




## LPEA's Guide to Optimizing your EG4 Battery System

**Overview:** This document is designed to guide the programming of EG4 power control systems(i.e. Grid Boss) that are paired with battery storage. The intended audience is the system installer who is programming settings to qualify the member for LPEA's battery rebate and/or to maximize the member's financial savings from the use of batteries to avoid Peak Demand charges or On-Peak energy charges.

*Because EG4's interface allows for a high-level of customization, such as supporting many different grid-tied and off-grid configurations, and because many parameters are dependent on the Interconnection Agreement unique to the member, this document should be treated as a guide which may require modification, not a prescriptive solution. Additionally, system owners' goals around using the solar energy they generate, being prepared for outages, and supporting the grid may all influence optimal settings.*

The required settings for the [LPEA Battery Rebate](#) are explicitly shown in this guide with a  icon. If proof of the setting is required in the Battery Rebate application, you will see a  icon.

**Taking a screenshot of the Application Setting, Charge Setting and Discharge Setting boxes on the Maintenance page will capture all necessary information for LPEA's Rebate application.**

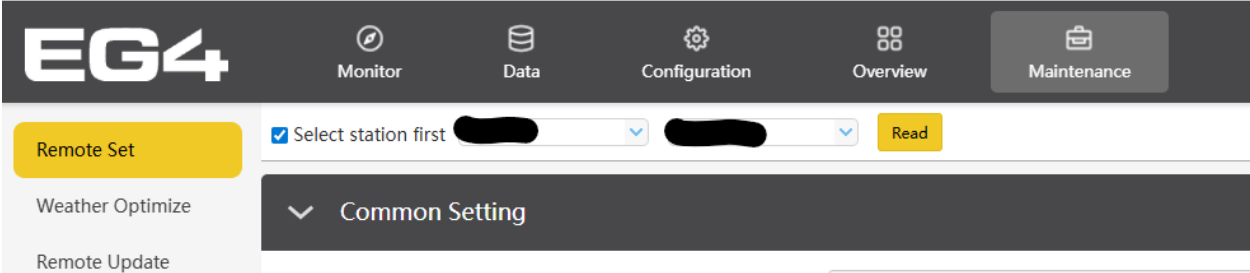
Additionally, there are several steps in this guide that have a  icon. This icon identifies situations where you need to choose how to operate the system based on your goals or the system's unique design.

If you are also applying for the [LPEA Bonus Battery Rebate](#) you will have a few additional actions in **Step 4**.



**Step-by-Step Instructions**

**Step 1. Log into EG4 web portal**

- 1. Select the Maintenance screen.
- 2. Select the appropriate Station and equipment (chosed the serial number for your power control system, i.e. *Grid Boss*) and then click Read. This will upload your current system settings.



## Step 2. Application Settings

In the **Application Settings** section, there are several settings that need to be enabled or disabled based on your Interconnection Agreement, system design, and goals.  You should read and understand what each of the settings does (click on  icon to learn more) and then choose what matches your Interconnection Agreement, system design, and goals. You are encouraged to reach out to EG4 and/or LPEA with questions about settings not specified below.

For any settings not specified below LPEA does not have requirements to participate in the Battery Rebate program. See the **blue** and **red** boxes in the image on the following page for relevant settings based on your Interconnection Agreement scenario.



Scenario 1: Typical Net-Metering with Unlimited Grid Export Allowed (blue boxes)

**Grid Sell Back:** Enable

**Grid Sell Back Power (kW):** AC Nameplate of PV System

Scenario 2: Net-Metering with Grid Export Limit Allowed (blue boxes)

**Grid Sell Back:** Enable

**Grid Sell Back Power (kW):** System Export Limit

Scenario 3: No Export Allowed (blue and red boxes)

