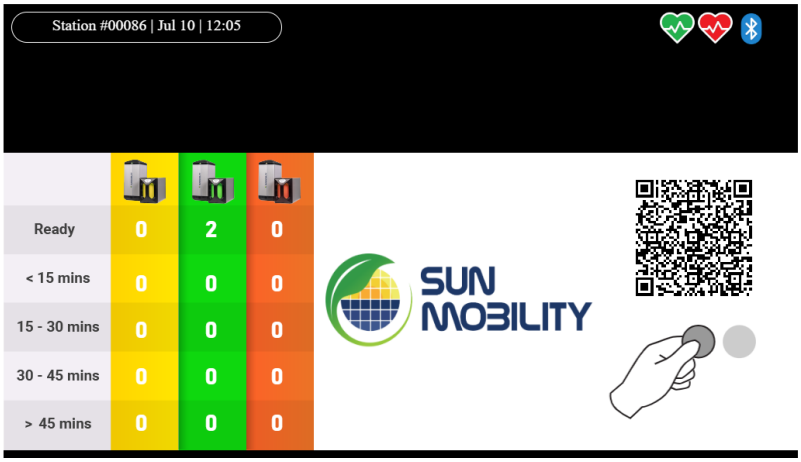
Mismatch UI Status:

CNC & Kibana Data:

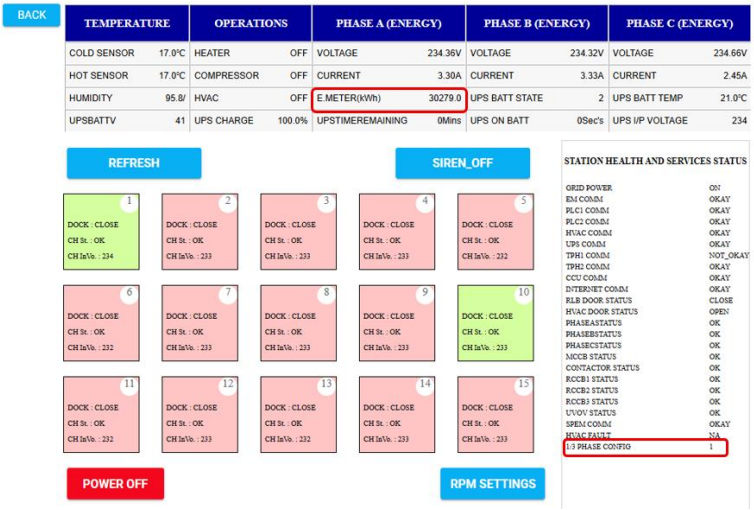


Time	sunmccu-data.alert-message.text-message	sunmccu-recordType	sunmccu-data.alert-message.modelName	sunmccu-data.alert-message.state	sunmccu-data.alert-message.alertId	sunmccu-txIdKey	@timestamp
July 8th 2025, 10:50:05.512	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751952005-512720	July 8th 2025, 10:50:05.512
July 8th 2025, 10:49:52.728	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951992-728375	July 8th 2025, 10:49:52.728
July 8th 2025, 10:49:40.693	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951980-693740	July 8th 2025, 10:49:40.693
July 8th 2025, 10:49:27.907	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951967-907585	July 8th 2025, 10:49:27.907
July 8th 2025, 10:49:15.870	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951955-870847	July 8th 2025, 10:49:15.870
July 8th 2025, 10:49:15.870	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951955-870847	July 8th 2025, 10:49:15.870
July 8th 2025, 10:49:03.841	Phase detection mismatch: EM=1, PLC2-A6=3	WHEELER-ALERT	qis.xm.1.phase-mismatch	set	mQis-Phase-Mismatch	1751951943-841003	July 8th 2025, 10:49:03.841

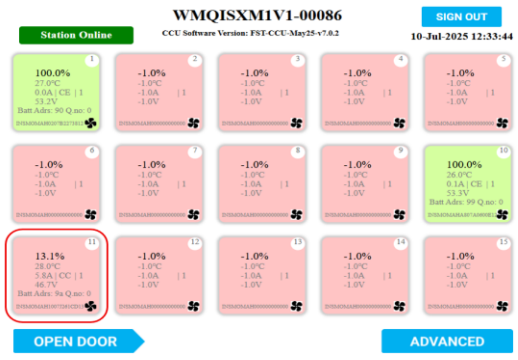
Verify Energy consumption for 1 BP Charging: [13% to 100% charging with KWHr check]



Energy Meter Reading In the UI Before Start the test in the Single-Phase Station.

