



## Powerwall Application Note: Powerwall and Third Party Backup

Overview..... 2

Installing a Generator in a Cascading Configuration with a Powerwall System..... 4

System Configuration and Basic Operation..... 4

Operational Scenarios.....5

Advantages of Powerwall System with Fixed Generator and External ATS.....5

Limitations of Powerwall System with Fixed Generator and External ATS.....6

System Installation and Commissioning..... 8

Site and Technical Requirements..... 8

Wiring Diagrams..... 12

Revision History..... 17

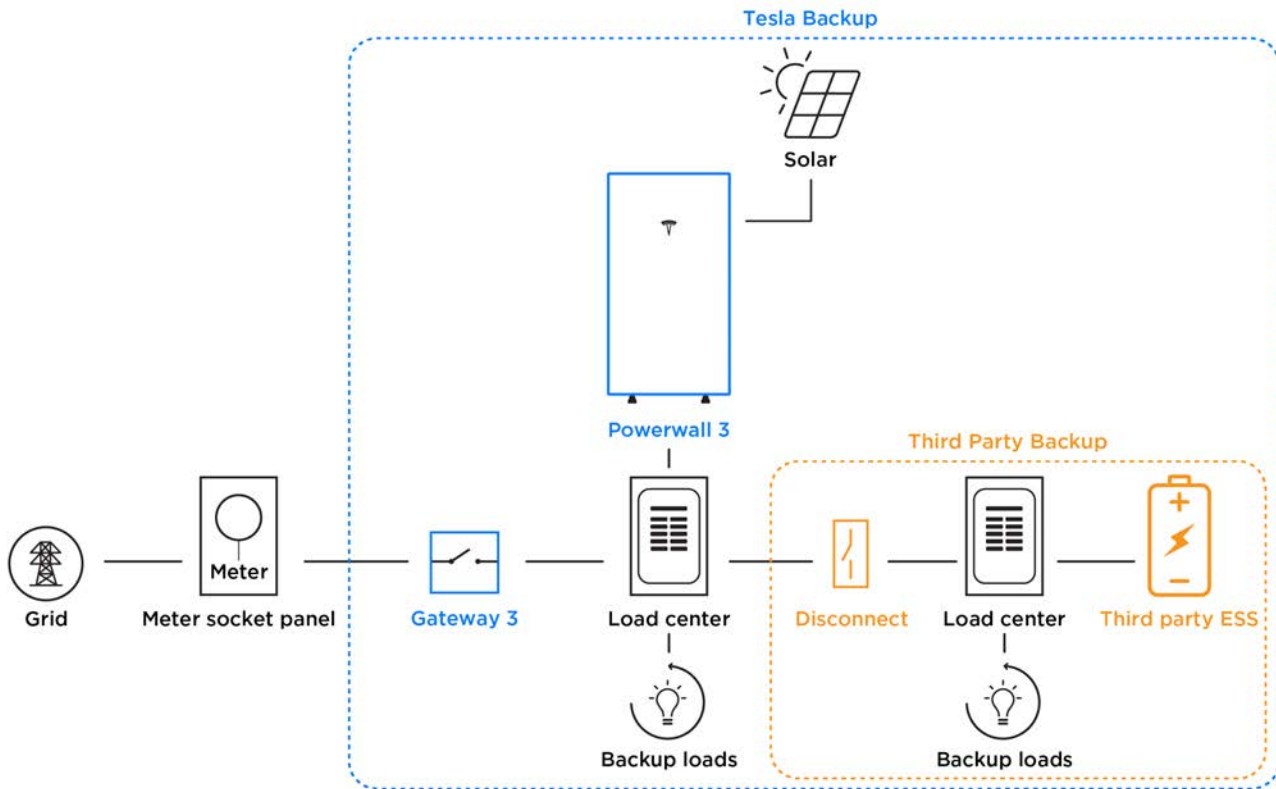


# OVERVIEW

Third party backup systems (including generators, vehicles, Powerwall 1, third party battery storage systems, UPS, etc.) are compatible with Powerwall systems in the following configurations. An important note on combining backup systems is that only one system can perform site control at any given time. When the backup systems are installed in a cascading configuration, the Tesla Site Controller (Backup Gateway 2, Controller Powerwall+, or Powerwall 3) performs site control for the entire system until Powerwall is depleted, at which point the third party backup system controls only its system. In the configuration where the backup systems are installed independently of each other, the Powerwall and the third party backup system each control their own system.

**NOTE:** In either of the following diagrams, the third party backup system may be a type of system other than the one shown. A third party disconnect or Automatic Transfer Switch (ATS) may be used to disconnect the third party system in either case.

