Home Battery Backup Education Series
PART 2: Technical Challenges to Consider

NOTE: This document assumes that you have an operational understanding of an Automatic Transfer Switch (ATS) as described in Part 1 of this series. This document will also review optional equipment and configurations that may not part of standard installations. These options may not be available for all battery system types.

Today, relatively few solar + storage systems can deliver on providing backup power to an entire home or property. Simply delivering power to all the circuits in a home during an outage, let alone powering the entire home, can be challenging for solar + storage systems to deliver.

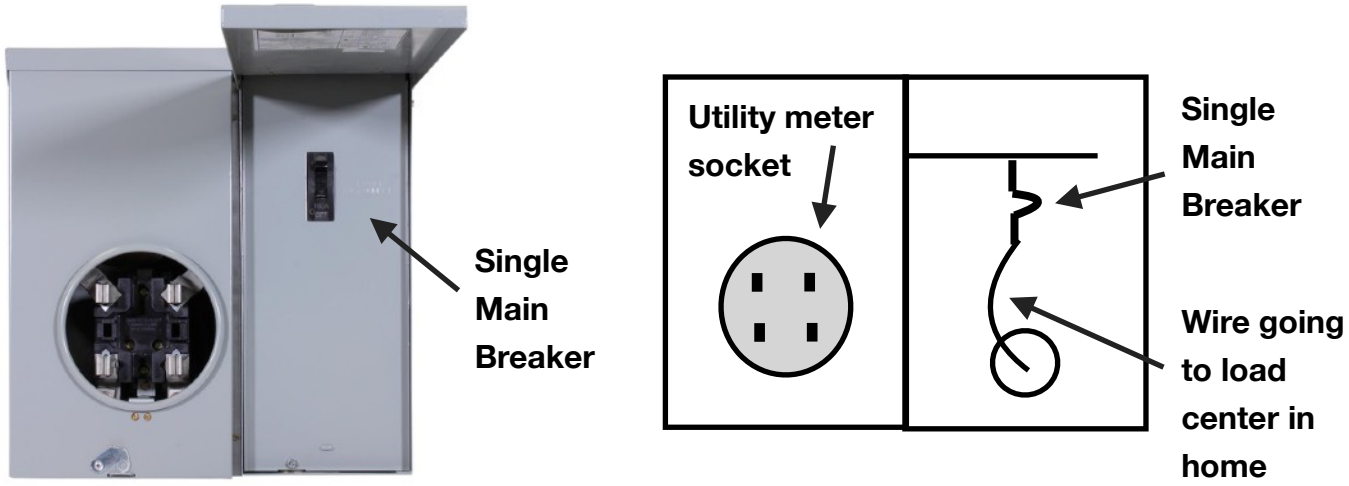
The most common configuration in solar + storage backup power is the sub-panel configuration. In a sub-panel configuration, essential loads such as lighting, security, and refrigeration are moved out of the main panel and into a “protected’ or “essential” loads panel. In the event of an outage, the battery transfers power to these loads, and these loads only. The essentials are powered while the rest of the home goes dark.

Battery energy storage systems with backup capabilities work best when they are designed to ration battery capacity and minimize the use of major appliances. Whole home backup systems are typically designed similar to off-grid living: the homes are typically smaller and well insulated; use combustion heating with propane backup; incorporate active and passive solar thermal systems; and do not have power-hungry air conditioning systems, high amperage electrical vehicle (EV) chargers, or swimming pools.