**Grid Sell Back:** Disable

**Grid Sell Back Power (kW):** 0

**Fast Zero Export:** Enable




Application Setting


No Batteries (?)	Enable	Disable		
Power Backup (?)	Enable	Disable		
Grid Sell Back (?)	Enable	Disable		
Fast Zero Export (?)	Enable	Disable		
PV Arc (?)	Enable	Disable		
Grid Loss Warning Clear (?)	Enable	Disable		
Normal / Standby (?)	Normal	Standby		
Micro-Grid (?)	Enable	Disable		
System Charge SOC Limit(%)	101		Set	
Seamless EPS switching (?)	Enable	Disable		
Grid Sell Back Power(kW) (?)	12		Set	
Off-Grid Mode (?)	Enable	Disable		
PV Arc Fault Clear (?)	Clear			
RSD (?)	Enable	Disable		
Restart Inverter (?)	Restart			
Max. AC Input Power(kW) (?)	No limitation		Set	
System Charge Volt Limit(V)	59.5		Set	
Parallel System				
Set System Type (?)	1 Phase Master		Set	
Set Composed Phase (?)	Phase U	Phase U	Set	
Share Battery (?)	Enable	Disable		
Parallel Setting Data Sync (?)	Enable	Disable		

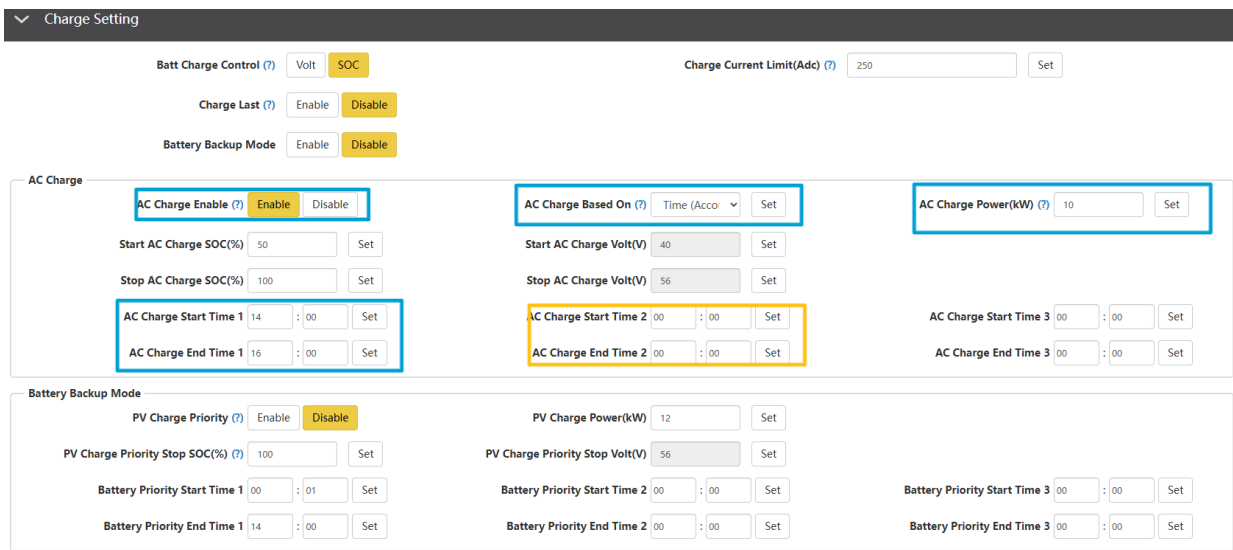
### Step 3. Charge Setting

To maximize the financial value of your battery system and its ability to support the grid, you want to ensure the batteries are fully charged by 4pm. *Although most days your batteries will charge from solar power, using the settings below will ensure your batteries are also fully charged from the grid when necessary, like on cloudy days or days when there is snow on the panels. This will help you minimize Peak Demand charges(or On-Peak energy charges) and help reduce LPEA's peak.*



- 1) Select “Enable” for **AC Charge Enable** setting.
- 2) Select “Time (According to)” for **AC Charge Based On** setting.
- 3) Enter “16:00” for **AC Charge End Time 1**.
- 4) Determine the optimal combination of **AC Charge Start Time 1** and **AC Charge Power (kW)** with consideration to the overall capacity of your battery in kWh and your **On-Grid Cut-Off SOC(%)**, which must be 30% or lower. 
  - a. *Most members choose to have the **AC Charge Start Time 1** as late in the afternoon as possible to allow for maximum solar charging and the AC Charge at the lowest necessary rate. 2 pm (14:00) is a commonly selected time.*
  - b. *Ex. In the picture below, the member has a 30-kWh battery and an **On-Grid Cut-Off SOC(%)** of 30. That means on a cloudy day where the battery is at its lowest possible charge, 30% or 9 kWh, they may need to add 21 kWh to achieve a full charge. If they allow a two-hour charge, from 14:00-16:00, they will need to have an **AC Charge Power** of 10.5 kW. In practice, members have reported the need for a slightly faster charge rate(~11.5kW) to achieve a full charge in this scenario.*

For Members on General Service rate, see [Blue boxes](#). Members on the TOU rate should read the text below. 



