FRANKLINWH

Unlocking Unrestrictive Vehicle to Load (V2L) Capabilities with the FranklinWH System

Introduction

With the growing demand for electric vehicles (EVs), including the introduction of electrified trucks such as the Ford F-150 Lightning, Tesla Cybertruck, and Chevy Silverado-each equipped with high-capacity batteries-homeowners are increasingly eager to leverage EV's batteries to power their homes during extended power outages. While only a limited number of EV trucks offer these capabilities today, it's an exciting development. Multiple vehicle manufacturers, such Ford, GM, Hyundai, Tesla, Rivian and Kia, are adding vehicle-to-load (V2L) and vehicle-to-home (V2H) capabilities to their newest EVs.

With an average daily household consumption of 30 kWh, a 100-kWh battery pack could theoretically power a home for up to three days. While this is an interesting and evolving field within renewables, there are still some barriers to address and before we achieve mass adoption. Homeowners are particularly concerned about the cost of adopting this technology and how EV warranties may be affected when additional capabilities, such as V2H or V2L are integrated. This creates exciting opportunities for integrating stationary home energy storage systems, such as the FranklinWH System, with existing EVs.

At FranklinWH, we are dedicated to innovation, energy freedom and futureproofing as fundamental pillars of our mission. The FranklinWH System supports V2L, allowing homeowners to use a compatible EV to power home loads and charge the aPower batteries during an outage. The best part is that this setup requires neither costly proprietary equipment from the vehicle manufacturer nor a significant investment to enable this feature. At FranklinWH, our goal is to seamlessly integrate all power sources into the home by focusing on innovation and simplicity. We do not currently support V2H bi-directional charging, however it is on the product roadmap.

FranklinWH's Innovative Approach to V2L

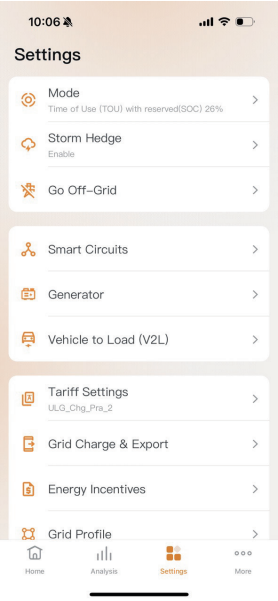
V2L refers to the process of transferring stored electricity from EV batteries to support loads (electric) in the home. Several pathways are available to bring EV power to the home. One of the more complex pathways may bring substantial costs due to the necessity of installing the required inverter equipment and infrastructure upgrades to effectively utilize this capability. Those costs may include a main panel upgrade, which adds to the overall project cost and leaves homeowners frustrated.

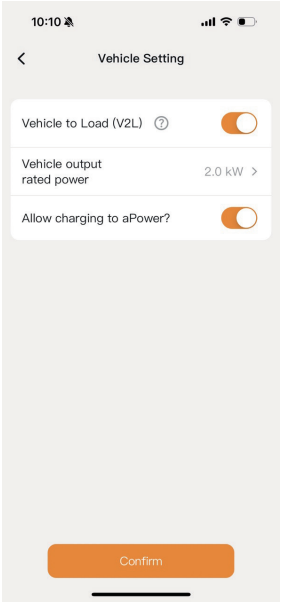
Enabling V2L Through Generator Module (for aGate)

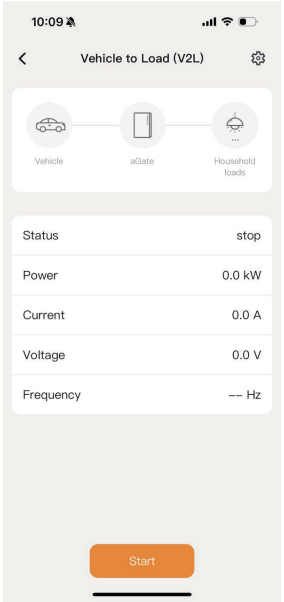
The FranklinWH System takes a simpler approach, without infrastructure upgrades. The system allows the eligible V2L compatible EV to feed home loads and charge the aPowers as well during an outage. Several EV trucks have an onboard 240 V NEMA 14-30 or NEMA 14-50 outlet which can be leveraged to integrate with the FranklinWH System using the Generator Module (aGate accessory). At the time of publishing this document, it's important to note that some EV manufacturers such as Hyundai and Kia may have EVs with V2L capabilities, however they cannot be integrated with the FranklinWH V2L solution as they do not have a true 240 V outlet.

