As requested I've started looking at the ESS (again) to try and document the benefit and how to get it.

Let me start by writing that this will limited to the results based on the settings. I'm not going to get into how to load the ESS Assistant in the Multiplus. Victron has plenty of information on how to load an
Assistant. https://www.victronenergy.com/live/ess:start

Let me also emphasize again that neither Victron nor AMSolar recommend or support running the ESS Assistant in an Off-Grid system that can be connected to shore power. (They believe it may be possible to inadvertently backfeed the power grid--a no no. Backfeeding is not possible in my setup for many reasons I won't belabor here--just be aware that this is an unsupported setup.)

Part 1: Why ESS?

What you'll see in this post is a screenshot of the settings as displayed on my CCGX (Color Control GX) and the actual flow of power as also shown on the CCGX for a given setting. There's a note explaining what's going on at that time.

NO ESS ASSISTANT

The ESS configuration is changed on the CCGX under **SETTINGS** > **ESS**.

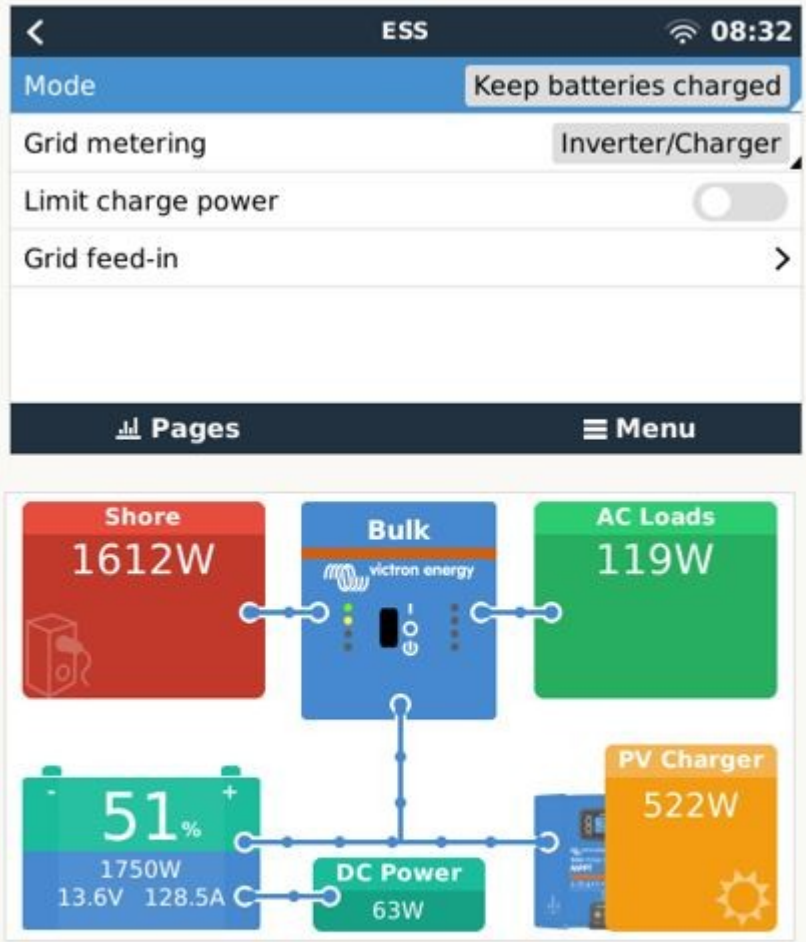
With a battery state-of-charge <100% and shore power connected, as currently configured without the ESS Assistant the batteries attempt to charge as quickly as possible from all possible power sources. I don't prefer this method because there is (normally) plenty of solar power (PV) available during the day to charge up my batteries. If the batteries charge quickly from shore power, PV available later in the day is not utilized--a waste. As you'll see later this is similar to the ESS Assistant mode ***Keep Batteries Charged***.

No ESS Assistant.