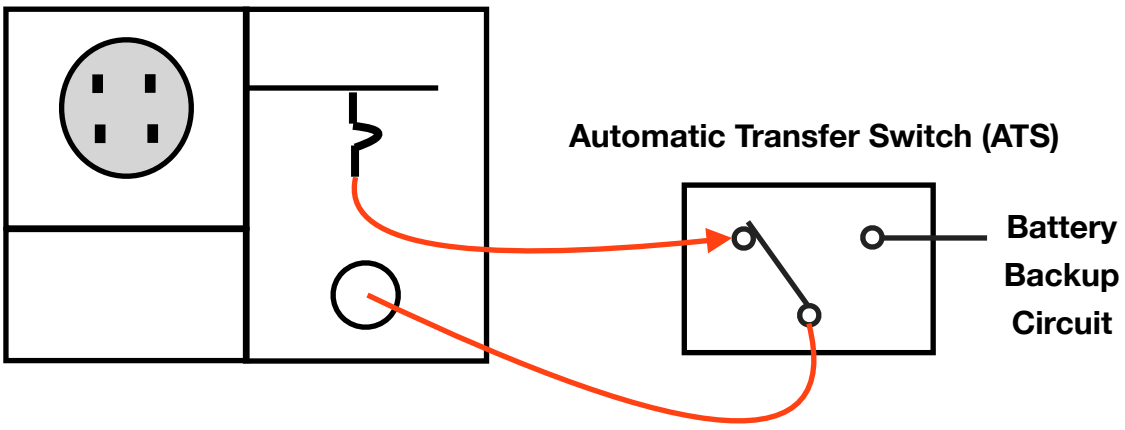
Of course, installing additional battery capacity and inverter power can address these energy and power limitations. But the cost of these systems may be too high for the typical homeowner. For more information on this topic please refer to the document, *Battery Energy Storage Fundamentals*.

If you are still interested in pursuing whole home backup, then you should be aware of some technical challenges encountered along the way. These challenges typically start with the design of the home’s existing electrical infrastructure and type of utility meter enclosure.

As outlined in Part 1 of this series, an ATS is designed to isolate the home's electrical system from the grid at a single point of connection. This is typically done with the home's "main breaker" located at the utility meter.



Example of a single main breaker feeding the whole home on the left and an illustration view of the same on the right

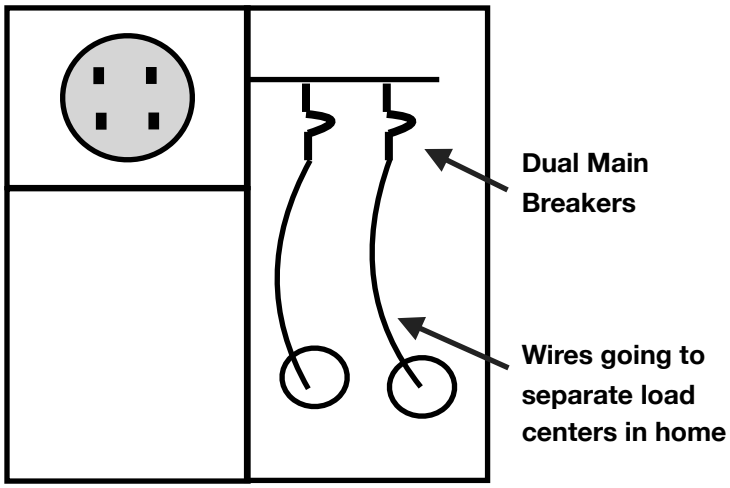


A single main breaker allows the entire home's power to be routed through the ATS for whole home backup.

Unfortunately, there are many meter configurations on the market that allow for multiple points of connection between the utility grid and the home's electrical system. This is where the technical challenges start to begin. Below are some scenarios that help describe this issue along with some example photos and illustrations.

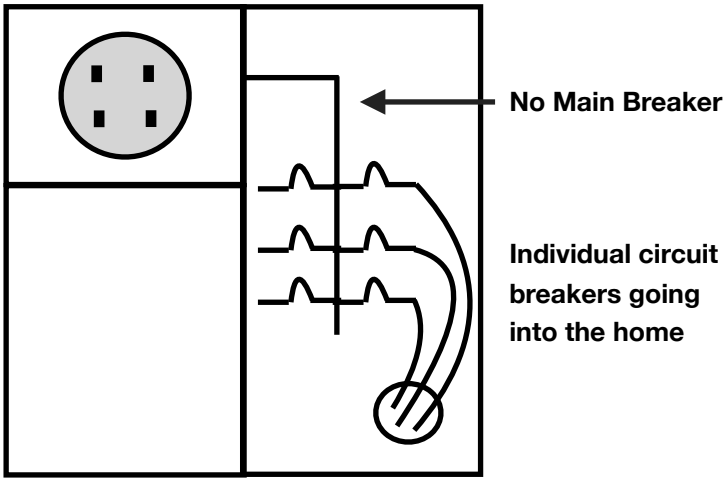
1) Dual Main Breaker Meter Enclosures

Some homes may have dual main breakers that feed separate load centers within the home. There is no single point to wire in an ATS for whole home backup, but partial home backup is still possible by choosing one of the circuits.



