



# SimpliPhi Power Battery

## INTEGRATION GUIDE: LUMIN SMART PANEL

Optimized Energy Storage & Management for Residential & Commercial Applications Utilizing Efficient, Safe, Non-Toxic, Energy Dense Lithium Ferrous Phosphate (LFP) Chemistry

# SimpliPhi Your Energy Security and Independence

and gain control of your own power.

SimpliPhi helps you manage your power as a personal resource. Anytime, anywhere, SimpliPhi energy storage systems optimize integration of any power generation source – solar, wind, generator – on or off grid and protects your home and mission-critical business functions from power outages and intermittency. SimpliPhi storage technology eliminates operating temperature constraints, toxic coolants and the risk of thermal runaway and fire. Safe lithium ferrous phosphate. No cobalt. No hazards.

SimpliPhi's battery technology utilizes the industry's most environmentally benign chemistry combined with proprietary architecture and power electronics (BMS) that eliminate the need for cooling or ventilation to create products that provide energy security and resiliency.

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*SimpliPhi Power offers proprietary, commercially available energy storage and management systems that are safe, non-toxic, reliable, durable, efficient, highly scalable, and economical over the lifetime of the PHI Battery*

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## 1.0 – Introduction

This Integration Guide covers the recommended set up and configuration of Lumin’s Energy Management Platform for optimizing performance with SimpliPhi PHI and AmpliPhi batteries. More information on SimpliPhi products can be found on our website: <http://simpliphipower.com/>.

Lumin® provides an intelligent energy management platform for the growing energy storage market. The patented, UL compliant, Lumin Smart Panel® and the smart algorithms and data assets behind it (Lumin Insights™) combine to intelligently automate home energy control and provide rich analytics to homeowners, installers, and utilities.

## 2.0 – Installation of Lumin Smart Panel

The LSP is compatible with both flush-mounted (i.e., set within drywall) existing electrical panels and surface-mounted electrical panels. Please determine which electrical panel type the LSP will be connecting to and follow the corresponding installation steps outlined in this manual. The LSP must be installed indoors. Please review the product’s technical ratings and specifications to confirm it is suitable for your application prior to installation.

NOTE: The LSP Circuit Label & CT Table (provided with the LSP) must be completed and delivered to the home/building owner upon the successful installation of the LSP. A completed LSP Circuit Label & CT Table is required in order for users to set up their Lumin account.



**CAUTION: The LSP Connects to dangerous voltages. The improper use or installation of the device can lead to serious or fatal injuries. Please observe the following safety precautions when installing the LSP.**

- The product must be installed by qualified personnel
- Review all the instructions before you start the installation
- Personal protective equipment should be worn when installing the product
- Do not use the product in any way other than its intended use
- Do not install or operate the product outdoors or in damp/wet conditions
- Do not install or operate the product in extreme temperatures
- Do not open, attempt to access, or touch any internal product parts
- Do not use the product if it is damaged or appears to be damaged
- Use only the wires and cables supplied with the product
- Do not connect the product to circuit breakers rated higher than 60 amps
- Adhere to all local and national safety regulations for installation and use

## 2.1 –Pre-installation circuit selection

The LSP is designed to provide the homeowner with the ability to remotely manage their electrical usage in both grid-tied and off-grid scenarios. The LSP allows the homeowner to utilize the existing circuit breaker panel as a protected-loads panel during grid outages. By automatically shedding unnecessary load circuits when an outage event occurs, Lumin keeps the overall demand on the energy storage system within specified limits. The LSP also provides the ability to modify which load circuits are activated or deactivated, in response to dynamic energy needs.

Each LSP is capable of controlling up to 12 single-pole circuits or 6 dual-pole circuits, up to 60 amps per line #1-6 (6-AWG) and up to 30 amps per line #7-12 (10-AWG), with a maximum 540 amps of total managed load current. When preparing to install the LSP, it is important to evaluate all available circuits to determine which circuits are most appropriate for integration with the LSP. Any circuits that are not connected through the LSP will not be controlled during an outage event. If additional circuit level control is required, multiple LSPs may be installed within the same location / user account.

### GENERAL CIRCUIT SELECTION CRITERIA & TIPS

- If the Lumin Smart Panel (LSP) will be used to loads greater than 60 amps, contact technical support for requirements.
- Multiple LSPs can be installed if the homeowner wishes to measure/control additional circuits
- If the LSP controls a circuit that supports an internet router, that circuit should be programmed to remain energized during an outage event.
- Verify each circuit is labeled correctly prior to connecting the LSP to any circuits.

### INSTALLATION SCENARIO: SOLAR + STORAGE ON THE MAIN DISTRIBUTION PANEL OR PROTECTECT LOADS PANEL

- Select any circuits that are greater than the storage system's max continuous power output and connect them to the LSP.
- Select any loads you may want to shed during an outage and connect them to the LSP. Ideally, these are large discretionary loads with breakers larger than 20 amps, which might be desirable in an outage but will not always be required.
- If any Lumin lines remain, select circuits to connect to the LSP, based on homeowner preference.
- Any circuits that are not connected to the LSP will be backed up by SimpliPhi by default. (Homeowners should use these loads sparingly)

## 2.2 – Circuit evaluation and system sizing

Once all circuits that will be connected to the LSP(s) have been identified, evaluations must be made regarding backup load demands and the required backup energy storage capacity. It is important to configure Lumin's Smart Power Mode to ensure the total continuous back-up load demands of the distribution panel do not exceed the maximum continuous output rating of the battery bank and inverter system. It is equally important to ensure the battery bank is sized appropriately based on the inverter system's maximum continuous output rating. Failure to adhere to these guidelines could result in damage to the batteries and will void the warranty.

## 3.0 – Battery Bank Sizing

A properly sized PHI battery bank should be at least double (2x) the kW rating of the inverter(s) and have a C/2 rating greater than the maximum charge controller rating. Depending on the specifications of the equipment used in the system, sizing the PHI battery bank based on these two criteria may yield different results. Therefore, the best practice is to calculate the PHI battery bank based on both criteria and use the greater of the two results as the minimum quantity. We can compare these two calculation methods assuming the nomenclature below:

- Battery rated continuous power =  $Bat_{kWh}$  (typically @ C/2)
- Inverter power full load =  $Inv_{kW}$
- Maximum battery charging current =  $I_{BatChrgMax}$
- PV charge controller maximum =  $I_{PVChrgMax}$
- Recommended minimum number of batteries =  $B\#$

Discharge equation:  $B\#_{Inv} \geq Inv_{kW} / Bat_{kWh}$

Charge equation:  $B\#_{PV} \geq I_{PVChrgMax} / I_{BatChrgMax}$

## 3.1 – Discharge Calculation: Inverter Power Bank Sizing

To optimize the PHI battery bank and protect against over-discharge (voiding the battery Warranty), the PHI battery bank should be sized at least double (2x) the kW rating of the inverter.