Figure 1. Cascading System with Powerwall 3 and Third Party Backup System



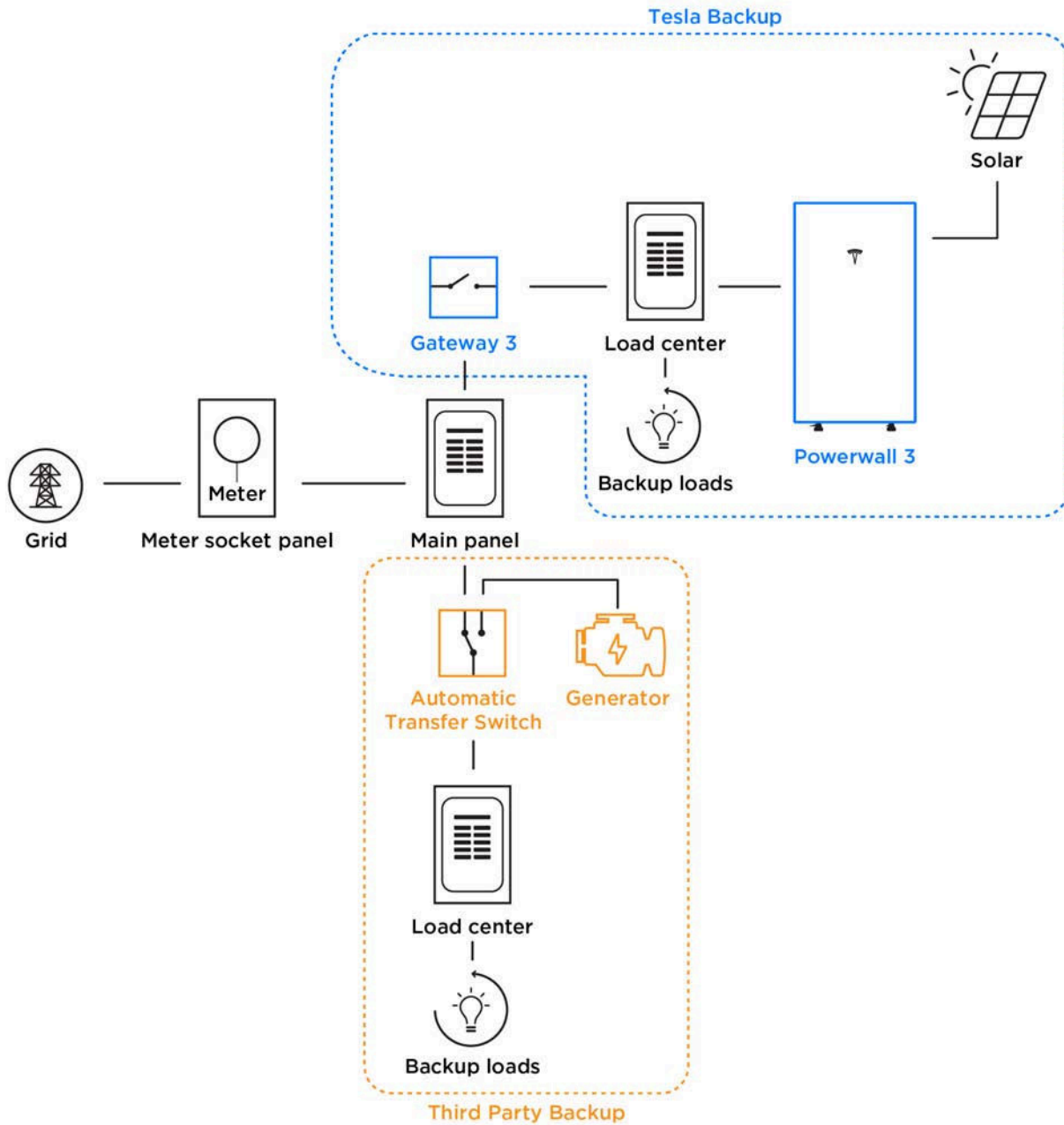
**NOTE:** Tesla is not responsible for the operation of the third party system or related performance issues.

In the example above, Powerwall backs up all the loads within the Tesla backup system. Once Powerwall has been depleted, the third party backup system backs up the loads labeled as third party. This is the most common configuration for systems with third party backup.



# OVERVIEW

Figure 2. Independent Powerwall System and Third Party Backup System



**NOTE:** Tesla is not responsible for the operation of the third party system or related performance issues.

In the example above, the two backup systems are installed independently of each other. Powerwall backs up the loads within the Tesla backup system, and the third party backup system backs up the loads labeled as third party. This configuration is most common with very large systems.

**NOTE:** Another example of independent backup systems being installed is when multiple Backup Gateways are installed on a single site. Both systems are Powerwall systems, but they are installed and function independently of each other. See the [Multiple Gateways on a Single Site Application Note](#) for more information on this configuration.



# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

The remainder of this application note focuses on installing a third party backup system, in this case a generator, in a cascading configuration with a Powerwall system. In this example, an Automatic Transfer Switch (ATS) is installed to turn the generator on automatically when the Powerwall system stops providing voltage, either when it runs out of energy or is overloaded. The ATS provides assurance to the customer that their important loads continue to be powered without requiring any intervention.

An alternative to the ATS is a Manual Transfer Switch (MTS) or disconnect; with an MTS, the customer can decide to switch loads from the Powerwall system to the secondary backup system. If the customer has a generator, this gives them full control of when their generator operates; for instance, they can use the MTS to turn the generator on only when they are home. The MTS / disconnect can also be used to allow Powerwall system to continue charging from solar while the secondary backup system independently powers the loads.

The remainder of this document describes a Powerwall system installed with an ATS and a generator. As noted above, the same concepts apply to other third party backup systems, and a MTS could be used in place of the ATS.

## System Configuration and Basic Operation

In the configurations discussed here, the Powerwall system is installed between the service entrance and the ATS so that it can respond to an outage before the ATS detects loss of power. Operation of the ATS and its start/stop control of the generator are independent of the Powerwall system. The Tesla Relay Device (Backup Gateway 2, Gateway 3, or Backup Switch) controls connection to the grid and the Tesla Site Controller controls operation of the Powerwall, but neither controls the generator. Because the Powerwall system is installed upstream of the ATS, it appears to the ATS as another power source, equivalent to the grid.

The ATS starts and stops the generator based on whether it detects power from the grid or the Powerwall system. The generator is used only when the Powerwall cannot provide backup power, for one of two reasons: Powerwall stops operating because it reaches a low state of charge, or loads exceed the system's maximum power output capability.

If Powerwall operation stops, the ATS transitions the home to generator power. In order to resume Powerwall operation so it can charge from solar, the Powerwall Enable switch must be toggled.



**NOTE:** The Powerwall Enable switch does not need to be toggled to enable Powerwall charging once grid power returns.



# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

## Operational Scenarios

### ***On-Grid Operation***

During normal, on-grid operation the Powerwall system can be used in any of the standard Powerwall modes, including Time-Based Control and Self-Consumption. The generator is not engaged while the grid is operational.