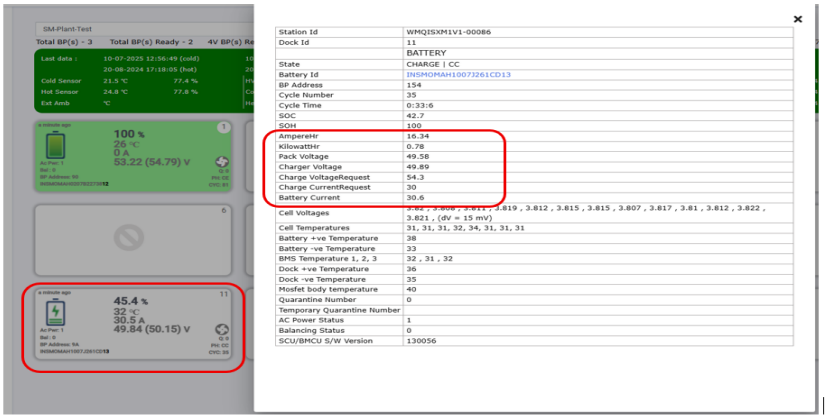


Battery is inserted in the 11th Dock, The BP is already charged 13 %

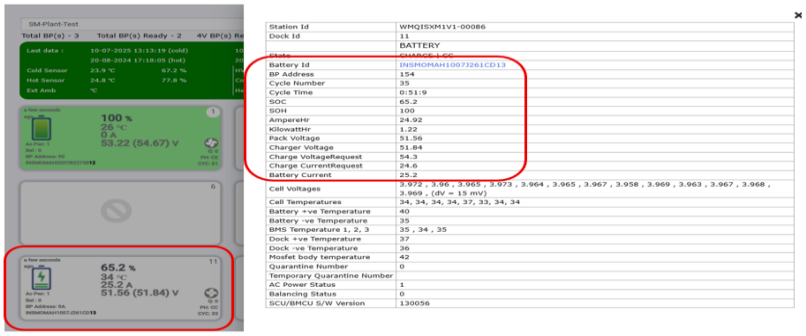


Intermediate Charging Information: SOC 13%,45% ,65%,100%; took around 1.82 Kwhr Energy for completion of 1 BP Charging.

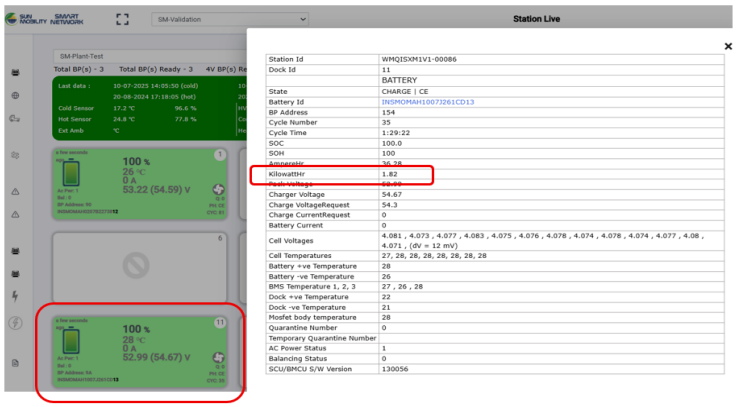
From [0% to 100%] it will take 2.2 Kwhr Energy for completion of 1 BP



Station Id	WMQISXM1V1-00086
Dock Id	11
	BATTERY
State	CHARGE | CC
Battery Id	INSMOMAH10073261CD13
BP Address	154
Cycle Number	35
Cycle Time	0:33:6
SOC	42.7
SOH	100
AmpereHr	16.34
KilowattHr	0.78
Pack Voltage	49.58
Charger Voltage	49.89
Charge VoltageRequest	54.3
Charge CurrentRequest	30
Battery Current	30.6
Cell Voltages	3.821 , (dV = 15 mV)
Cell Temperatures	31, 31, 31, 32, 34, 31, 31, 31
Battery +ve Temperature	38
Battery -ve Temperature	33
BMS Temperature 1, 2, 3	32 , 31 , 32
Dock +ve Temperature	36
Dock -ve Temperature	35
Mosfet body temperature	40
Quarantine Number	0
Temporary Quarantine Number	
AC Power Status	1
Balancing Status	0
SCU/BMCU S/W Version	130056



Station Id	WMQISXM1V1-00086
Dock Id	11
	BATTERY
Battery Id	INSMOMAH10073261CD13
BP Address	154
Cycle Number	35
Cycle Time	0:51:9
SOC	65.2
SOH	100
AmpereHr	24.92
KilowattHr	1.22
Pack Voltage	51.56
Charger Voltage	51.84
Charge VoltageRequest	54.3
Charge CurrentRequest	24.6
Battery Current	25.2
Cell Voltages	3.969 , (dV = 15 mV)
Cell Temperatures	34, 34, 34, 34, 37, 33, 34, 34
Battery +ve Temperature	40
Battery -ve Temperature	35
BMS Temperature 1, 2, 3	35 , 34 , 35
Dock +ve Temperature	37
Dock -ve Temperature	36
Mosfet body temperature	42
Quarantine Number	0
Temporary Quarantine Number	
AC Power Status	1
Balancing Status	0
SCU/BMCU S/W Version	130056



Station Id	WMQISXM1V1-00086
Dock Id	11
	BATTERY
State	CHARGE | CE
Battery Id	INSMOMAH10073261CD13
BP Address	154
Cycle Number	35
Cycle Time	1:29:22
SOC	100.0
SOH	100
AmpereHr	36.28
KilowattHr	1.82
Pack Voltage	54.43
Charger Voltage	54.67
Charge VoltageRequest	54.3
Charge CurrentRequest	0
Battery Current	0
Cell Voltages	4.081 , 4.073 , 4.077 , 4.083 , 4.075 , 4.076 , 4.078 , 4.074 , 4.078 , 4.074 , 4.077 , 4.08 , 4.071 , (dV = 12 mV)
Cell Temperatures	27, 26, 28, 28, 28, 28, 28, 28
Battery +ve Temperature	28
Battery -ve Temperature	26
BMS Temperature 1, 2, 3	27 , 26 , 28
Dock +ve Temperature	22
Dock -ve Temperature	21
Mosfet body temperature	28
Quarantine Number	0
Temporary Quarantine Number	
AC Power Status	1
Balancing Status	0
SCU/BMCU S/W Version	130056