Discharge Example A:  $B\#_{Inv} \geq Inv_{kW} / Bat_{kWh}$

- Inverter is rated at 6 kW
- PHI 3.8 kWh-48V battery is rated at 3.8 kWh; therefore, the C/2 load rating is 1.9 kW

$$B\#_{Inv} \geq 6 \text{ kW} / 1.9 \text{ kW} = 3.16$$

Discharge Example B:  $B\#_{Inv} \geq Inv_{kW} / Bat_{kWh}$

- Inverter is rated at 6 kW
- PHI 3.5 kWh-48V battery is rated at 3.5 kWh; therefore, the C/2 load rating is 1.75 kW

$$B\#_{Inv} \geq 6 \text{ kW} / 1.75 \text{ kW} = 3.4$$

In both examples A and B, a properly sized PHI battery bank based on maximum discharge of the inverter would have a minimum of 4 batteries. This ensures no greater than C/2 battery load. If the PHI battery bank has fewer batteries than calculated, special care must be taken with the inverter settings to limit the load below the specified rating of the PHI battery.

## 3.2 – Charge Calculation: Charge Controller Power Sizing

To optimize solar harvesting, a properly sized PHI battery bank should be able to accept the maximum PV charge current. To determine the minimum number of PHI batteries required to optimize PV, divide the output of the charge controller(s) by the “max continuous charge current” per PHI battery. Be sure to verify the “max continuous charge current” for the PHI battery model that you’re using, because it may differ from C/2, depending on the model.

Charge Example A:  $B_{\#PV} \geq I_{PVChrgMax} / I_{BatChrgMax}$

- Max continuous charge current for PHI 3.8 kWh-48V = 37.5A
- PV charge controller max = 80A

$$B_{\#PV} \geq 80A / 37.5A = 2.13$$

Charge Example B:  $B_{\#PV} \geq I_{PVChrgMax} / I_{BatChrgMax}$

- Max continuous charge current for PHI 3.5 kWh-48V = 34A
- PV charge controller max = 80A

$$B_{\#PV} \geq 80A / 34A = 2.35$$

In both examples A and B, a properly sized PHI battery bank based on available PV charge would have a minimum of 3 batteries. This maximizes the use of available PV while ensuring the PHI batteries are never stressed by overcharging. If the PHI battery bank has fewer batteries than calculated, special care must be taken with the inverter settings to limit the charge rate below the specified rating of the PHI battery. These settings are described in the following sections of this Integration Guide.

In summary: When comparing the same system using these two calculations for sizing the PHI battery bank, the minimum number of batteries should be the greater of the two results (Discharge Calculation & Charge Calculation). In both examples A and B, this translates into 4 PHI batteries in the system.



**CAUTION:** Not All system discharge or charge characteristics can be mitigated via programming. Under-sizing a PHI Battery bank relative to the system’s maximum discharge or charge rate will destroy the PHI Batteries and Void the Warranty.

## 4.0 – Lumin Smart Panel Installation

The following section details the basic installation process for the Lumin Smart Panel. This guide is only intended to supplement the installation instructions provided with the LSP and is not intended to replace or supersede the original manufacturer's installation instructions. Please refer to the documentation provided with your LSP for additional details regarding the LSP installation process.

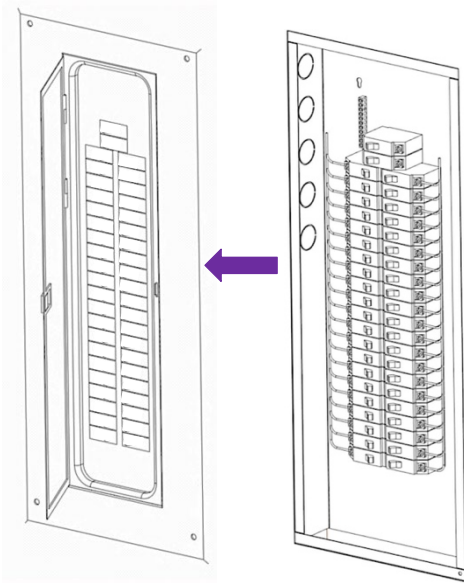


**WARNING:** The LSP should be installed by personnel, in accordance with all local and national electrical codes and standards. Failure to adhere to this guideline can result in damage to equipment and will void the warranty.



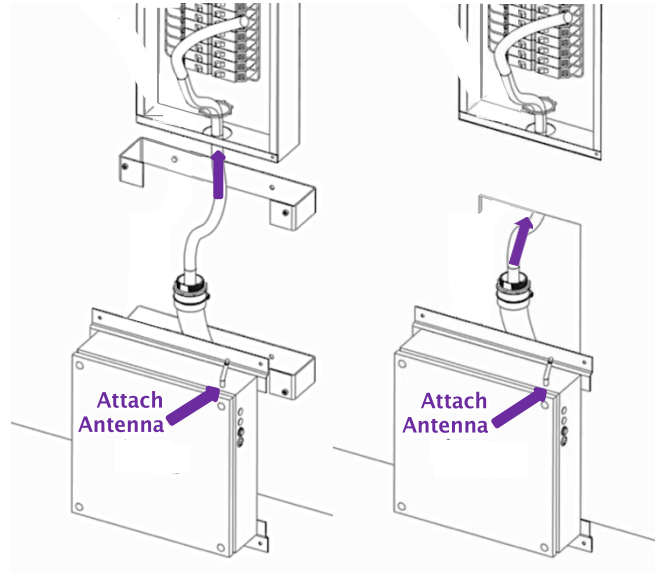
# 4.1 – Mounting the LSP to the wall

## 1: REMOVE ELECTRICAL PANEL COVER



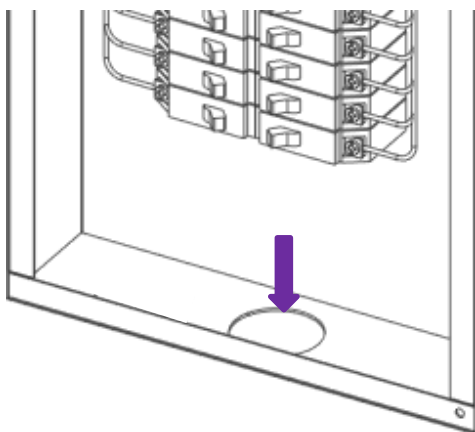
Turn off the main electrical feed and remove the cover of the existing electrical panel.

## 3: ATTACH ANTENNA & INSERT WIRES INTO PANEL



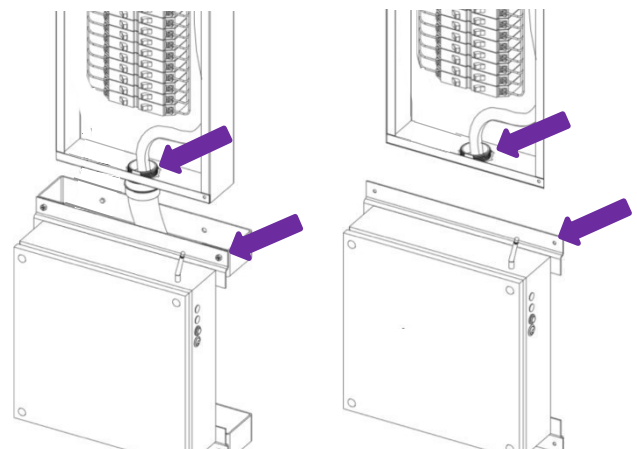
Attach the LSP's antenna then guide the LSP's wire whip through the 2" hole in the electrical panel.