### ***Backup from Powerwall***

In the event of a grid outage, Powerwall responds immediately and transitions to backup operation before the ATS can detect the outage, supplying power to the home. The transition from the grid to Powerwall occurs quickly so that loads are not dropped. If Powerwall reaches a low state of charge, or if loads exceed the maximum power output of Powerwall, Powerwall stops operation and the generator is engaged.

### ***Backup from Generator***

In the event the Powerwall system's state of charge drops below a set threshold (10 percent), or if the total load exceeds the power capability of the Powerwall system, Powerwall stops operation, the generator is started, and the ATS transitions to the generator.



**NOTE:** During the ATS transition from Powerwall to the generator, loads are temporarily dropped.

## Advantages of Powerwall System with Fixed Generator and External ATS

### ***Durability***

Generators with conventional battery backup systems suffer from limited battery capacity and lifespan. Powerwall has higher energy density, a greater cycle count, and a longer lifespan than traditional battery backup systems. The Powerwall system carries a 10-year warranty.

### ***Immediate Transition to Backup Operation***

The Powerwall system has a very fast reaction time to an outage and can transition to backup operation without interrupting electrical service to the home.

### ***Lower Cost of Operation***

By using Powerwall to back up essential loads in short-duration outages, the generator can be reserved for longer outages or for operation of high-power appliances such as air conditioners or heat pumps. The generator is used less frequently, saving fuel and money.




# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

## Limitations of Powerwall System with Fixed Generator and External ATS

### **Charging Powerwall During an Outage**

To allow the Powerwall system to charge from solar while the generator is running, the ATS must be manually disconnected from the system by opening the breaker in the ATS, opening a switched disconnect installed between the Tesla Relay Device (Backup Gateway 2, Gateway 3, or Backup Switch) and ATS, or (where the generator is wired for partial home backup) by opening the breaker feeding the ATS. Once Powerwall has charged sufficiently or grid power returns, the ATS breaker, switched disconnect, or panel breaker is then closed manually, allowing the ATS to detect power from the grid or from Powerwall.

 **NOTE:** If Powerwall begins to charge from solar and is not isolated from the ATS, the ATS will switch back to the Powerwall system before it is fully charged, resulting in the Powerwall charging very slowly if solar is also powering loads.

### **Powerwall State of Charge**

To ensure Powerwall can meet the backup need during an outage, the homeowner must manage power usage and limit the use of energy-intensive appliances. In an extended outage, if the Powerwall reaches a low state of charge, it will stop operation and the generator will be engaged.

### **Powerwall Output Capability**

If the load demand exceeds the maximum power output capability of the Powerwall system, Powerwall will stop operation. To operate a large number of appliances, or to run appliances that draw high amounts of power, such as heat pumps or air conditioners, the generator will be engaged.

### **Resuming Powerwall Operation During an Outage**

In outage situations where the Powerwall system stops operation because of low state of charge or an overload, Powerwall must be reactivated manually before it can resume operation.

#### **After a shutdown because of Powerwall low state of charge:**

The homeowner must wait until solar generation is available, open the ATS main breaker (or the disconnect between the Tesla Relay Device (Backup Gateway 2, Gateway 3, or Backup Switch) and the ATS), and then toggle the Enable switch on one of the Powerwalls. The Powerwall system then begins to charge from solar. When the Powerwall is sufficiently charged, the homeowner closes the breaker/disconnect, causing the ATS to turn off the generator and allowing Powerwall to power the loads.

#### **After a shutdown because of Powerwall overload:**

The homeowner must reduce loads (so the total load is lower than the power capacity of the system) and then toggle the Enable switch on one of the Powerwalls. Powerwall then resumes operation and powers the reduced loads.



# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

## ***Restoring Connection to the Grid***

When grid power returns, the Tesla Relay Device (Backup Gateway 2, Gateway 3, or Backup Switch) handles reconnection to the grid as follows:

- If the Powerwall system is powering the loads, the Tesla Relay Device waits for a prescribed reconnection delay time before connecting to the grid. This reconnection delay varies by grid code, but can be up to five minutes.
- If the generator is powering the loads, the Tesla Relay Device immediately reconnects to the grid, then the ATS switches the loads to the grid and turns off the generator.