ESS Assistant Loaded, Mode = Keep Batteries Charged

There are four ESS modes: ***Optimized (With Battery Life)***, ***Optimized (Without Battery Life)***, ***Keep Batteries Charged*** and ***External***. I use ***Optimized (Without Battery Life)*** and ***Keep Batteries Charged*** depending on my usage scenario. (Battle Born batteries don't need the "with battery life" configuration as their Battery Management System (BMS) takes care of itself. I don't remember what "External" is used for--there's info in the ESS manual if you're curious.)

Below is what happened with ***Keep Batteries Charged*** selected.



ESS ***Mode*** is ***Keep batteries charged***. Shore power is being tapped to recharge batteries as quickly as possible.

ESS Assistant Mode Optimized (Without Battery Life)

In the picture below the ***Minimum SOC (unless grid fails)*** means that PV will be utilized to recharge the batteries (and support ***AC Loads*** and ***DC Power*** requirements) before tapping ***Shore*** power. Since the Minimum SOC setting is 25% and the battery SOC is 51%, the PV Charger is providing almost all the power to the trailer. The 45W from ***Shore*** will be explained shortly.

Shore power will stay at or near 40W because of the ***Grid setpoint*** shown below if there is ***Shore*** power available and if the battery SOC is above the ***Minimum SOC (unless grid fails)*** setting.

Grid setpoint 40W. This keeps the shore power connection "alive" even when there is sufficient PV power. I chose 40W...could be more, could be a bit less.

ESS Assistant -- ESS #1

ESS #1? That means the *SOC is low* per the Victron ESS manual. An example shown below. Note the settings that triggered ESS #1

Battery SOC (51%) is near ***Minimum SOC (unless grid fails)*** setting (50%), so state is ***ESS #1***. ***AC Loads*** supported by ***Shore*** power. ***PV Charger*** power going to batteries.

There's more but this is all for this post.

Howard
Last edited by howson; Yesterday, 05:35 PM.

Part II of ***Why ESS?***

In all the scenarios in post 53 PV was being utilized, but in some cases not leveraged to it's maximum since shore power (if allowed) would quickly charge the batteries and then available PV is left untapped. Even worse, without the ESS Assistant when the batteries are full *PV is ignored if Shore is available*.

In the graphic below the ESS Assistant is not loaded, Shore power is available, and the batteries are at 100%. A residential refrigerator and a dehumidifier are running thus there's ~450W AC Load going through the Multiplus. *Note the PV Charger's output is 0 even though the sun is shining and it's nearly noon*. This is not good--especially when the Shore power being consumed is paid for by yours truly!

No ESS Assistant loaded. Note that even though PV is available all power is coming from Shore!

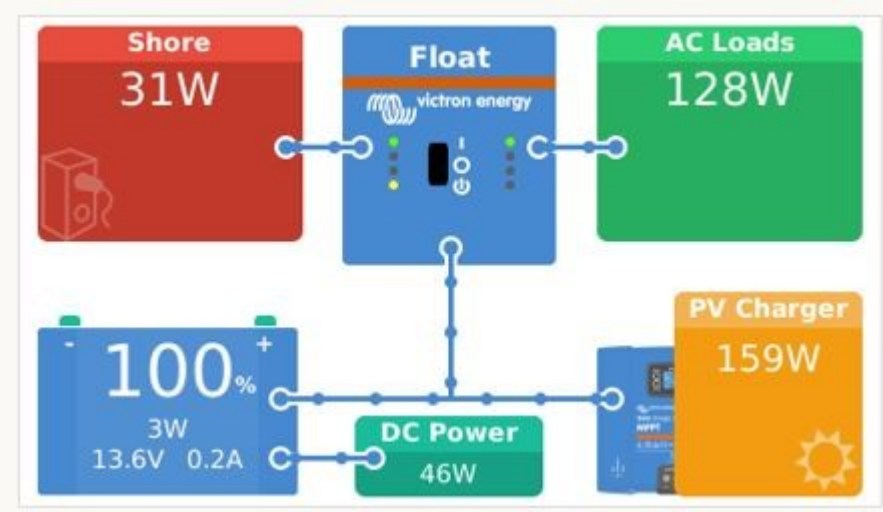
The Multiplus is in Absorption mode due to system reconfiguration...really should be in Float and will be if left for 30 minutes (the time I've got mine set for Absorption). Also note the batteries are not accepting any charge (BMS has shut off incoming charge), an indication the *batteries* are in Float, even if the Multiplus isn't.