## 2: PUNCH KNOCKOUT IN ELECTRICAL PANEL



Punch a hole in the electrical panel to accommodate the LSP's 2" conduit. Remove drywall (flush-mounted installations only) for access if needed. Exact hole location in electrical panel may vary.

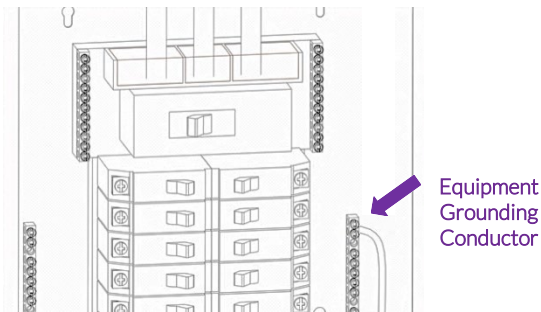
## 4: SECURE LSP TO WALL & ELECTRICAL PANEL



Secure the LSP to the wall and electrical panel utilizing the LSP's mounting hardware and conduit bushing.

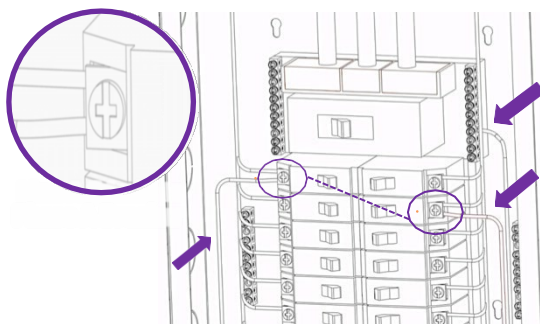
## 4.2 -Wiringthe LSPto the Electrical Panel

### 1: CONNECT LSP GROUND WIRE



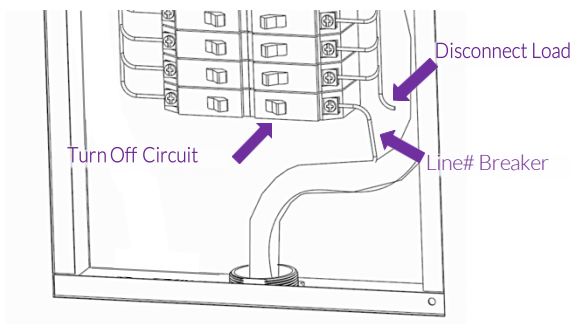
Connect the LSP's equipment grounding conductor to the existing ground bar in the electrical panel.

### 2: CONNECT LSP POWER CABLE HARNESS



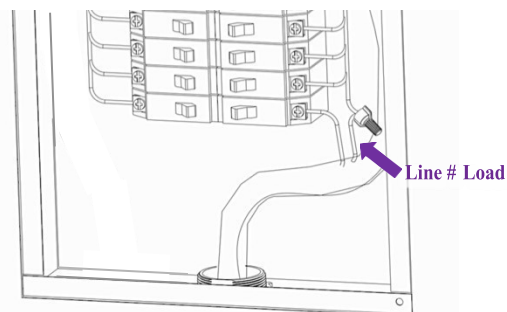
Connect LSP wire labeled "Neutral" to the neutral bar. Connect LSP wires "Line A" and "Line B" to a dual-pole 15- or 20-amp breaker. (no GFCI breakers). For Lumin installation purposes, Leg A breakers are those on odd rows in the electrical panel (rows 1, 3, 5, etc.). Leg B breakers are on even rows (2, 4, 6, etc.). "Line A" must be landed on an A-row breaker terminal and "Line B" must be landed on a B-row breaker terminal.

### 3: CONNECT LSP WIRE "LINE#BREAKER" TO BREAKER



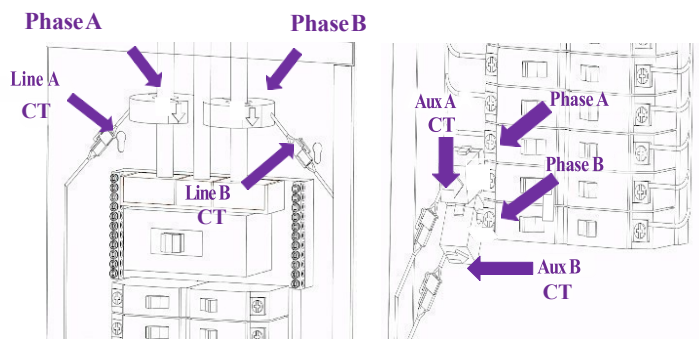
Turn off the circuit breaker and disconnect the existing load. Connect LSP wire "Line 1 Breaker" to the circuit breaker.

### 4: CONNECT LSP WIRE "LINE # LOAD" TO LOAD



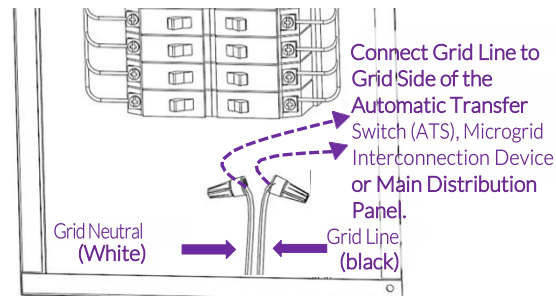
Connect LSP wire "Line 1 Load" to the load wire with a wire nut or other splicing method. Record circuit name and LSP line number in the circuit table provided. Repeat steps 3-4 until all LSP lines are connected.

### 5: CONNECT CURRENT TRANSFORMERS (CTs)



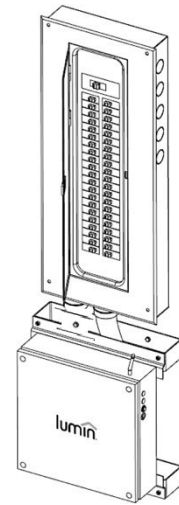
Connect CTs "Line A/B CT" to their corresponding LSP connector **before** attaching to main service lines on the corresponding phases, ensuring that the printed "K" on the CT that faces the grid.

### 6: CONNECT GRID VOLTAGE DETECTOR WIRES

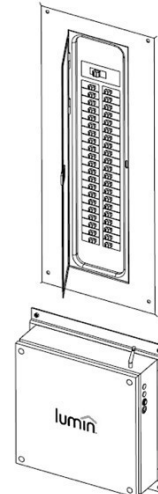


Extend Grid Neutral to furthest-upstream neutral connection point. Extend Grid Line to a point in the system that will lose power in an outage. (Gridside of the Energy Storage System)

Once the Installation process is complete, check for any loose objects and clean any debris from the interior of the panel. Install the protective cover on the panel and re-energize the equipment.



Surface-mounted installation



Flush-mounted installation

**NOTE:** Please make any necessary drywall repairs (if applicable) and clean up the area around the circuit breaker panel once the LSP installation is completed. Make sure the LSP's antenna is securely attached prior to powering on the device.

### 4.3 – LSP Circuit Table Designation

During the physical installation process of the LSP unit, the associated Circuit Table and CT table must be completed. An accurately designated circuit table is required to complete the application setup and programming steps of the commissioning process.