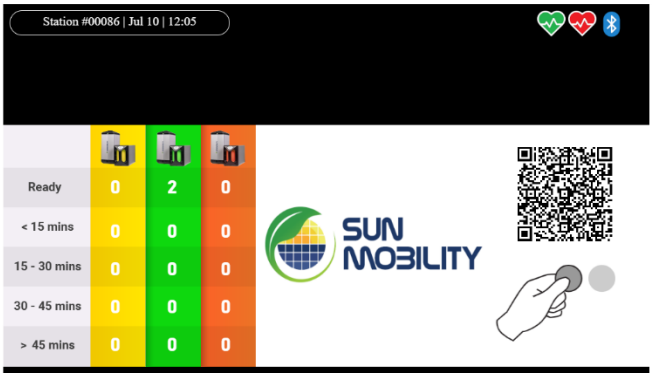
BDD Charging data is available here …with Kwhr for 1 BP

https://sm-bdd-tool.azurewebsites.net/dashboard/assets/live-data

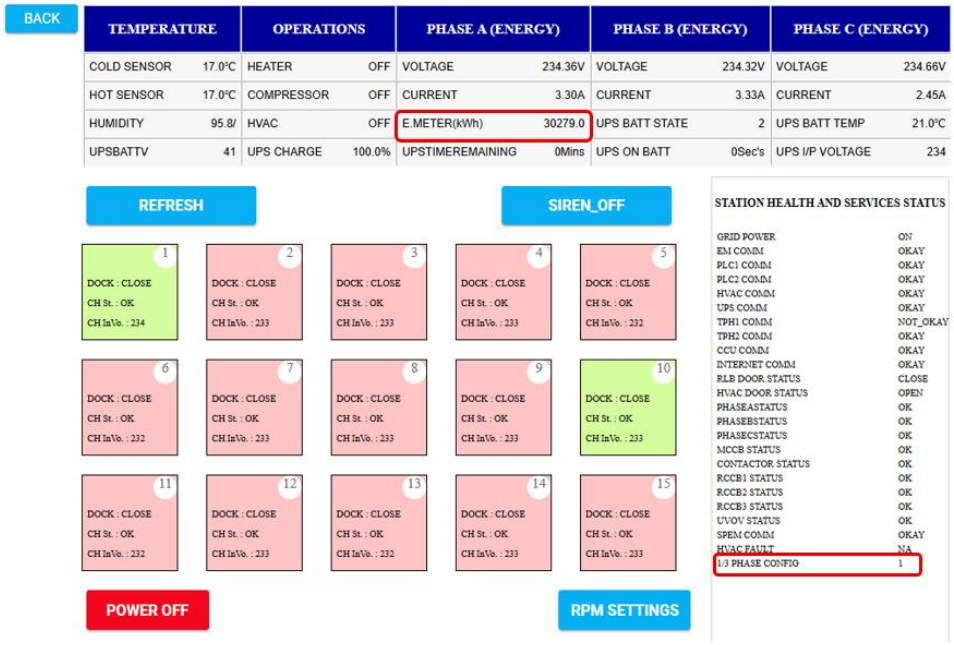
Swap: [Single Phase]

TC_17	Verify swap operation is not blocked in Single Phase	Station running on 1P input	1. Attempt to perform a BP swap 2. Monitor system behavior	Swap should proceed successfully if no other blocking faults		Pass

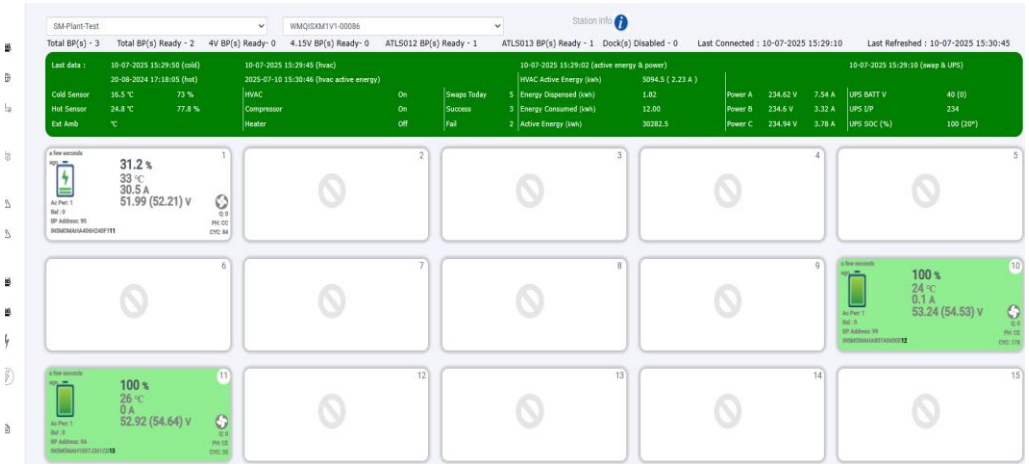
UI Status Before Swap:



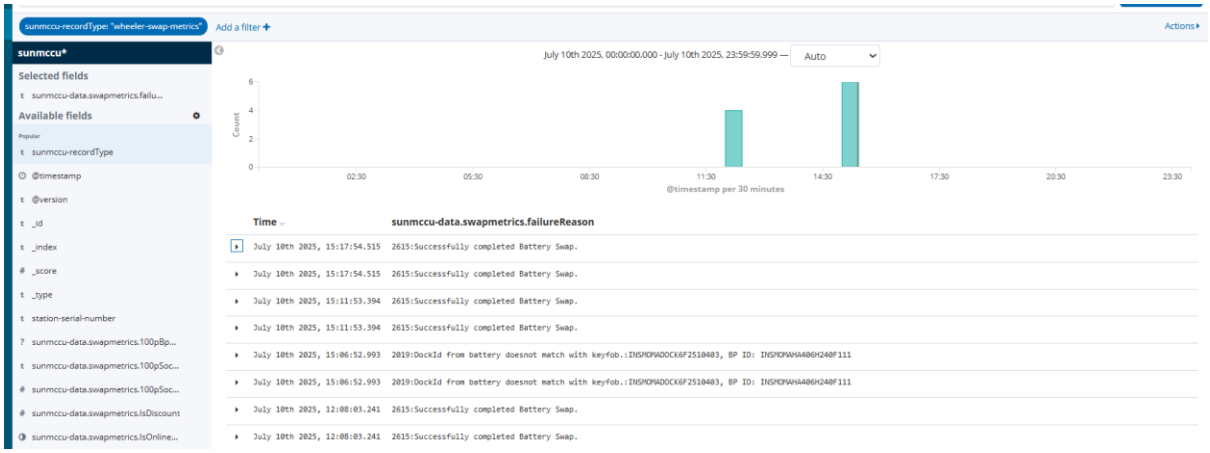
Admin window Status: Single phase:



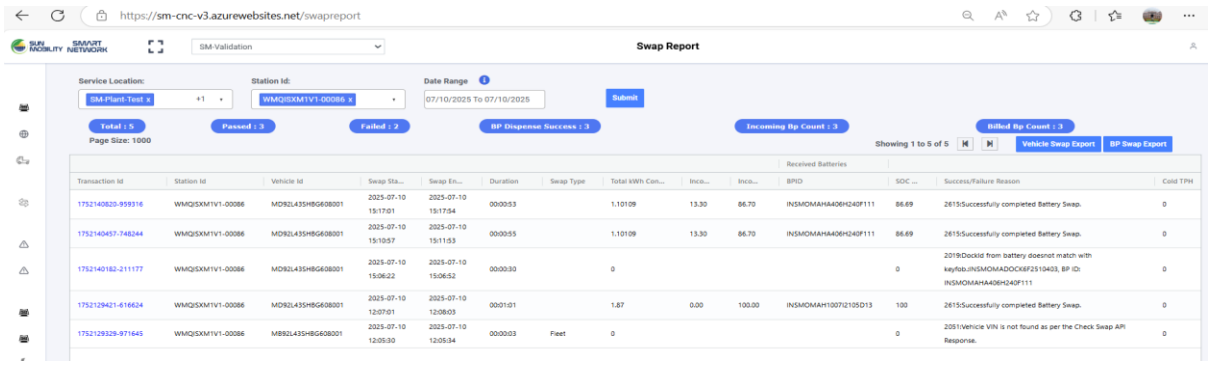
CNC Status:

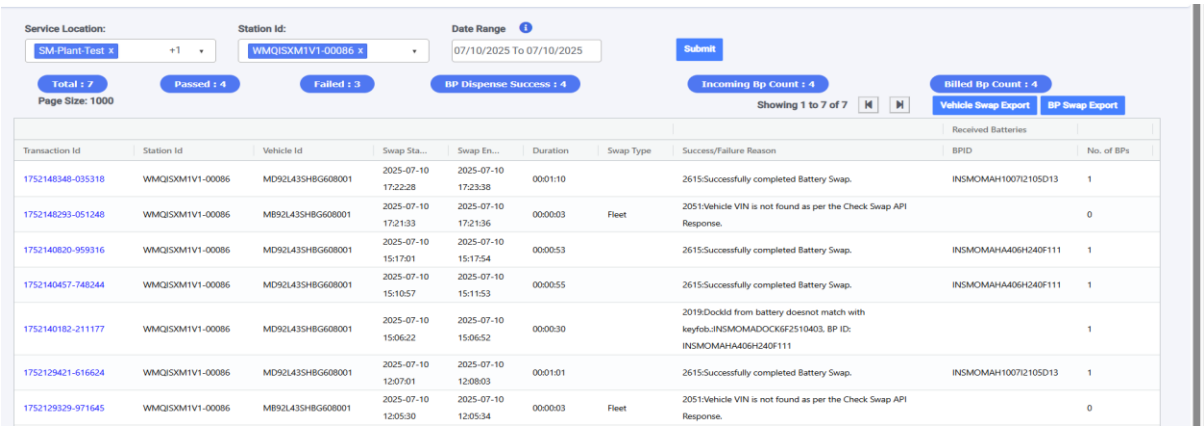


Kibana Status:



CNC Data Swipe Successful:





SWAP Working as Expected for 1 BP: PASS

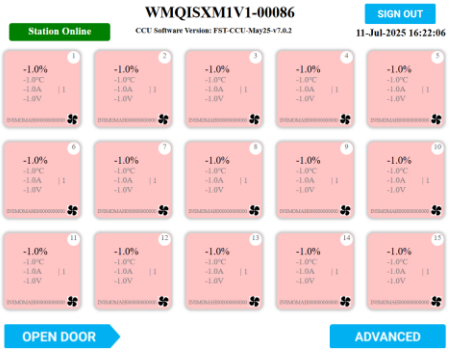
UPS Single Phase - Battery Not Charging, BPs Dispense on swap.