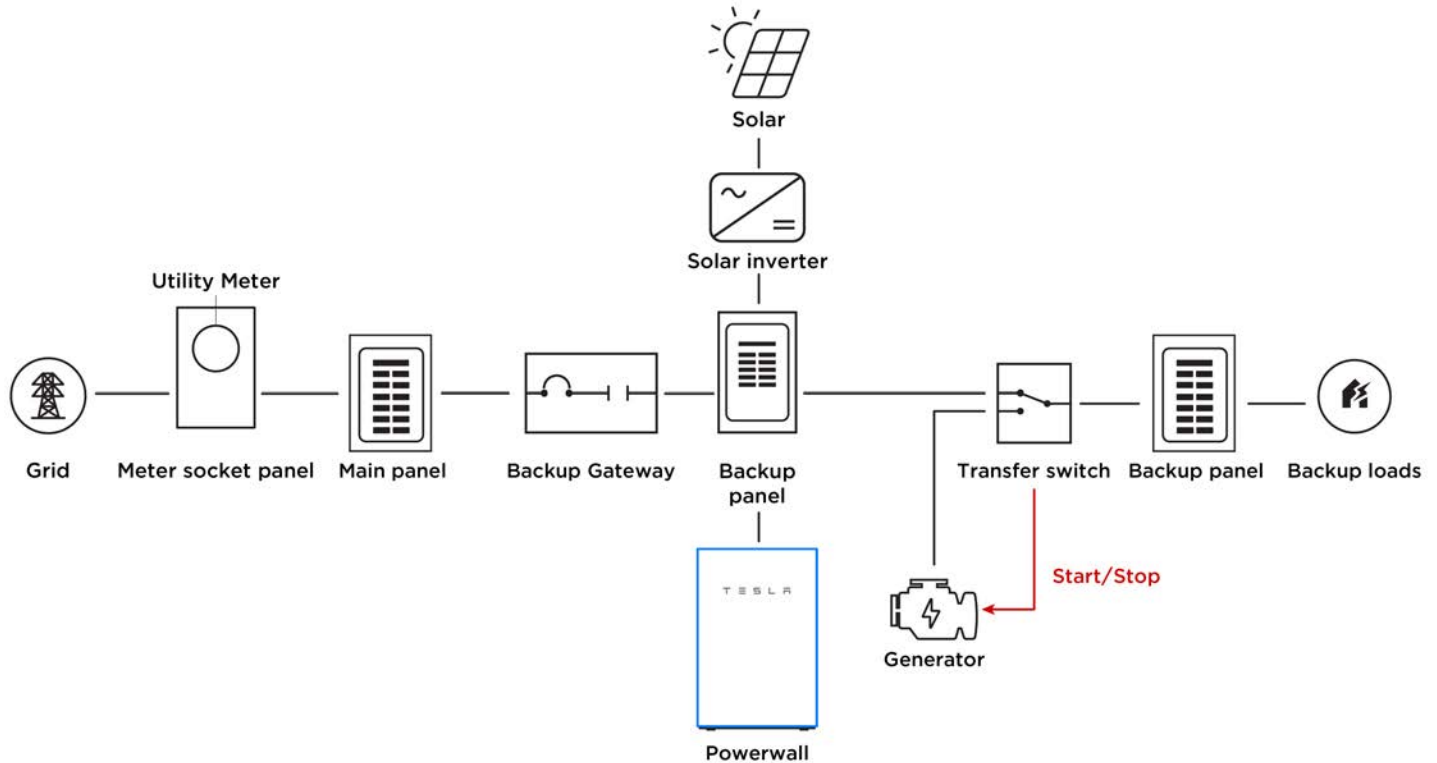
**NOTE:** The Powerwall Enable switch does not need to be toggled to enable Powerwall charging once grid power returns.



# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

## System Installation and Commissioning

The image below illustrates a generator wired for partial home backup; a whole home backup system would not have the main panel upstream of the Gateway. See [Wiring Diagrams on page 12](#) for more detail and additional configurations.




## Site and Technical Requirements

### Additional Equipment

In addition to the standard installation materials for Powerwall and the Tesla Relay Device, the following materials are needed for installation:

- Metering Kit (with up to 2 current transformers) for measuring the system power flows:
  - **Powerwall 3 Installations:** Tesla Remote Energy Meter Kit (Tesla P/N 2045796-xx-y)
  - **Powerwall 2 / Powerwall+ Installations:** Neuroio Remote Energy Meter Kit (Tesla P/N 1112484-xx-y)
- The ATS is usually connected with a breaker on the supply side in an upstream panel, or it has a disconnect on the supply side or a manual override feature. If none of these are present, it is recommended to install a manual disconnect on the supply side of the ATS (downstream of the Backup Gateway 2 / Backup Switch / Gateway 3 and Powerwall system)

 **NOTE:** There are no specific requirements for the type of breaker used to connect the ATS to the upstream panel.

# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

## **Installed Location of the Backup Gateway 2 / Backup Switch / Gateway 3**

The Tesla Relay Device (Backup Gateway 2 / Backup Switch / Gateway 3) must always be installed upstream of the ATS so that Powerwall appears as a power/voltage source to the ATS. If the system includes a Gateway, it should be installed as close to the ATS as possible, especially for whole-home backup scenarios: a long wire run would require large conduit for wiring rated for residential service (up to 200 A).

## **12V Connection Between Backup Gateway 2 / Powerwall+ and ATS**

To power the Tesla Site Controller (Backup Gateway 2 or Controller Powerwall+) when the Powerwall has ceased discharging/grid-forming and the generator is powering the home, run a pair of 16 AWG wires from the 12V output terminals on the ATS to the 12V Jump terminals on the Backup Gateway 2 or Controller Powerwall+ as shown below:

Figure 3. Backup Gateway 2 12V Jump Ports

### **Backup Gateway 2**

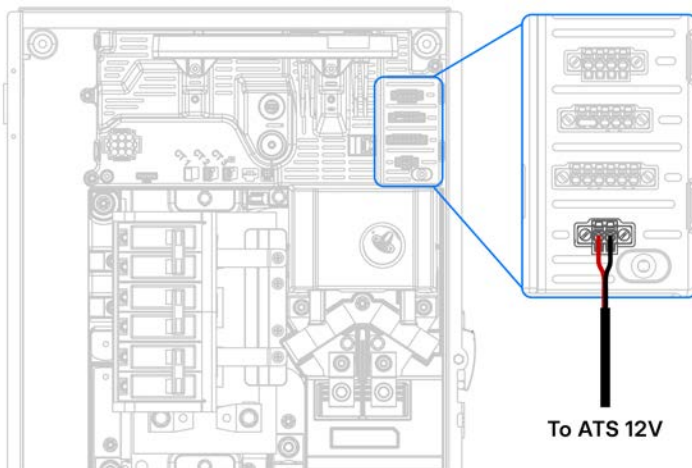
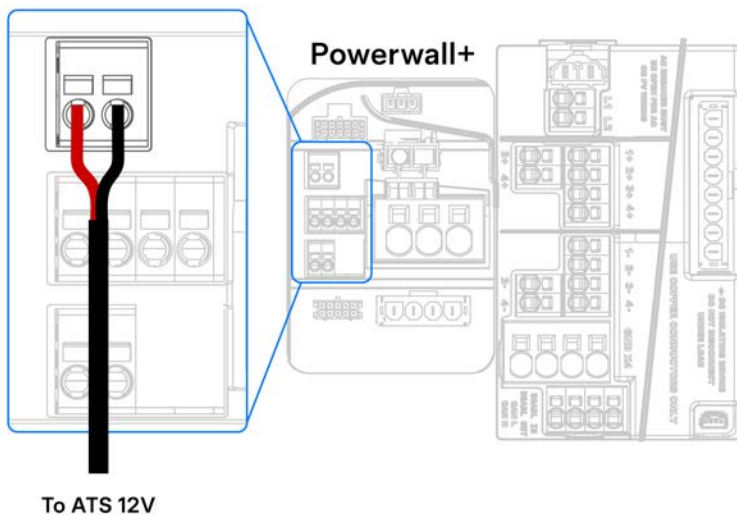