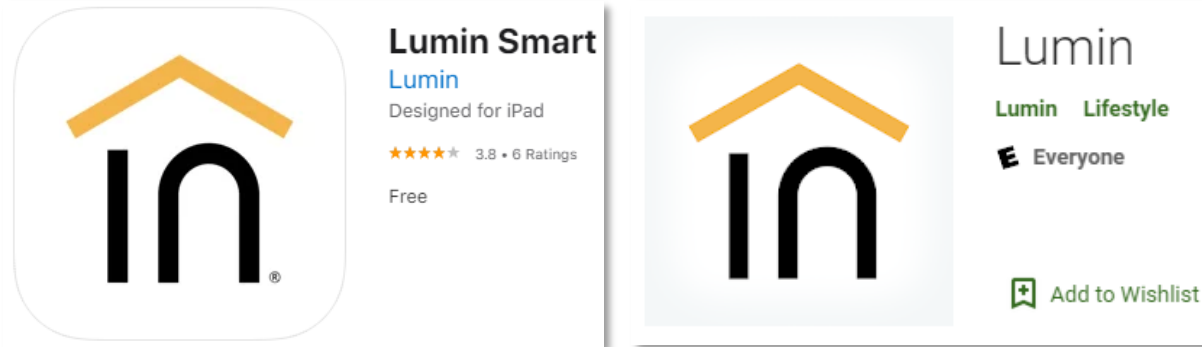
LSP LINE #	PHASE (circle one)	CIRCUIT BREAKER LABEL/NAME	LSP LINE #	PHASE (circle one)	CIRCUIT BREAKER LABEL/NAME
1	A	<b>Refrigerator</b>	7	A	
	B			B	
2	A		8	A	
	B			B	
3	A		9	A	
	B			B	
4	A		10	A	
	B			B	
5	A		11	A	
	B			B	
6	A		12	A	
	B			B	
CURRENT TRANSFORMER (CT)			CURRENT TRANSFORMER (CT)		
Line A/B CTs			Aux. A/B CTs (Optional)		

**NOTE:** Record the circuit label/name and phase (A or B) with the corresponding LSP line number in the LSP Circuit Label & CT Table provided (ex. record "Refrigerator" next to LSP Line 1 and circle Phase A if the circuit labeled "refrigerator" is on phase A and is connected to the LSP's Line 1). Dual pole circuit breakers will require two LSP line numbers.

# 5.0 – Application Setup and Programming

## 5.1 – Download and install the Lumin Smart App

Once power has been restored and the LSP has been activated, the remaining setup can be completed through the Lumin Smart mobile application. Download the *Lumin Smart Application* and follow the on-screen prompts to begin the account setup process. An automated setup flow within the app will provide instructions for every step of the process and will automatically advance to the next setup screen.



iOS:

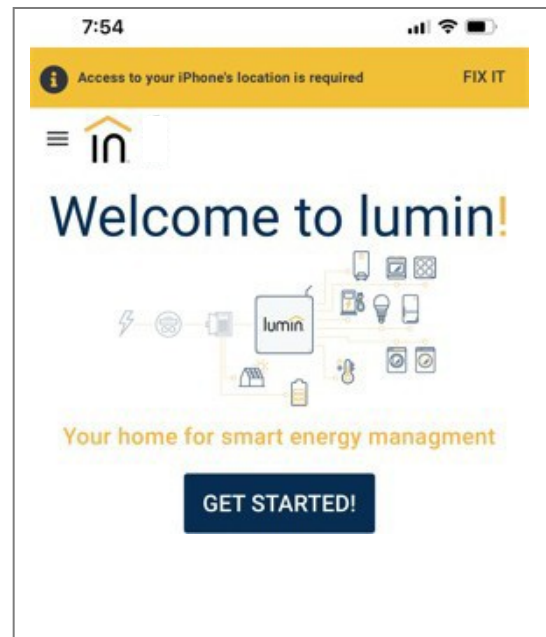
<https://apps.apple.com/us/app/lumin-smart/id1472704942>

Android:

[https://play.google.com/store/apps/details?id=com.luminsmart.morse&hl=en\\_US&gl=US](https://play.google.com/store/apps/details?id=com.luminsmart.morse&hl=en_US&gl=US)



Open the *Lumin Smart App*, enter your preferred login credentials, and select *Create Account*




Welcome screen appears after successful account creation


## 5.2 – Establishing Network Connection

You will use the Lumin Smart mobile app to commission new LSPs that you have installed. Utilize the app on a smartphone (not a tablet) and ensure that the phone is connected to the home WiFi network the LSP will connect to. An ethernet cable connecting the LSP to the router is the preferred connection method, but Lumin can also connect to a 2.4 GHz WiFi network. Follow the on-screen prompts, as shown below:


### Before Connecting



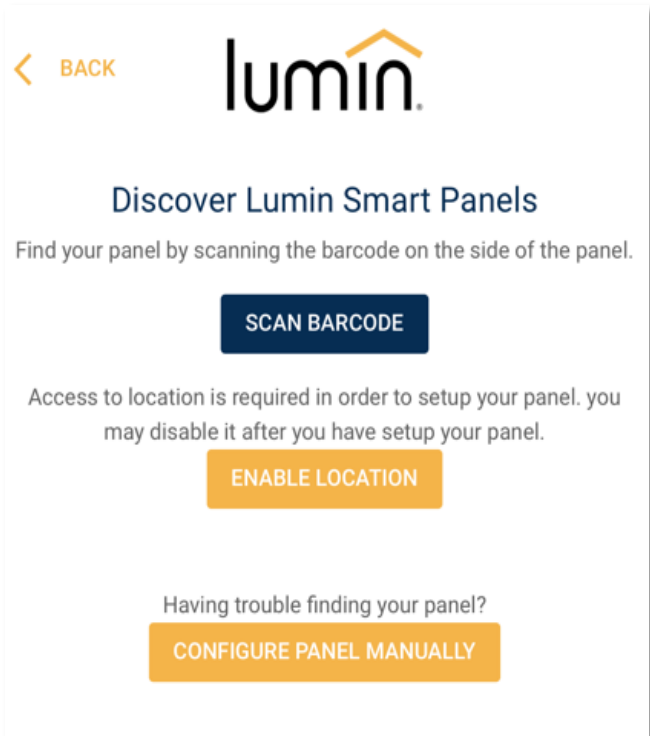
**1. Router with 2.4 GHz Enabled**  
Make sure your router is configured with 2.4 GHz enabled. The Lumin Smart Panel is only able to connect to 2.4 GHz WiFi networks.



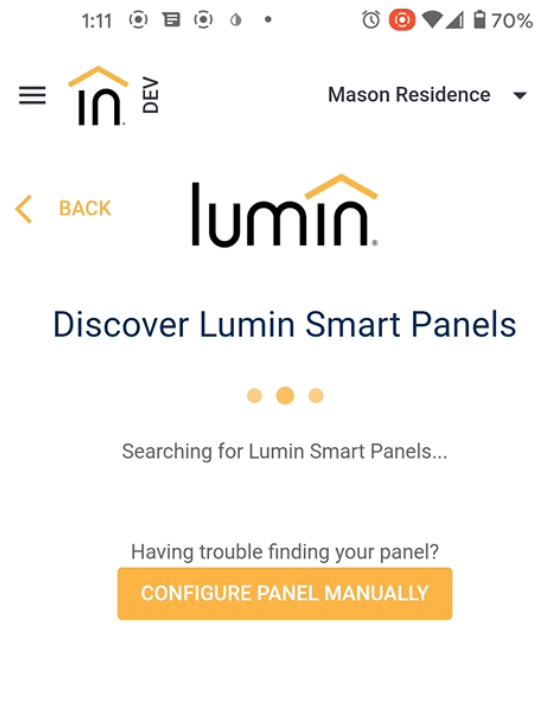
**2. Connect to the home WiFi Network**  
Ensure that your phone or tablet is connected to the home WiFi network.