July 10th 2025, 17:22:5	WHEELER-ALERT	1752148377-740320	Main Power grid fails in the mQis Station	set	mQis-Grid-Fails	-

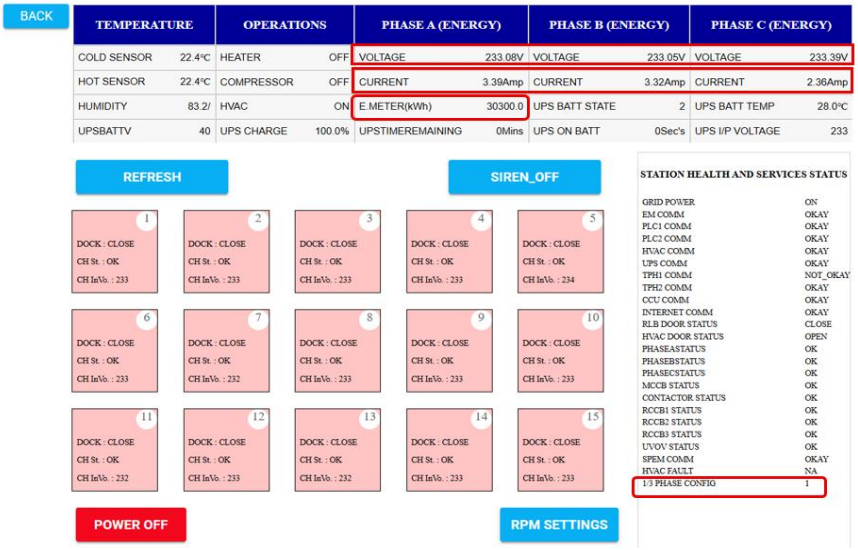
SP_TC_026	Verify system behavior when main power is OFF, UPS is running, and battery is not charging.	The system is connected to a Single-Phase UPS. Main power supply is turned OFF. UPS is actively supplying power to the system (running on battery). Battery is not charging (simulated fault or real scenario). The system/station is powered ON through UPS. Previously charged BPs (Battery Packs) are loaded in the dispenser.	Verify main power status Confirm UPS is running and powering the system. Check battery charging status in UPS software/interface. Try dispensing a BP Observe system stability over time (e.g. 15-30 mins). Monitor system alerts or logs	Main power should be detected as OFF System should remain ON, powered by UPS. Battery should show Not Charging. System should allow dispensing from already charged BPs System remains ON and functional until UPS battery drains. Alert for "Battery not charging" or "Running on battery" should be triggered	Pass

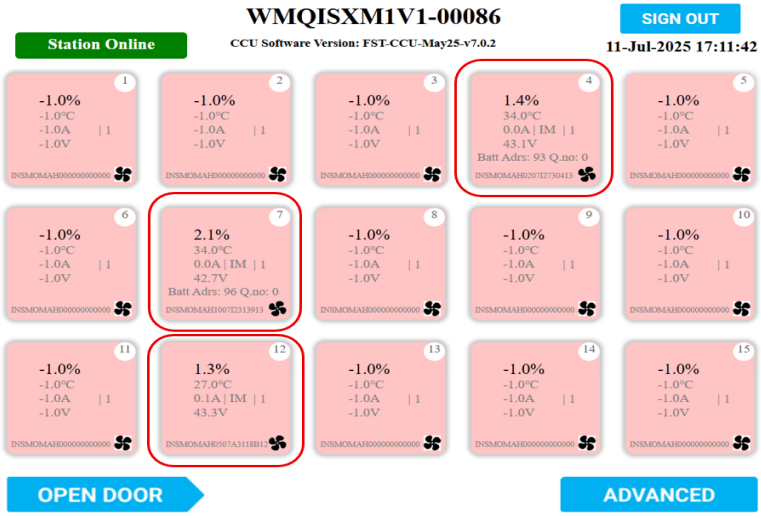
Validate energy consumption reported by the meter when charging Row 1, Row2, and Row 3 chargers charging 3 Bps simultaneously from 0 – 100%.