Figure 4. Powerwall+ 12V Jump Ports



 **NOTE:** The location of the 12V output terminals on the ATS may vary based on which ATS model has been installed. Refer to the ATS manufacturer documentation for more information about where to connect wiring.

 **NOTE:** When Powerwall 3 is the Site Controller, no 12V connection is needed, as the Powerwall 3 Tesla Asset Controller (TACO) remains powered by Powerwall 3 itself.

# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

## Sizing of System Components

Because both the Powerwall system and the generator cannot power loads at the same time, they should be sized independently of one another:

- The generator should be sized to match expected backup loads, including any high-power appliances.
- The number of Powerwalls should be determined by expected backup loads. If the customer wants to back up the entire home, the Powerwall capacity should match the generator size.

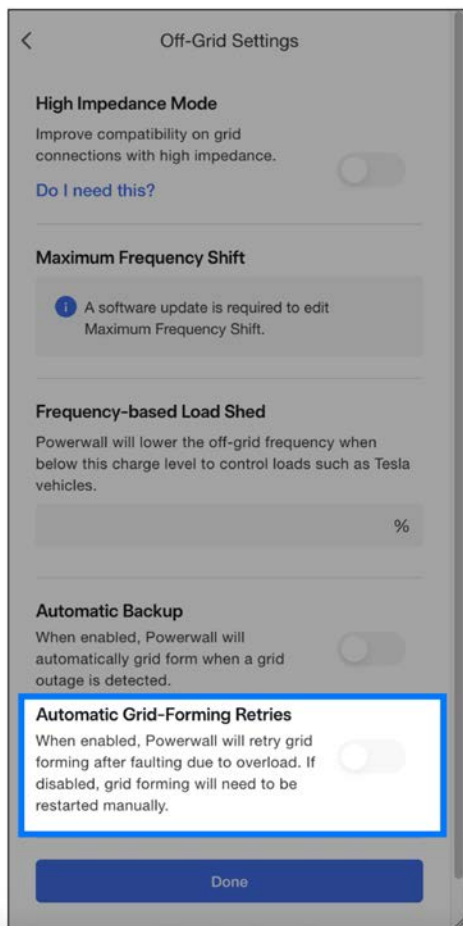
## Metering of System Components

In addition to the normal Site metering (at the Backup Gateway 2 / Backup Switch / Gateway 3) and Solar metering (at the solar inverter), an additional metering kit with two current transformers (CTs) is required. Two CTs are placed at the connection of the generator to the ATS to measure output when the generator is engaged. This allows the customer to see the size of the load on the generator, so they know when the load is small enough to switch back to Powerwall.

## Commissioning

Commission the system using Tesla One. See [Performing Device Setup in Tesla One](#) for instructions.

- While configuring the energy metering, make sure to select what each CT is measuring. For each CT, you can select the location as Site, Solar, Generator, or Conductor. If a CT is not measuring anything, select None.
- If the system includes an ATS: In the *Off-Grid Settings* (select **Settings > Advanced Settings > Off-Grid Settings**), toggle *Automatic Grid-Forming Retries* **OFF**.





# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM



**NOTE:** In the event the Powerwall system is overloaded, the homeowner will be prompted via their Tesla App to reduce loads and manually restart the system.