**3. Confirm the Lumin Smart Panel is ready and in setup mode**  
Setup mode is active when the green and blue indicator lights are blinking. To enable setup mode, press the WiFi button (located below the indicator lights).



iPad discovery

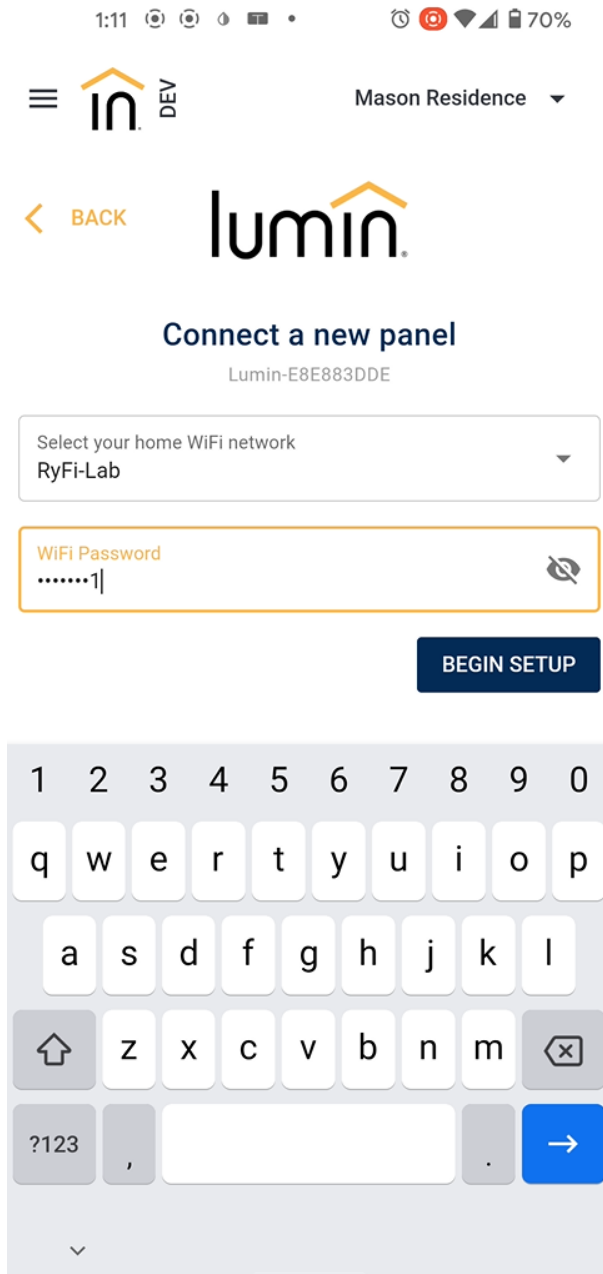


Android Discovery

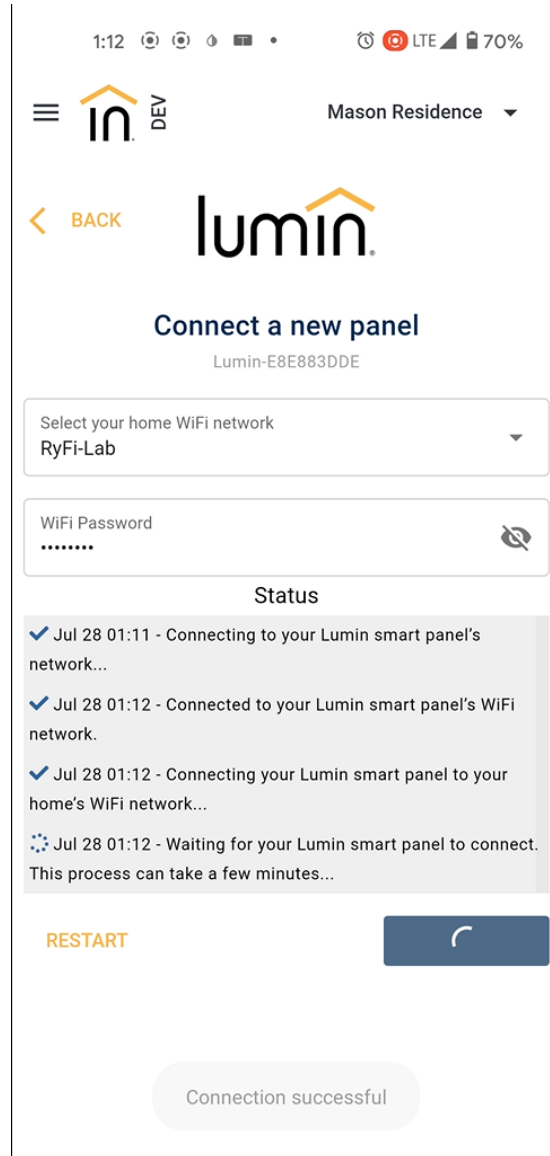
On an iPhone, select “Scan Barcode”. On an Android device, select “Search for Lumin Smart Panel” Alternatively, there is also an option to configure the LSP manually, if the ability to scan the barcode or search for LSPs is unavailable. Once the app has discovered available LSPs, tap to select the LSP you would like to commission.

If the LSP has an ethernet cable connected, the LSP will appear twice in the list of available LSPs, once with a WiFi symbol and once with an ethernet symbol. Select the desired connection option. Note that an ethernet connection will not require a password and tends to be more reliable over time than WiFi.

If connecting via WiFi, enter the name and password for the home’s WiFi network. If utilizing a WiFi extender that broadcasts its own SSID (WiFi network name), ensure that the credentials for the extender network are entered.



After entering WiFi credentials and selecting “Begin Setup”, a series of checkmarks will appear as the LSP assimilates the home’s WiFi credentials and establishes a connection with the server.



Once the LSP is connected, the app will direct the user into the “Edit Circuits” procedure. The information from the handwritten Lumin circuit table will be entered into the LSP during this process.





Mason Residence ▾

## Edit Circuit

TEST

Line #1

Name  
HVAC

Customize your circuit names

Category  
HVAC

Used for data visualizations

Circuit Phase  
Phase A

Paired With  
None

240-volt circuits must be paired

Visible on the home page and included in calculations

Circuit ID: #94112

Panel: Wheatley

Advanced settings

Back

Step 2 of 22  
Configure Line #1 ^

Next

Ensure that the circuit is correctly phased. If it is a 2-pole 240-volt circuit, assign a name and phase to the first Lumin line associated with the circuit. Then, using the “Paired With” dropdown menu, select the second Lumin line associated with the circuit. This second line will be automatically assigned a phase. Paired circuits will appear as one circuit on the Lumin app home screen and disabling a paired circuit will open both hot legs of the circuit.