2) No Main Breaker

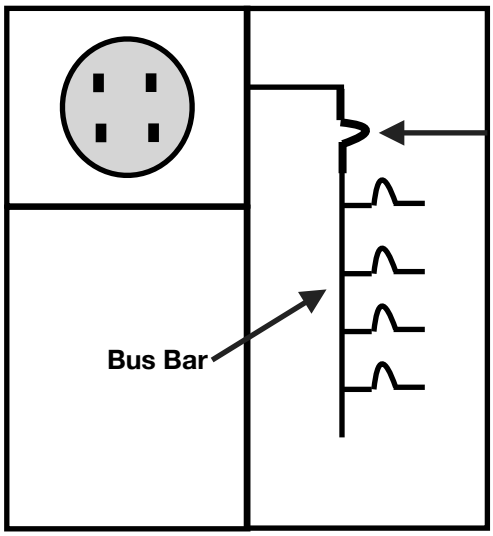
Some meter enclosures have no main breaker, but instead have individual circuit breakers directly feeding separate home loads. There is no single point to wire in an ATS for whole home backup, but partial home backup is still possible by choosing one of the circuits.



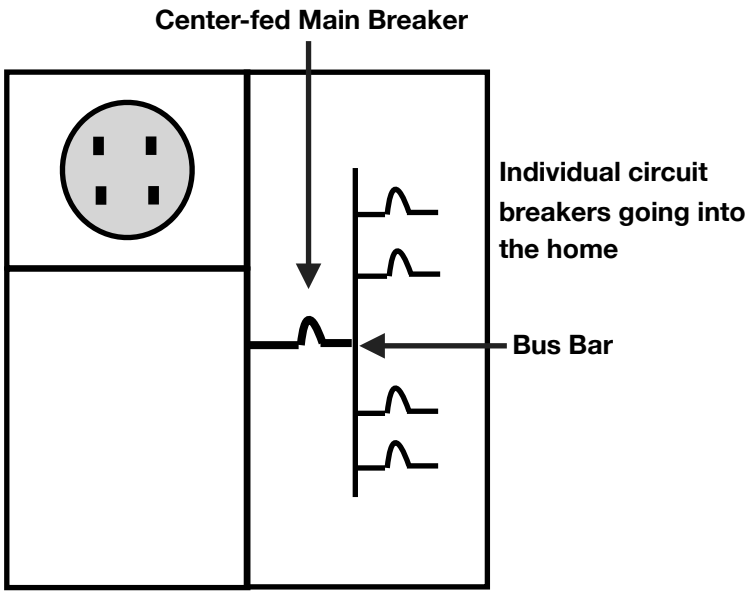
3) Main Breaker Feeding Metal Bus Bar

Some meter enclosures have a single main breaker, but it is directly connected to a solid metal “bus bar” feeding individual circuit breakers to separate home loads. There is no single point to wire in an ATS for whole home backup, but partial home backup is still possible by choosing one of the circuits.

Bolt-on style main breaker feeding individual circuit breakers.



Center-fed main breaker feeding individual circuit breakers.



In many of these scenarios you will most likely be required to upgrade the electrical service and/or meter enclosure to a different style, or possibly consolidate all of the existing home load breakers into a new main ‘sub panel” to create a single point of connection for the ATS input.

A possible alternative in these situations is to do a “partial” home backup instead of “whole” home backup. In any of the examples above, you would need to choose one of the individual breakers to back up a single load center in the home.

A more cost effective and practical approach may be to have the ATS connected to a separate protected loads panel only: no large appliances such as air conditioning, 240-volt EV chargers or electric stoves. Instead, just an appropriate amount of circuits in the house for refrigeration, lighting, entertainment, communications and convenience outlets. A protected loads panel allows a homeowner to segment off a smaller subset of the home’s electrical needs that they want to keep powered during an emergency power outage.

By default, Kumukit battery energy storage systems that have backup power capabilities include a protected loads panel as part of our standard installation. These protected panels provide limited backup power to dedicated electrical outlets located inside the panel. Many homeowners simply plug extension cords into the convenience outlets for emergency power during a power outage, similar to a backup generator. **These protected load panels will not supply power to the entire home during a power outage.** There is an option to hard-wire a limited number of circuits from within the home to this protected load panel for an additional fee. Every home’s electrical layout is different, so we will need to estimate this amount on a case-by-case basis.