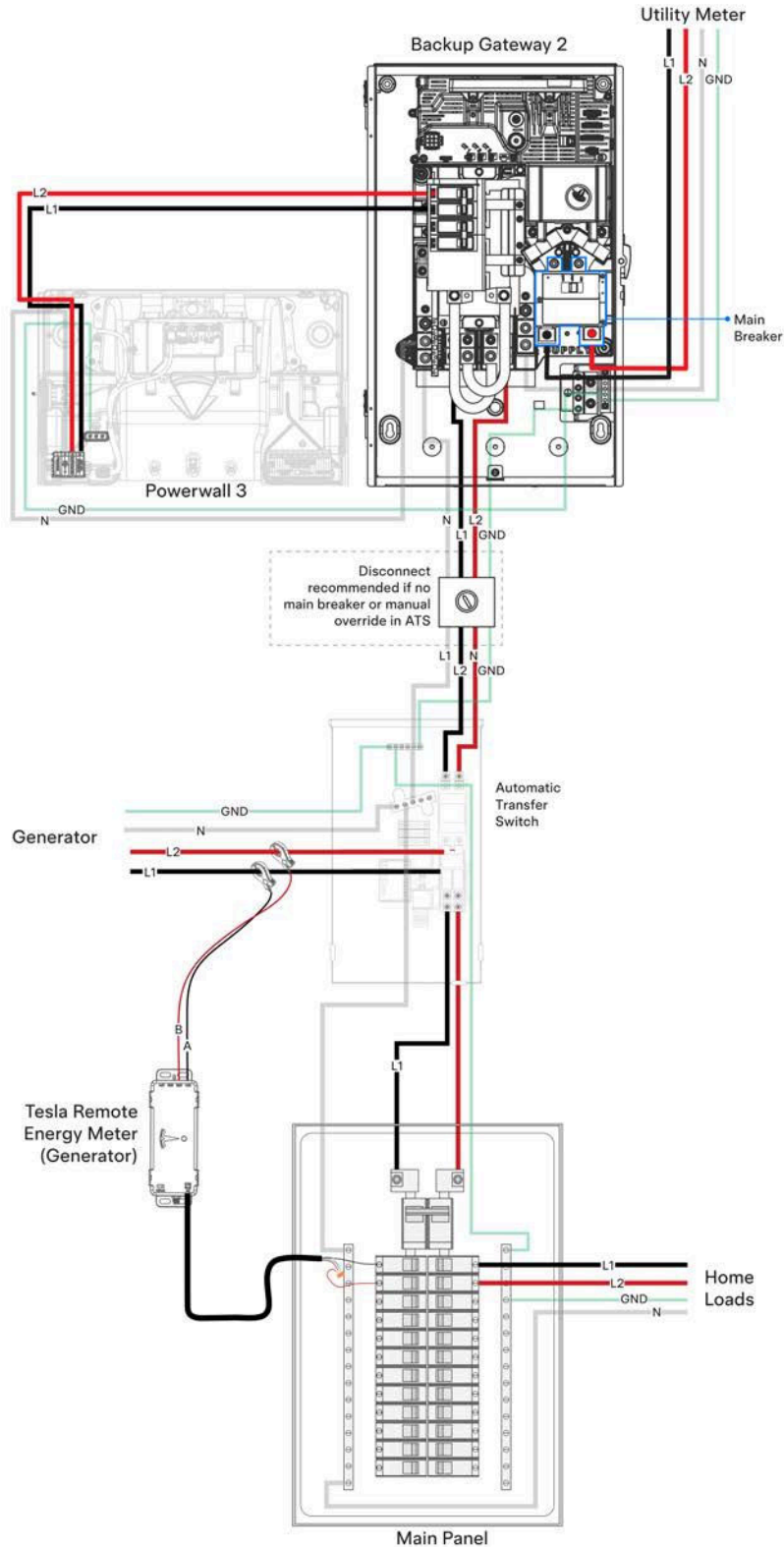
**NOTE:** If the system includes a manual transfer switch, do not disable automatic grid-forming retries.

# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

## Wiring Diagrams

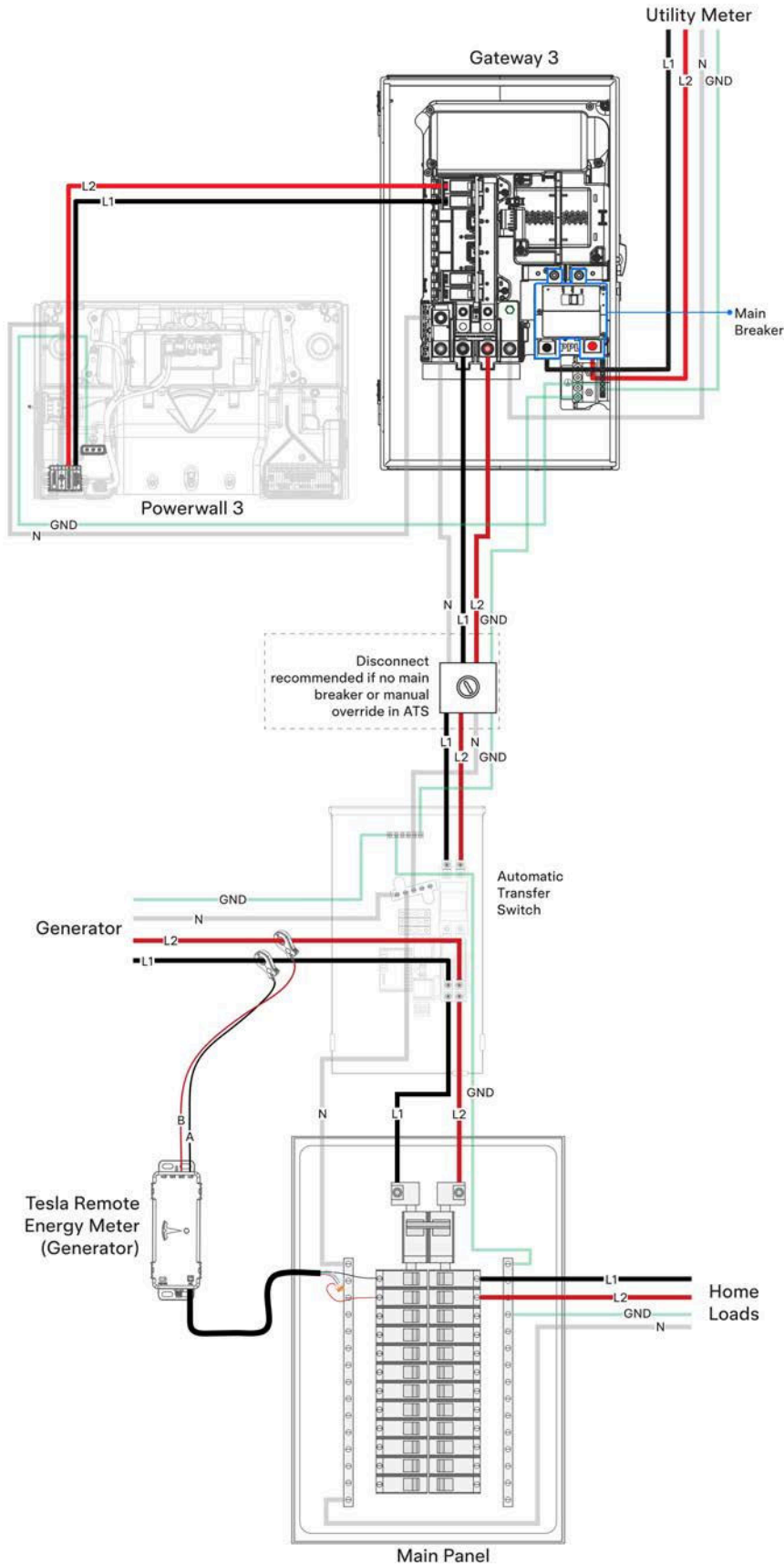
**NOTE:** The following examples represent sample site layouts to show example system layout and metering. These diagrams should not be considered complete plan sets.