Before Start the test Admin Screen Status:



Before Start the test Energy Meter Reading in the UI: 30300.0 kwh





CC Mode:

While Charging:

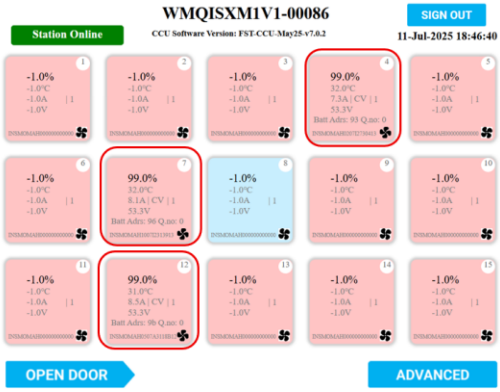
BACK

TEMPERATURE		OPERATIONS		PHASE A (ENERGY)		PHASE B (ENERGY)		PHASE C (ENERGY)	
COLD SENSOR	24.9°C	HEATER	OFF	VOLTAGE	230.14V	VOLTAGE	230.10V	VOLTAGE	230.43V
HOT SENSOR	25.0°C	COMPRESSOR	OFF	CURRENT	6.63Amp	CURRENT	6.83Amp	CURRENT	7.21Amp
HUMIDITY	72.7/	HVAC	ON	E.METER(kWh)	30301.5	UPS BATT STATE	2	UPS BATT TEMP	31.0°C
UPSBATTV	40	UPS CHARGE	100.0%	UPSTIMEREMAINING	0Mins	UPS ON BATT	0Sec's	UPS I/P VOLTAGE	230

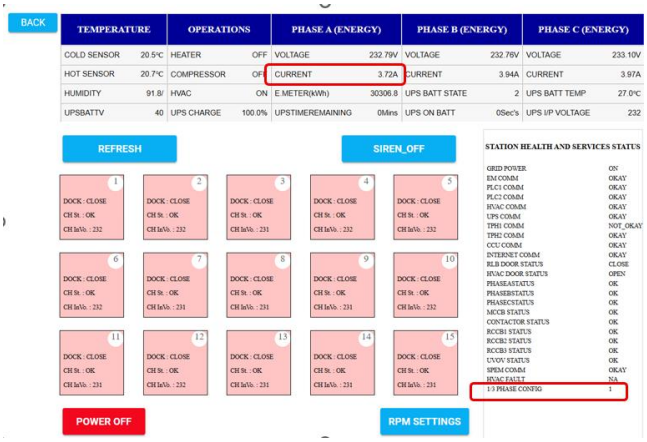
Note:

99.0% Charging Reached from that time to 100% took around 10 minutes time.

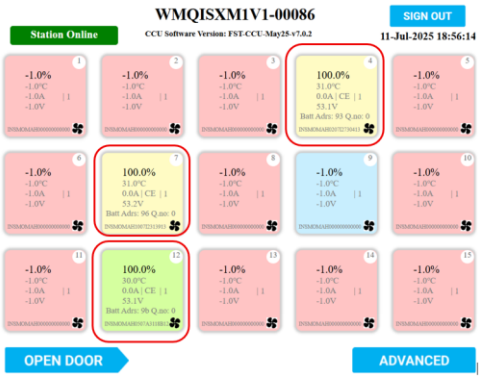
Charge 99%, Time: 18:46:40



Energy Meter Reading:



100% Charge duration: Time: 18:56:14



Energy Consumed for 3 BPs Charging:

Start Energy Meter Reading: 30300.8 Kwhr

End Energy Meter Reading: 30307.0 Kwhr

Sunmccu-recordType SPEM-PERIODIC-METRICS

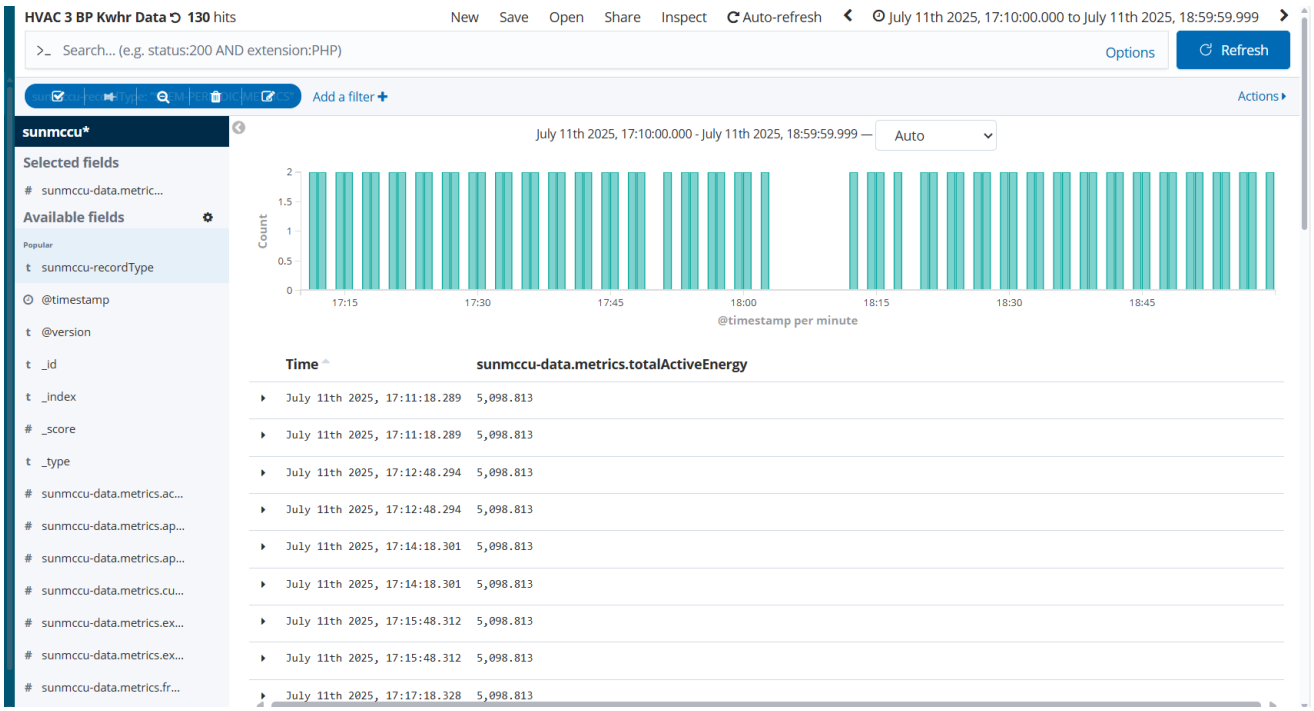
HVAC Single Phase kwhr Consumption:

Verified HVAC Kwhr Consumption when 3 BPS are Charging.

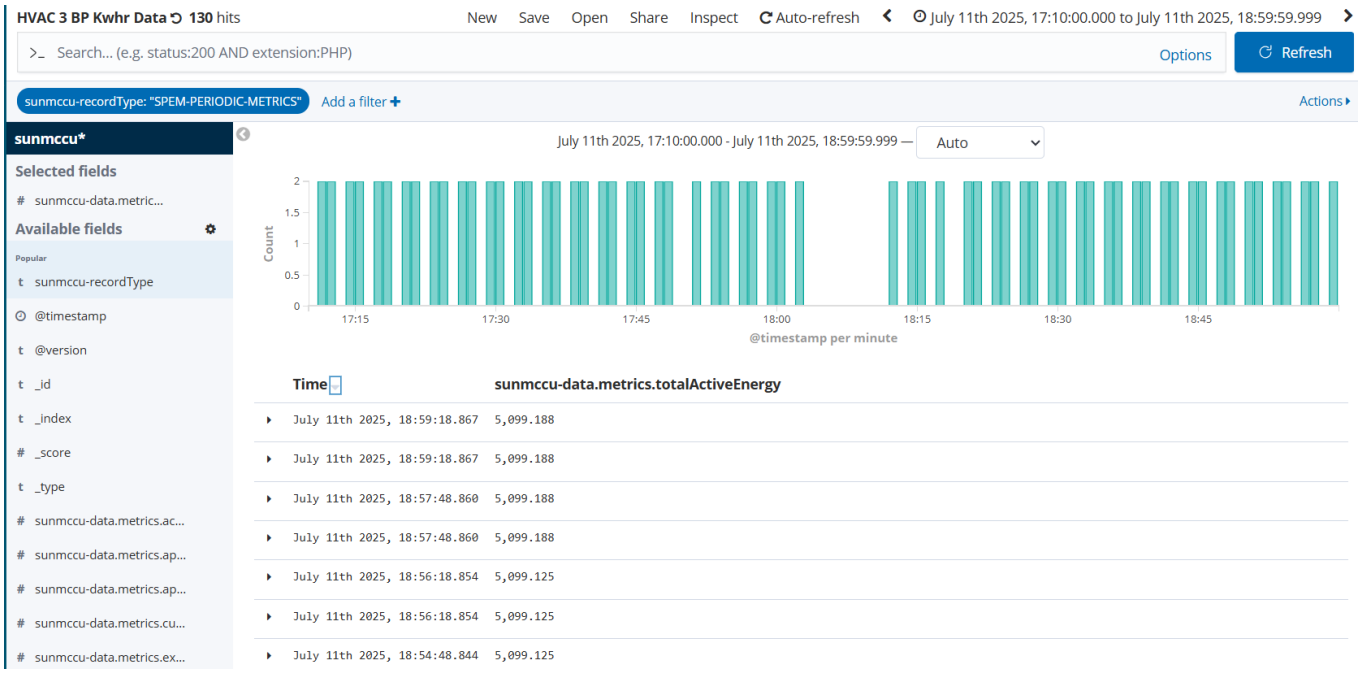
Start Time: 17:11:18.289 Total Active Energy = 5,098.813 Kwhr