The pic below was captured moments later after reconfiguring the Multiplus with the ESS Assistant. *Now the PV Charger is providing all the power to the trailer and the only money I'm paying to Gulf Power is the amount to keep the 30W Shore line "awake"*. (The refrigerator compressor may have kicked off thus the lower AC Load.)

What you see below is why all the time and effort to learn about the ESS Assistant was worth it (to me).

ESS Assistant loaded and mode is ***Optimized (without Battery Life)***. ***Grid setpoint*** = 30W. The ***PV Charger*** is supplying all required power to trailer as available PV >= ***AC Loads*** + ***DC Power***

Below is with just the residential refrigerator running and a few odds and ends in the trailer. The PV Charger is taking care of business and providing all the power.



So now let's discuss what happens when the sun goes down.

Obviously PV will drop to 0 but the residential refrigerator will still draw power. Currently my system is configured as shown below. The Minimum SOC (unless grid fails) percentage I've chosen is arbitrary--easily could be different as desired by each user.

So what does this all mean? How will the system react when the sun goes down?

What will happen is the battery bank will supply power to the inverter for the AC Loads until the battery SOC reaches 45%. Then Shore will be prioritized. (If Shore fails obviously the batteries will continue to power the trailer until exhausted.)

In the morning when the sun comes up and PV Charger power is available, power is

sent to the batteries and AC Loads. As long as the batteries are charging the PV Charger output is the *maximum the solar panels can generate*. When the batteries are at 100% the maximum the PV Charger will generate is the AC Loads requirement (up to the maximum the solar panels can generate).

One more scenario: as you saw in post 53, if the batteries are at (or near) the Minimum SOC setting (*ESS #1*), Shore power kicks in to ensure the battery SOC doesn't drop further.

Head hurt yet? I hope not...

SUMMARY

Without ESS Assistant the power prioritization is:
A) SHORE
B) PV / BATTERY

With the ESS Assistant the power prioritization is:
1) Battery Bank > Minimum SOC setting and mode ***not*** Keep Batteries Charged
A) PV
B) Battery Bank
C) Shore
2) Battery Bank <= Minimum SOC setting and mode ***not*** Keep Batteries Charged
A) SHORE + PV

SO WHAT?

So how do I use the ESS Assistant in the real world?

If I'm at a paid-for commercial campground, the ESS Assistant is set to ***Keep Batteries Charged***. No sense using my system and cycling my batteries if I've paid for electricity.

At home or "moochdocking" I use ***Optimized (without Battery Life)***. Honestly I'm still messing with the Minimum SOC--during the winter 50% was about as low as I could go and still power the minimum items in the trailer and expect the batteries to recharge during the day (with the low-in-the-sky, weak sun).

Final thought (anticipating a comment or question): *Won't using the ESS Assistant and constantly charging/disccharging the Battle Born batteries wear them out?* My

response? *I hope so!* The batteries are rated for ~3,000 cycles. If I wear out the batteries (before I wear out) I'll have gotten the maximum use out of them. (If the average is one cycle per day, that's 8 years worth of battery usage! I hope my 315RLTS lasts 8 years...) The Minimum SOC could be set at 95% and use very little battery power overnight, but still maximize PV Charger power during the day (to power AC Loads) if desired.

So there you have it. Hope these two posts were informational enough without being too wordy.

Howard