Figure 5. Whole Home Backup with Backup Gateway 2



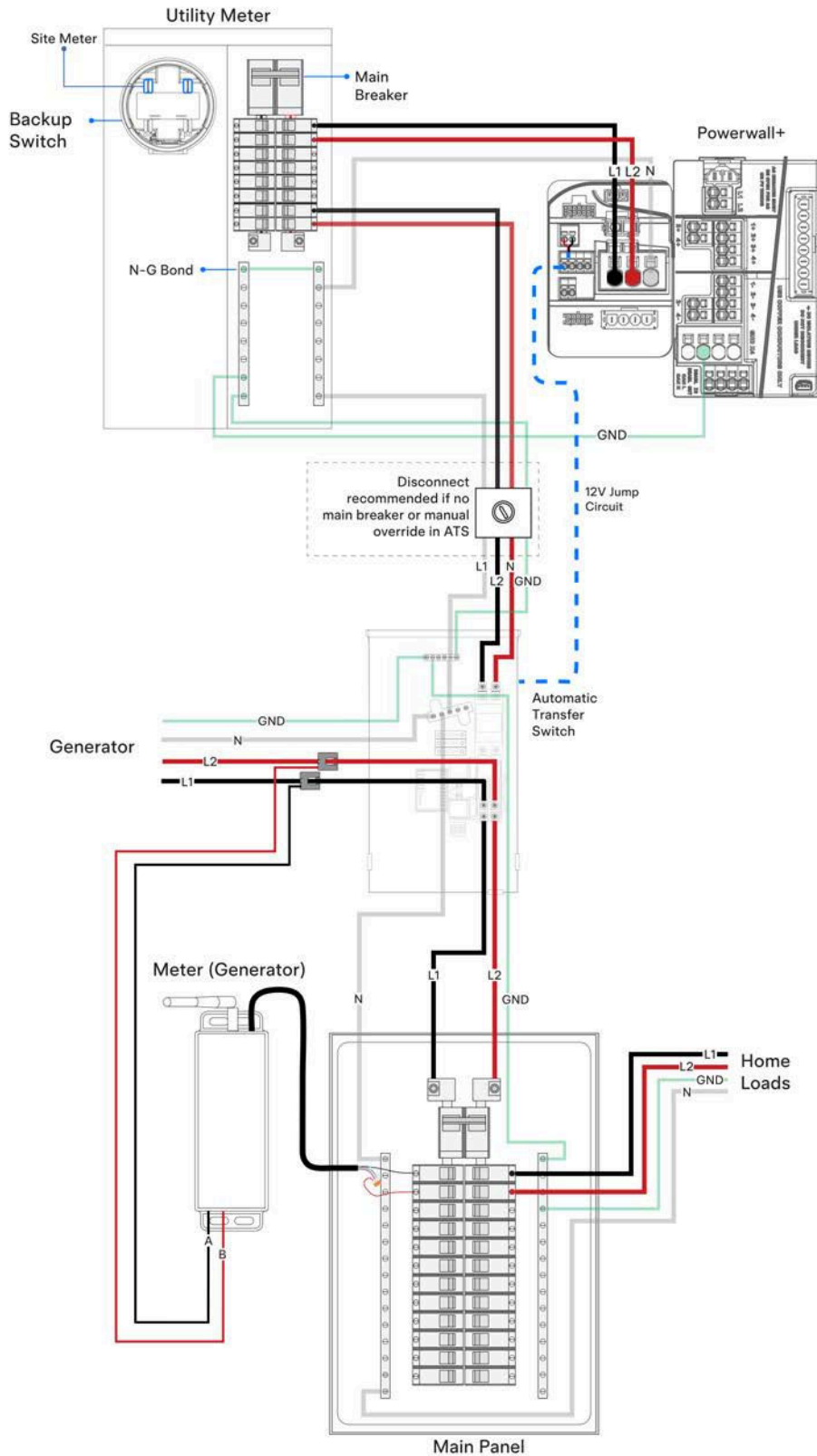
# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

