#### **PROBLEM Description:**

In the ESS System, when there is a stable situation with exceeding energy - Bulk Charging is working well – but as soon as the batteries are sufficiently charged to switch to absorption, the Multiplus is flapping between absorption and inverter (discharge) mode in intervals of 10sec to 1 minute and with amplitudes up to +/- 10 Amps. I would expect a stable absorption mode with constant voltage and decreasing current for the configured absorption time of 2 hours – but no negative current at all.

ON AC side there is no device with fast changing power consumption which could cause this situation. Battery measurement is done with a smart shunt and on the CX device Smart Shunt is shown as "auto selected". If the BMS is expected as a root cause: The BMS of the LIFEPO4 Batterie is not communicating with the Victron System and the BMS is not showing errors and has no disconnects in the loggings. Even when the BMS was bridged, the problem did not disappear - see elimination test on #3.

Content of this document:

# 1: I have done some measurements on a sunny day on 2021-21-31

#2: measurements bulk mode and no exceed energy on 2022-01-14

# 3: I have done some elimination tests on 2022-01-14 (disconnect MPPT, disconnect BMS, disconnect Fronius Inverter, disconnect Multiplus).

# 4: System Parameters

1. Measurements on 2021-12-31





31.12.21 12:12

27.12.21 15:00 – Exceeding Energy – but Discharging!



Amplitude and frequency of this behaviour is not constant – sometime current is in the range between + 1 Amp and – 1 Amp, sometime current is flapping between + 10A and – 10 A in a 10 sec interval – (see 12:39 - 12:40).





#### AC Input Power [276]

---- Input power 1 (W) ---- Input power 2 (W)

🛶 Input power 3 (W) 🛛 🛶 Total

Solar Charger Battery Voltage and Current - PV 48V 3500Wp [279]

- Voltage (V) - Current (A)









### 2. Tests on 2022 - 01 - 14

In this situation there was no exceed energy – ESS had to regulate according to the gridpoint.

Bulk charging worked well even when PV production was changing because of cloudy weather and changing AC loads.

2022-01-14 14:50:



## 3. Tests on 2022 - 01 - 14

**Process of elimination:** 

(Test was done 30 min after reaching first time absorption mode – and a stable situation with exceeding energy).



a. Bridging BMS at 14:01  $\rightarrow$  no change in behaviour

b. Disconnect MPPT von 14:03 – 14:07
 → no change in behaviour



c. Change of interval and amplitude at 14:16 – reason unknown (AC load did not change at that time):





14:27

55.56 V

14:25

#### d. Switch off Fronius PV Inverter 14:18 – 14:30 – no change in behaviour

-10.3 A

14:30



e. Switch off MULTIPLUS 14:35 -14:40

## For unknown reason DC voltage rises by 1 Volt

In this situation the MPPT was no longer in "external control mode" and in consequence of the deactivated multiplus the MPPT was regulating down the power.

The absorption voltage in the settings of the MPPT is identical to the ESS settings of the Multiplus, which is relevant when MPPT is in external control mode.



f. After switching on Multiplus again – strong flapping of DC voltage/ current





at 14:53 deactivate MPPT Charge and reactivate  $\rightarrow$  still flapping but smaller amplitudes.

# 4. Systemconfiguration

Battery LIFEPO4 16S 280 AH with DALY BMS

Daly BMS is not communicating with Victron – DALY would disconnect in case of threshold exceeded for Cell Voltage min / max.