End Time: 18:59:18:867 = 5,099.188 Kwhr

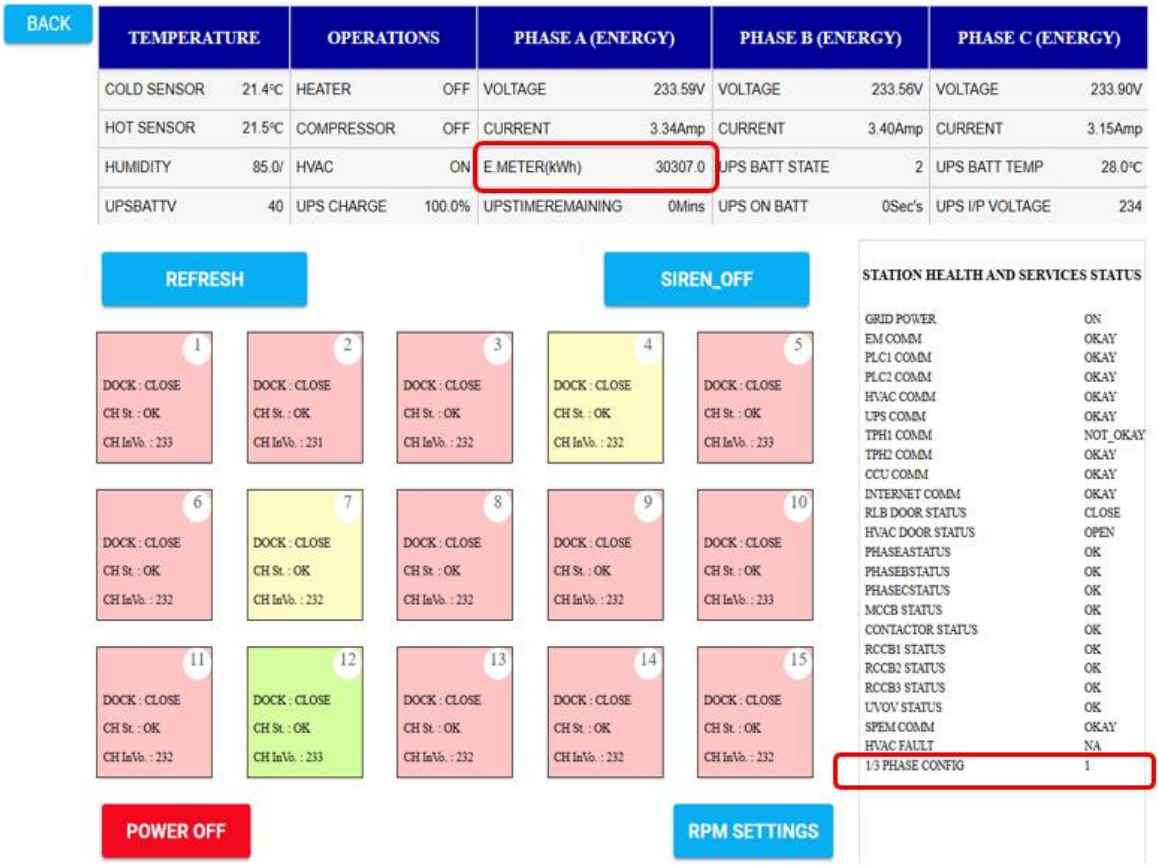
Total Energy consumed only HVAC is = 1.6 Kwhr


HVAC 3 BP Kwhr Data 130 hits
New Save Open Share Inspect Auto-refresh July 11th 2025, 17:10:00.000 to July 11th 2025, 18:59:59.999
Search... (e.g. status:200 AND extension:PHP)
Options Refresh
Add a filter
Actions
sunmccu*
Selected fields
sunmccu-data.metric...
Available fields
sunmccu-recordType
@timestamp
@version
_id
_index
_score
_type
sunmccu-data.metrics.ac...
sunmccu-data.metrics.ap...
sunmccu-data.metrics.ap...
sunmccu-data.metrics.cu...
sunmccu-data.metrics.ex...
sunmccu-data.metrics.ex...
sunmccu-data.metrics.fr...
July 11th 2025, 17:10:00.000 - July 11th 2025, 18:59:59.999 — Auto
Count
@timestamp per minute
Time
sunmccu-data.metrics.totalActiveEnergy
July 11th 2025, 17:11:18.289 5,098.813
July 11th 2025, 17:11:18.289 5,098.813
July 11th 2025, 17:12:48.294 5,098.813
July 11th 2025, 17:12:48.294 5,098.813
July 11th 2025, 17:14:18.301 5,098.813
July 11th 2025, 17:14:18.301 5,098.813
July 11th 2025, 17:15:48.312 5,098.813
July 11th 2025, 17:15:48.312 5,098.813
July 11th 2025, 17:17:18.328 5,098.813

End Time:


HVAC 3 BP Kwhr Data 130 hits
New Save Open Share Inspect Auto-refresh July 11th 2025, 17:10:00.000 to July 11th 2025, 18:59:59.999
Search... (e.g. status:200 AND extension:PHP)
Options Refresh
sunmccu-recordType: "SPEM-PERIODIC-METRICS"
Add a filter
Actions
sunmccu*
Selected fields
sunmccu-data.metric...
Available fields
sunmccu-recordType
@timestamp
@version
_id
_index
_score
_type
sunmccu-data.metrics.ac...
sunmccu-data.metrics.ap...
sunmccu-data.metrics.ap...
sunmccu-data.metrics.cu...
sunmccu-data.metrics.ex...
July 11th 2025, 17:10:00.000 - July 11th 2025, 18:59:59.999 — Auto
Count
@timestamp per minute
Time
sunmccu-data.metrics.totalActiveEnergy
July 11th 2025, 18:59:18.867 5,099.188
July 11th 2025, 18:59:18.867 5,099.188
July 11th 2025, 18:57:48.860 5,099.188
July 11th 2025, 18:57:48.860 5,099.188
July 11th 2025, 18:56:18.854 5,099.125
July 11th 2025, 18:56:18.854 5,099.125
July 11th 2025, 18:54:48.844 5,099.125

Admin Window: Energy Meter Reading



Battery Inserted Battery Number:
INSMOMAH0207I2730413
INSMOMAH1007I2313913
INSMOMAH0507A3118B12

6.Tools /Dashboards:

- Kibana – For monitoring logs.
- CNC- For Verifying swaps.
- Excel-For entering data manually.
- Docker -For monitoring station data.

7.Test Environment:

- Tested in pre-Prod (Stage).

8.Conclusion:

- The functionality has been verified and is working as expected. The feature is cleared and ready for production deployment.