The screenshot shows a 'Charge Setting' interface with the following elements:

- Batt Charge Control:** Volt (selected), SOC (highlighted in yellow).
- Charge Current Limit(Adc):** 250 (Set).
- Charge Last:** Enable (selected), Disable (highlighted in yellow).
- Battery Backup Mode:** Enable (selected), Disable (highlighted in yellow).
- AC Charge Section:**
  - AC Charge Enable:** Enable (selected), Disable (highlighted in blue).
  - AC Charge Based On:** Time (Acco - dropdown), Set (highlighted in blue).
  - AC Charge Power(kW):** 10 (Set, highlighted in blue).
  - Start AC Charge SOC(%):** 50 (Set).
  - Stop AC Charge SOC(%):** 100 (Set).
  - Start AC Charge Volt(V):** 40 (Set).
  - Stop AC Charge Volt(V):** 56 (Set).
  - AC Charge Start Time 1:** 14 : 00 (Set, highlighted in blue).
  - AC Charge End Time 1:** 16 : 00 (Set, highlighted in blue).
  - AC Charge Start Time 2:** 00 : 00 (Set, highlighted in orange).
  - AC Charge End Time 2:** 00 : 00 (Set, highlighted in orange).
  - AC Charge Start Time 3:** 00 : 00 (Set).
  - AC Charge End Time 3:** 00 : 00 (Set).
- Battery Backup Mode Section:**
  - PV Charge Priority:** Enable (selected), Disable (highlighted in yellow).
  - PV Charge Power(kW):** 12 (Set).
  - PV Charge Priority Stop SOC(%):** 100 (Set).
  - PV Charge Priority Stop Volt(V):** 56 (Set).
  - Battery Priority Start Time 1:** 00 : 01 (Set).
  - Battery Priority Start Time 2:** 00 : 00 (Set).
  - Battery Priority Start Time 3:** 00 : 00 (Set).
  - Battery Priority End Time 1:** 14 : 00 (Set).
  - Battery Priority End Time 2:** 00 : 00 (Set).
  - Battery Priority End Time 3:** 00 : 00 (Set).

**?** Members who are on LPEA's TOU rate could elect to add a second window of charging in the very early morning to ensure they have sufficient energy to avoid On-Peak energy purchases from 6-9am. This would be accomplished by selecting an **AC Charge Start Time 2** and **AC Charge End Time 2** (orange box).

Just like the afternoon grid charge, the early morning grid charge duration will be dependent on the **AC Charge Power (kW)** selected and the amount of kWh that you want to add to the battery. Most members desire to only add enough energy so their batteries can meet all home energy needs from 6-9am and then finish with a low SOC% so that the batteries will then charge from solar. This may take some experimentation. As a starting point, try a 1-hr charge from 5:00-6:00 am. You want to ensure the **AC Charge End Time 2** is no later than 6:00.

#### Step 4. Discharge Setting

To minimize or eliminate use of the grid during Peak Demand hours (4-9 pm) or On-Peak times for TOU rates (6-9 am, 5-10pm) you will need to utilize the Peak Shaving settings.