## 5.3 – Location Settings

The setup flow next opens the “Manage Location” preferences. Note that a zip code must be entered for proper operation.

The screenshot shows a mobile application interface for managing location settings. At the top, there is a navigation bar with a back arrow, the title "Manage Location", and a menu icon. Below the navigation bar are six input fields, each with a label and a value:





- Location Name: Home
- Location Timezone: America/Los\_Angeles
- Occupants: 0
- Location Zip Code: (empty)
- Utility Name: Select a utility
- Average Rate (kWh): (empty)

## 5.2 – Off-Grid Mode

The setup flow will next open the Off-Grid Mode settings. Off-Grid Mode is disabled by default but should be enabled for all grid-tied systems. Enable by moving the slider at the upper right to the right so that it turns green. Note that some users may be directed to use Smart Power Mode instead of Off-Grid Mode. They work in similar ways and can be set up in the same manner.

## Off Grid Mode

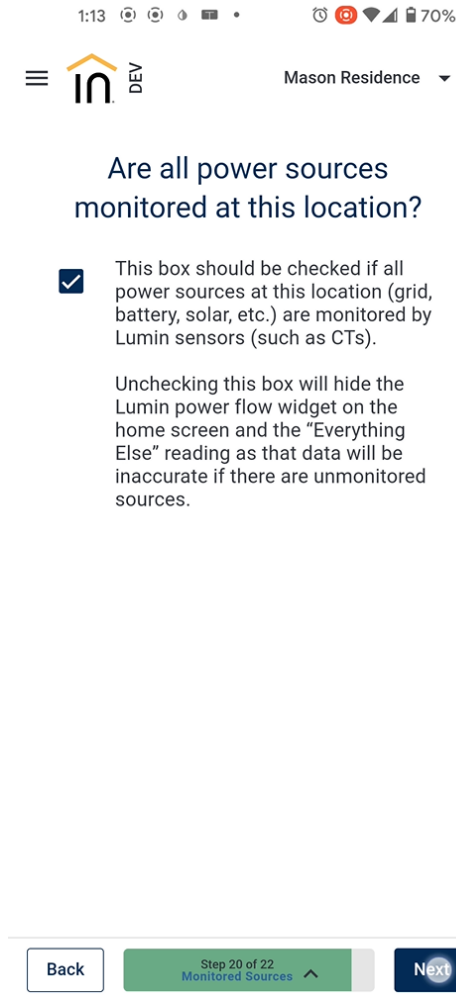
Off-grid mode is designed to keep your home's energy use in check during an outage. When a grid outage is detected, the Lumin Smart Panel will automatically shed all Lumin circuits **not** marked as "protected" to ensure that your home does not waste precious energy during the outage. Five minutes after the outage is over and grid power is restored, your home will return to normal operation. To enable the benefits of off-grid mode, move the toggle in the upper right-hand corner to the right so that it turns green.

Circuits	Protected
 Grid Voltage Detector	<input type="checkbox"/>
 HVAC	<input type="checkbox"/>
 Oven	<input type="checkbox"/>
 Water Heater	<input type="checkbox"/>

Any circuit connected to Lumin and not marked as "protected" will be shed by Off-Grid Mode within 650 milliseconds of a grid outage. Lumin will deliver maximum benefit if most circuits are set to be shed in this manner. Users can always re-enable any circuit they desire to use by tapping on that circuit in the app and moving the slider to enable it while operating off grid.

Any circuit marked as protected will not be shed by Off-Grid Mode. If the circuit powering the home's modem and router has been placed under Lumin control, it *must* be marked as protected.

## 5.2 – Monitored Sources



The setup flow will now prompt a question as to whether all power sources are monitored. As long as the CTs have been placed on the feeders to the load center associated with Lumin, select “yes” when prompted with this question.

### – Inviting Users

The setup flow will now prompt the installer to invite new users. System owners should be granted access to Lumin through this process. Simply enter the owner’s email address in the dialog box and select “Invite”. The owner will get an email welcoming them to Lumin. They will download the same Lumin mobile app from the App Store or Google Play Store and register with the email used for their invitation. Once they have downloaded the app, registered, and been invited to a system, they will see that system when they log into the app.



## Manage Users

Inviting a new user to this Lumin location will give them full access to all smart panel data and control at this location.

### Invite User

Email + INVITE

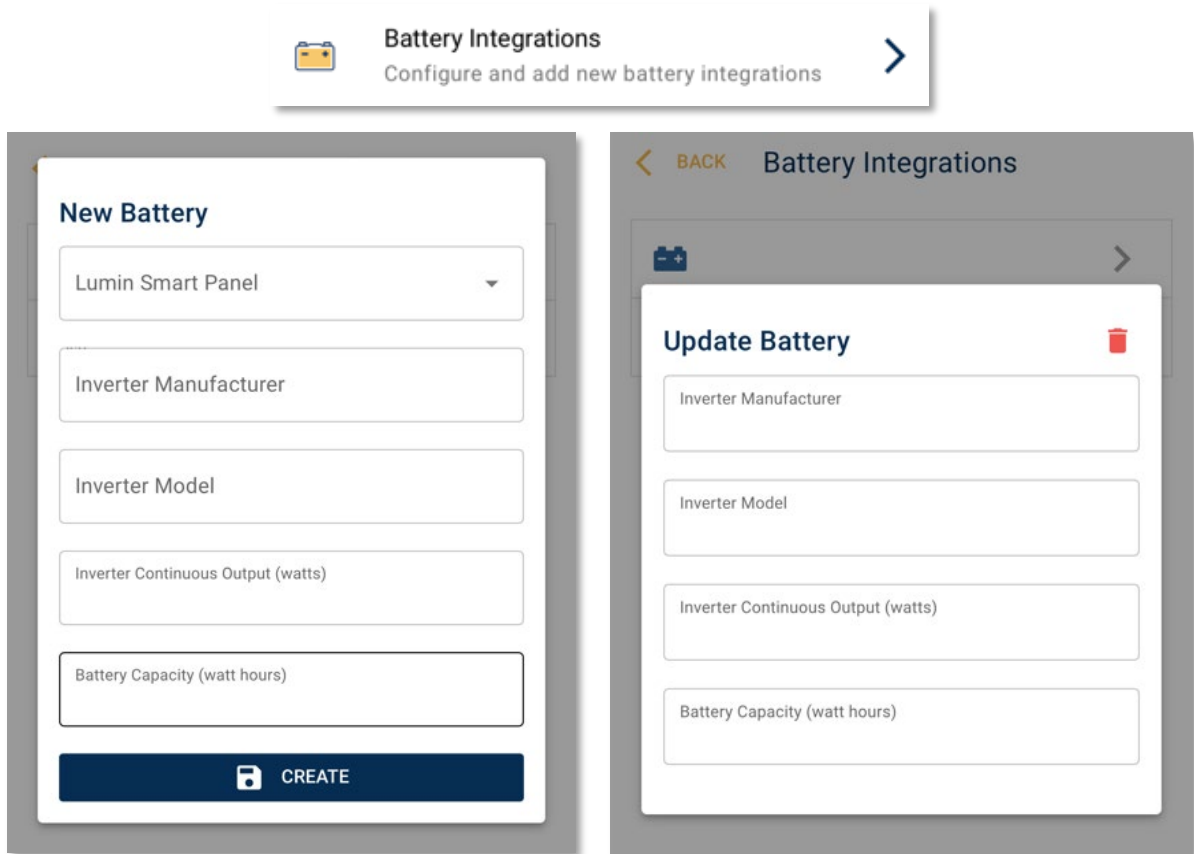
Invite a user you would like to share with

Shared With

Inviting users is the last step in the automated Lumin setup flow. There are several more preferences that can optionally be set by navigating through the Lumin menu.