Mulitplus II 48/3000 35-32 with ESS mode enabled - only AC input connected

Fronius Symo Gen24 8 kw 3 phase AC connected with 9 kwp Solar Panels

Victron Smartmeter for measurement of Grid Power

Cerbo CX Device

Battery shunt BMV 500 A

Victron MPPT 150/70 with Solar Panels 3,5 kwp

General Gild Inverter Charger Vitual switch Assistants	General Gild Inverter Charger Vitual switch Assistants
System frequency	Grid code selection TOR Erzeuger Typ A grid code settings
6 50Hz	Country / and code standard
Shore imit	Austria: TDR-Erzeuger A V1.1:2019-12
AD input current limit 16.0 A 🔽 Overruled by remote	
<ul> <li>Dynamic current limiter</li> <li>External current senecr connected (see manual)</li> </ul>	Loss Off Mains (LOM) detection LOM detection AC input 1 Type B (grid code compliant) 💌
Enable battery monitor     State of charge when Bluk finished 95.0 %	Note: Click here for more info on LOM.
Battery capacity 290 Ah	
Charge efficiency 1.00	
Ix Ix	
Seneral UID Inverter Charger Virtual switch Assistants	General Gind (Invertor) Charger Virtualswitch Assistants
End code selection I UH Lizeuger Typ A grid code settings	Inverter output voltage 230 V
Han Anni an diabha Eanda ainm 177	Countries 20
	DC input low shut-down 46.40 V 🔽 shul-down on SDC
Max AC current 100.0 % of INom	DC input low restart 43.00 y SOC low shut-down 10.0 %
Limit generated apparant power to 100.0 % of rated power	DC input low nie alam 49.00 v SOC low restart Z0.0 %
Normal connect	
waiting time 60 s powernate, 100% per 600.0 s	Do not restart after short-circuit (PDE 25 (0-2 safety)
Low frequency 47.500 Hz High frequency 50,100 Hz	T mahir AES
Low voltage 85.00 % Un High voltage 109.00 % Un	stor 4Es waan lood lover han 69 W
Recorded after two	Step 4Eb when load 46 W Indhenthem stem level
Reconnect after hip	otao ABb water load 46 // Indepitient stars lovel
Reconnect after hip weiting time 300 ≈ power tate. 100% per 600.0 ≈	Step AEs with loss 46 // higher them step lovel
Reconnect after trip weiting time 300 c power rate, 100% per 600.0 c Low frequency 47.500 Hz High frequency 50.100 Hz	$\begin{bmatrix} \text{Also Also weakload} & \textbf{46} & \text{if holise transition level} \\ & \text{Also base} & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & \\ \hline \textbf{C} & \text{matrixed sine wave} & & & & & \\ \hline \textbf{C} & matrixed sine wave sine sine wave sine sine sine sine sine sine sine sin$
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Reconnect after hip waiting time 300 ≈ power rate, 100% per 600.0 ∗ Low frequency 47.500 Hz High frequency 50.100 Hz Low votage 85.00 % Un High votage 109.00 % Un	Stop Abbit viewentlops 46 // Indirection stem lovel
Reconnect after hip         waiting time       300       >       power tate. 100% per       600.0       >         Low frequency       47.500       Hz       High frequency       50.100       Hz         Low votage       85.00       % Un       High votage       109.00       % Un         IP protection	Stop Abbit washing at the second standard standa

General Grid Inverter Chorgon Vitual switch Assistants	General Glid Inverter Charger Vituo switch Assistants
P Enable charger Baltery type	Usage
Weak AC input     No corresponding default     Stop after excessive buk	Specily virtual switch usage :
Ethium balteres	C drive multilunctional (aux.) relay: VS or=open, VS olf=close
Configured for VE.Bus BMS	🔿 ignore AC input VS on=ignore; VS off=do nol ignore
Charge curve Fixed	C dedicated ignore AC nput
Absorption voltage 55.60 V Repeated absorption time 1.00 Hr	C drive aux relay (VS pr-open) + dedicated ignore AC input
Float vokage 55.20 V Repeated absorption interval 7.00 Days	C ignore AC input (VS on=ignore) + dedicated generator control
Charge current 35 A Absorption time 2 Hr	? Нер

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ESS (Energy Storage Syste		
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<	ESS	19:26	<	System setup	19:25
Mode	Optimized (	vithout BatteryLife)	System name		ESS
Grid metering		External meter	AC input 1		Grid
Inverter AC output in use			AC input 2		Not available
Multiphese regulation		Tatal of all phases	Monitor for grid failure	2	Disabled
Multiphase regulation		lotal of all phases	Battery monitor		Automatic
Minimum SOC (unless grid	d fails)	10%	Auto selected: SmartS	hunt 500A/50mV on	VE.Direct
Limit charge power			<u> 네</u> Pages	~ :	≡ Menu
Maximum charge power		3500W			
Limit inverter power					
Grid setpoint		OW			

Batteriemonitor

## ← Batterieeinstellungen

Batteriekapazität	280Ah
Spannung wenn Aufgeladen	54.2V
Entladungsboden	50%
Schweifstrom	3.00%
Zeit f. Ladezustandserkennung	3m
Peukert-Exponent	1.03
Ladewirkungsgrad	99%
Strom Schwellwert	0.10A
Durchschnittliche Restlaufzeit	3m
Batterie startet synchronisiert Ladezustand nach Zurücksetzen ist 100%	-
Ladezustand Manuelles Einstellen des aktuellen Ladezustan	ndes 76.6%
SOC auf 100% synchronisieren SYNCH	IRONISIEREN
Nullstromkalibrierung	KALIBRIERE

# MPPT Solar Charger

← Einstellungen	
Batteriespannung	48V 👻
Max Ladestrom	70A
Ladegerät aktiviert	-
Batterievoreinstellung	Benutzerdefiniert 👻
Expertenmodus	-
Ladespannungen	
Absorptionsspannung	55.60V
Erhaltungsspannung	55.00V
Ausgleichsspannung	Deaktiviert
Bulk	
Re-Bulk-Spannungsoffset	0.40V
Absorption	
Absorptionsdauer	Fest
Absorptionszeit	2h 0m
Schweifstrom	0.1A
Ausgleichung	

Ausgleichung	
Ausgleichsstrom in Prozent	0%
Automatischer Zellenausgleich	Deaktiviert
Ausgleichsstoppme Automatisch, an	n Spannung 👻
Maximale Ausgleichsdauer	0m
Manueller Zellenausgleich	JETZT STARTEN
Spannungskompensation	
Temperaturkomnpensation	Deaktiviert
Batteriegrenzwerte	
Abschalten bei niedriger Temperatur	5°C
← Lastausgang	

#### Lastausyany

Betriebsmodu BatteryLife

Only "Always on" and "Always off" modes take effect instantly, the other modes have a two minute delay.

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