- 1) Set **Batt Discharge Control** to “SOC” for State of Charge
- 2) Set the **On-Grid Cut-Off SOC(%)** to 30% or less. *This is the lowest SOC the battery will discharge to before going into a standby mode and resuming relying on the grid for home energy needs.*
- 3) In the Peak Shaving box, enable **Grid Peak-Shaving**. (Blue Box)
- 4) Set **Grid Peak-Shaving Power 1(kW)** to 0. (Blue Box) This number is the amount of power that your house will always be allowed to draw from the grid before also using energy from the batteries. *There are rare situations where a non-zero number would be better for you and the grid, typically situations where you have a very high energy need and relatively small battery capacity. Reach out to [communitypower@lpea.coop](mailto:communitypower@lpea.coop) if you think this might apply to you.*
- 5) Set the **Peak Shaving Start and End Time** values.
  - a. If you are on LPEA’s General Service rate set: (Blue Box)
    - i. **Peak Shaving Start Time 1:** 16:00
    - ii. **Peak Shaving End Time 1:** 21:00
  - b. If you are on LPEA’s Residential TOU rate set:
    - i. **Peak Shaving Start Time 1:** 16:00
    - ii. **Peak Shaving End Time 1:** 22:00
  - c. If you are on LPEA’s Residential TOU rate you will also want to enter a second time interval: (Orange Box)
    - i. **Grid Peak-Shaving Power 2(kW):** 0
    - ii. **Peak Shaving Start Time 2:** 6:00
    - iii. **Peak Shaving End Time 2:** 9:00

#### STEPS 6-9 ONLY APPLY TO MEMBERS WHO ARE ELIGIBLE FOR AND ARE PROGRAMING THEIR BATTERY TO EARN THE BONUS BATTERY REBATE (Red Box)

- 6) In the Forced Discharge box, enable **Force Discharge Enable**.
- 7) Set **Stop Discharge SOC(%)** at 50%.
- 8) Set **Forced Discharge Power(kW)** at a value that is the approximate average production from your PV system between 9:00-12:00. *As a rule of thumb, you can use 70% of the AC nameplate capacity.*
- 9) Set the **Forced Discharge Start and End Time 1** values.
  - a. **Forced Discharge Start Time 1:** 9:00
  - b. **Forced Discharge End Time 1:** 12:00

Reach out to [communitypower@lpea.coop](mailto:communitypower@lpea.coop) if you think you might need a variance from the specific values for Steps 7 and 8.



### Discharge Setting

<b>Batt Discharge Control (?)</b> Volt <b>SOC</b>	<b>Discharge Current Limit(Adc) (?)</b> 250 Set	<b>Start Discharge P_import(W) (?)</b> 100 Set
<b>On-Grid Cut-Off SOC(%) (?)</b> 30 Set	<b>Off-Grid Cut-Off SOC(%) (?)</b> 15 Set	
<b>On-Grid Cut-Off Volt(V) (?)</b> 40 Set	<b>Off-Grid Cut-Off Volt(V) (?)</b> 40 Set	

#### Forced Discharge

<b>Forced Discharge Enable (?)</b> Enable <b>Disable</b>	<b>Forced Discharge Power(kW) (?)</b> 12 Set	
<b>Stop Discharge SOC(%) (?)</b> 50 Set	<b>Stop Discharge Volt(V)</b> 40 Set	<b>PVSelfToGrid(Comp. w/ NEM3.0) (?)</b> Enable <b>Disable</b>
<b>Forced Discharge Start Time 1</b> 00 : 00 Set	<b>Forced Discharge Start Time 2</b> 00 : 00 Set	<b>Forced Discharge Start Time 3</b> 00 : 00 Set
<b>Forced Discharge End Time 1</b> 00 : 00 Set	<b>Forced Discharge End Time 2</b> 00 : 00 Set	<b>Forced Discharge End Time 3</b> 00 : 00 Set

#### Peak Shaving

<b>Grid Peak-Shaving (?)</b> <b>Enable</b> Disable	
<b>Grid Peak-Shaving Power 1(kW) (?)</b> 0 Set	<b>Grid Peak-Shaving Power 2(kW) (?)</b> 0 Set
<b>Start Peak-Shaving Volt 1(V)</b> 52 Set	<b>Start Peak-Shaving Volt 2(V)</b> 52 Set
<b>Start Peak-Shaving SOC 1(%)</b> 31 Set	<b>Start Peak-Shaving SOC 2(%)</b> 30 Set
<b>Peak Shaving Start Time 1</b> 16 : 00 Set	<b>Peak Shaving Start Time 2</b> 00 : 00 Set
<b>Peak Shaving End Time 1</b> 21 : 00 Set	<b>Peak Shaving End Time 2</b> 00 : 00 Set