## 5.3 – LSP Battery Integrations Menu

For the LSP to effectively interface with an integrated energy storage system, the inverter and battery system information must be accurately programmed into the *Lumin Smart App*.



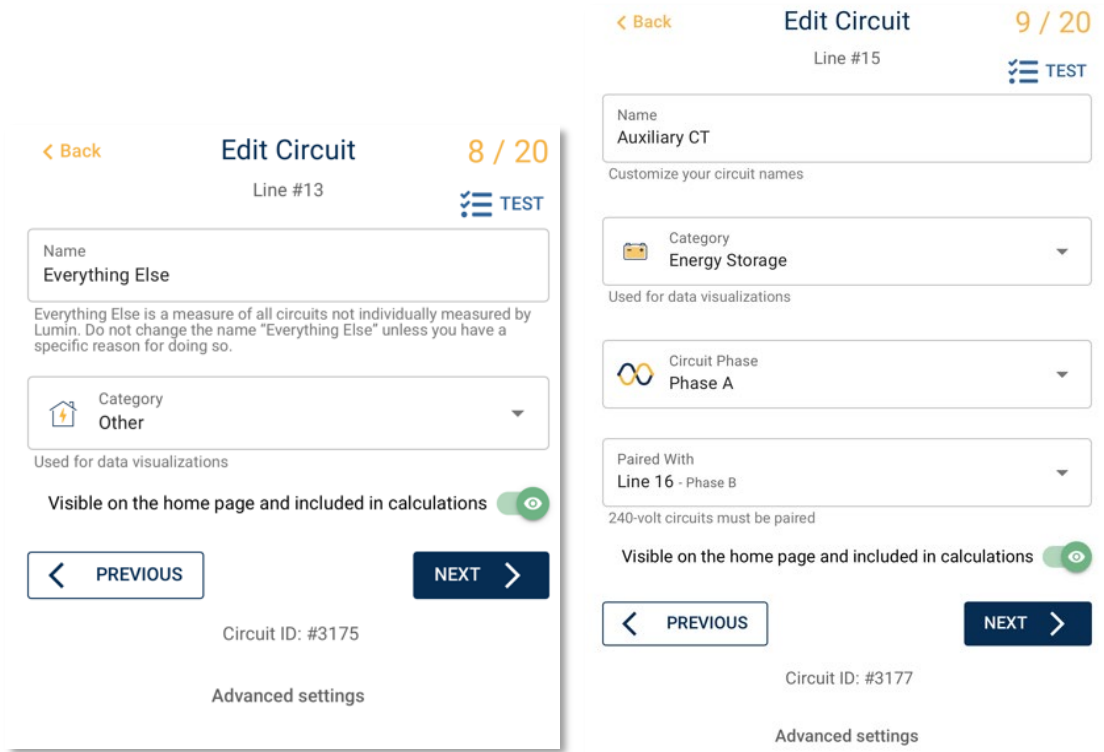
From the Location Settings menu, select the *Battery Integrations* option, and enter in the details of your energy storage system. This menu allows you to add a new battery system, as well as update the details of an existing battery system. To add a new battery, enter the inverter details, including manufacturer and model information as well as the inverters continuous output rating (in watts). This information can be found in the original documentation provided by your inverter manufacturer. You must also include the total energy storage capacity of the battery bank (in watt hours).

It is critical to ensure the details of the energy storage system are accurately programmed into the battery integration settings. Additionally, whenever the energy storage system is modified or expanded, these details will need to be reassessed and accurately updated prior to returning the system to normal operation.

If in doubt, regarding how to accurately determine these values, please contact our Technical Support Team for assistance, at 805-640-6700 Opt.1, or [techsupport@simpliphipower.com](mailto:techsupport@simpliphipower.com)

## 5.4 – Auxiliary and Uncontrolled Circuits

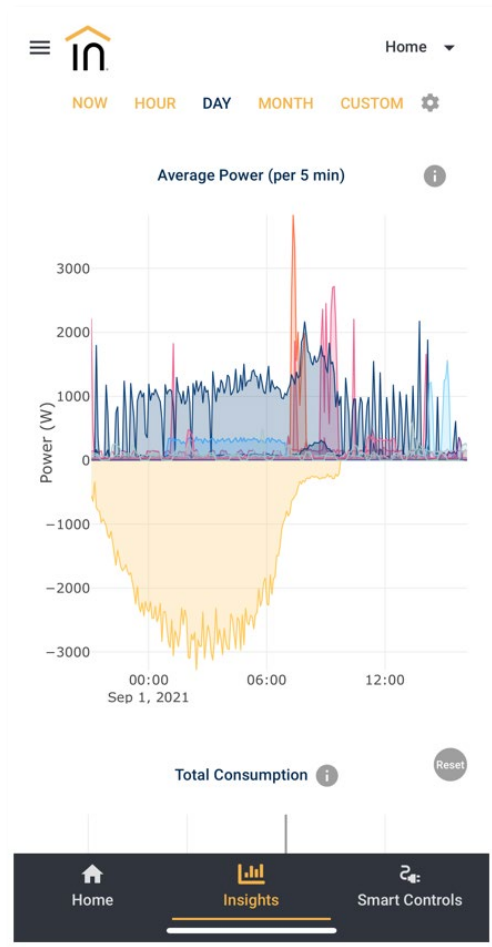
Once all individually controlled circuits have been programmed and tested, the auxiliary energy monitoring circuits (CTs) must be programmed to designate the circuit energy source.



The main CTs, installed on the main service lines, are used by the LSP to measure total current flow through the panel during operation. This measurement, along with the individual controlled circuit measurements, allow the LSP to calculate the amount of power consumed by all circuits not controlled by the LSP. This value is represented as *Everything Else* in the *Insights* section of the Lumin Smart App. It's important to remember that any circuits not controlled by the LSP will be energized by the backup energy storage system in an outage event.

Auxiliary CTs should be installed to monitor current flow from additional energy sources such as generators, solar array, and battery systems. Each *Aux CT* circuit must be programmed according to the specific energy source being monitored to maintain the LSP's accuracy and functionality.