Figure 6. Whole Home Backup with Gateway 3



# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

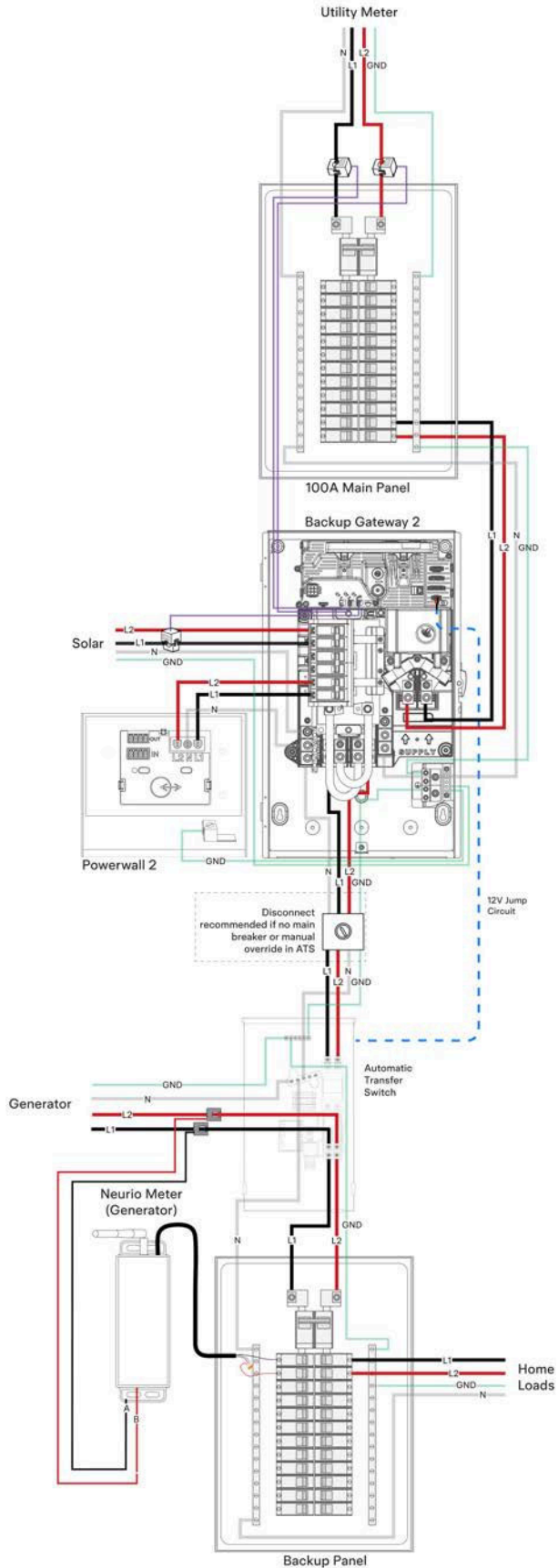
Figure 7. Whole Home Backup with Backup Switch



**NOTE:** In this example, the recommended disconnect is not required because there is already a breaker upstream of the ATS.

# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

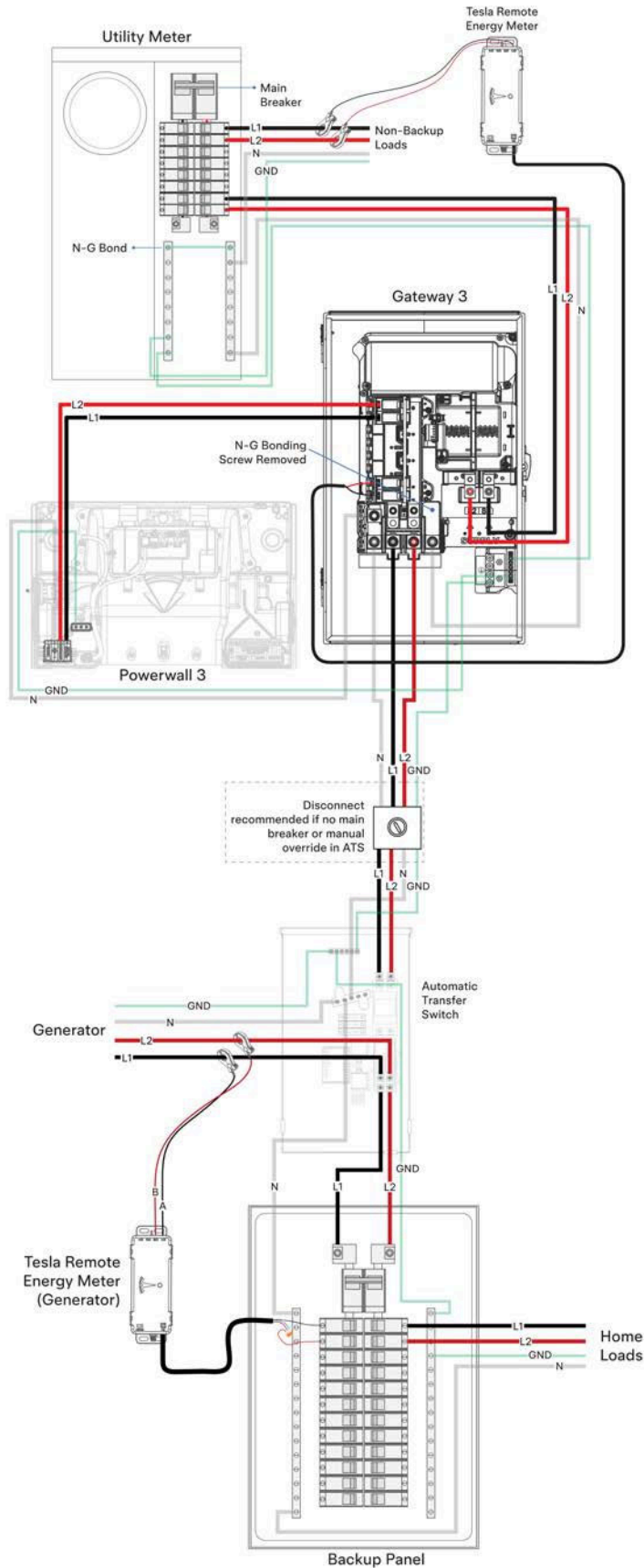
Figure 8. Partial Home Backup with Backup Gateway 2





# INSTALLING A GENERATOR IN A CASCADING CONFIGURATION WITH A POWERWALL SYSTEM

Figure 9. Partial Home Backup with Gateway 3





## REVISION HISTORY

Revision	Date	Description
4.0	1-15-2025	<ul style="list-style-type: none"><li>• Updated to include Powerwall 3 and Gateway 3</li><li>• Added <a href="#">12V Connection Between Backup Gateway 2 / Powerwall+ and ATS on page 9</a></li><li>• Updated <a href="#">Commissioning on page 10</a> with instruction to toggle Automatic Grid-Forming Retries OFF if the system includes an ATS</li></ul>