In order to avoid damaging the equipment, the CTs must be connected to their corresponding LSP cable prior to being clamped around any live conductor. Failure to adhere to this guideline can result in damage to the LSP and will Void the Warranty

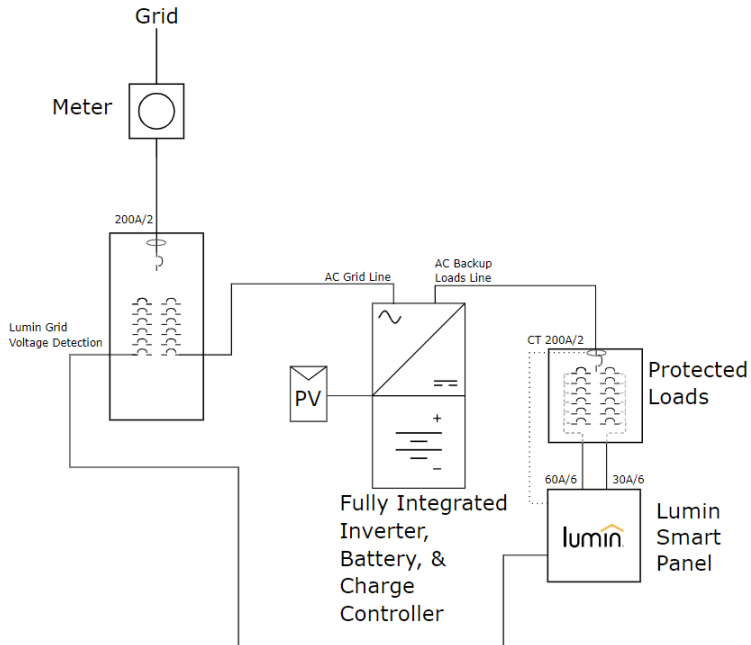


By selecting the “Insights” tab, at the bottom of the home screen, you can access the graphical interface displaying historical energy usage for all monitored circuits. This menu can be useful in analyzing historical energy data and identifying trends in energy usage. The graphing timeline for historical data can be customized from one hour to one year, and live data can be viewed in 5-second increments.

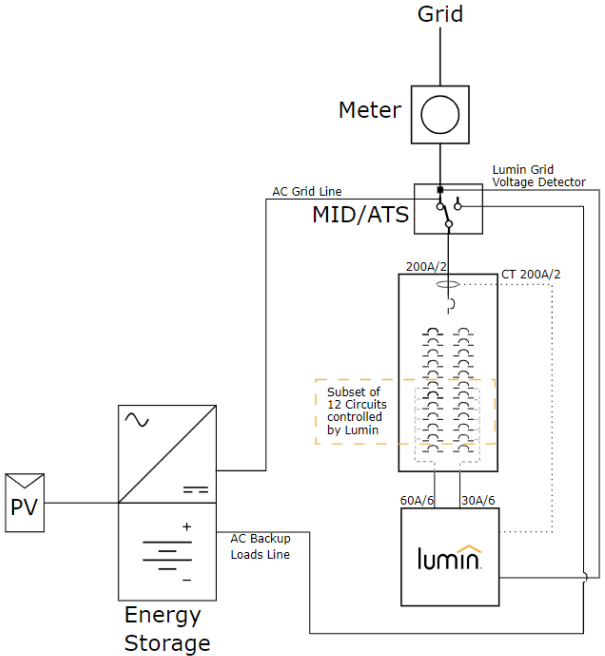


# 6.0 – Single Line Diagrams

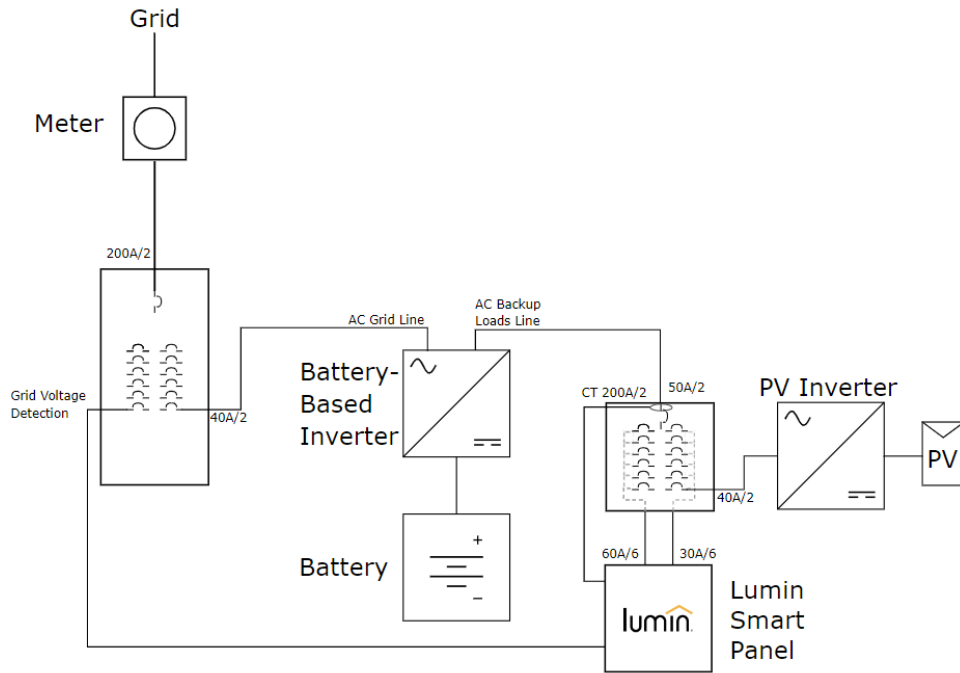
## 6.1 – DC Coupled System on Protected Loads Panel



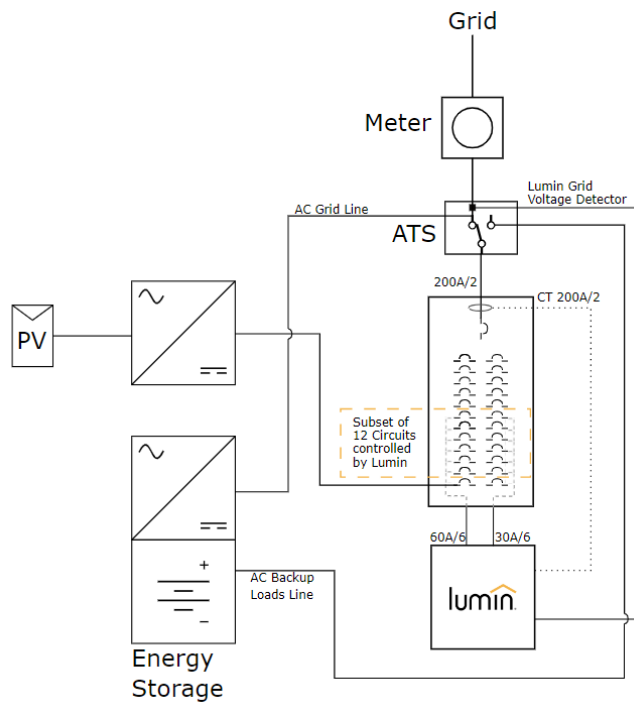
## 6.2 – DC Coupled System on Main Distribution Panel



### 6.3 – AC Coupled System on Protected Loads Panel



### 6.4 – AC Coupled system on Main Distribution Panel



## 7.0 – Specifications & Warranty

For your reference:

- See PHI 3.8kWh Installation Manual.
- See PHI Battery Wiring guide for Batteries with Threaded terminals
- See PHI Battery 10-Year Warranty; Failure to adhere to installation protocol will void Warranty.

## 8.0 – SimpliPhi Technical Support

For technical support related to your PHI Battery (or other SimpliPhi Power products), please contact us directly at:

805.640.6700

[techsupport@simpliphipower.com](mailto:techsupport@simpliphipower.com)