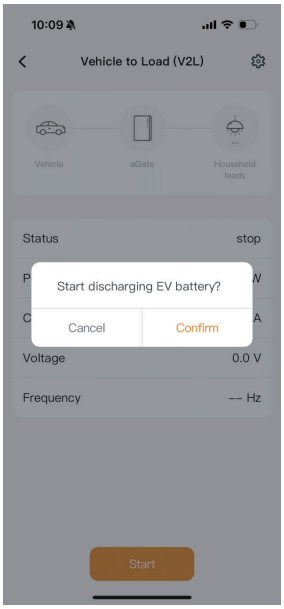
When the utility grid and solar are not available, and during a prolonged outage or at night, the aPower battery state of charge (SOC) can be depleted to a low-level. In such events, just like generator operation for the FranklinWH System, the eligible EV model can serve as a backup power source for the household loads and to recharge the aPower battery.

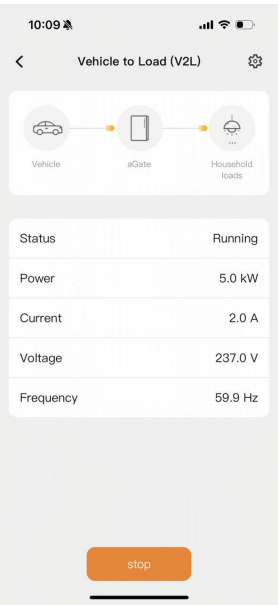
This feature enables uninterrupted power experience for homeowners during prolonged outages without requiring any additional hardware or major electrical upgrades. The Ford F150 Lightning (Pro and Lariat), an example of the EV's tested for this feature, consists of a 240 V generator output in the truck bed which was landed on the aGate's Generator Module. The Generator Module L1 and L2 lugs are typically wired to a NEMA14-50 receptacle. A NEMA14-50P cable is run between the house outlet and the Ford Lightning. It is commissioned in the FranklinWH App. Refer to the commissioning instructions and screenshots below. Navigate to the Settings page, select Vehicle to Load (V2L) - Disable for V2L configuration as shown in the following images.

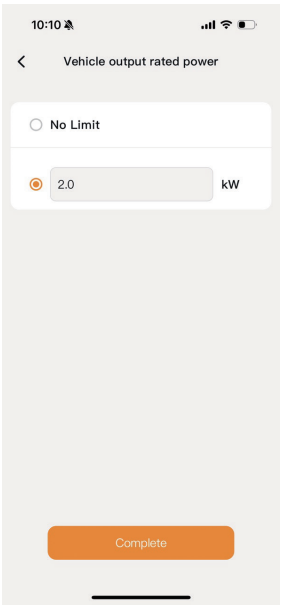


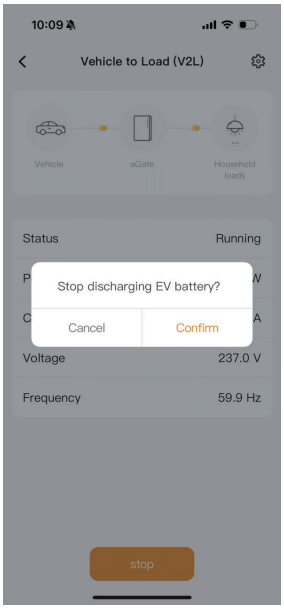


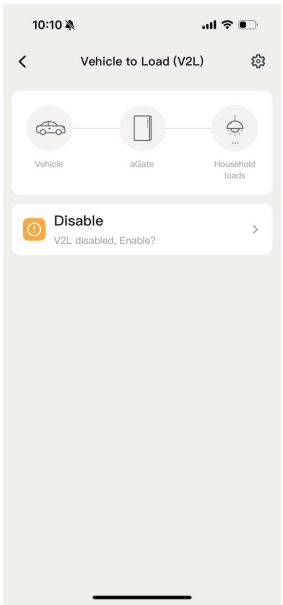












FranklinWH tested this integration with several EV pickup trucks and confirms that the EV trucks tested were serving home loads as well as charging the aPower battery. The trucks were able to charge the aPower in a few hours while supporting basic home loads. For the Ford F-150, the NEMA 14 plug connecting to the F-150 will need to have its ground wire disconnected. If it remains connected, the truck's electrical system will show a ground fault error.

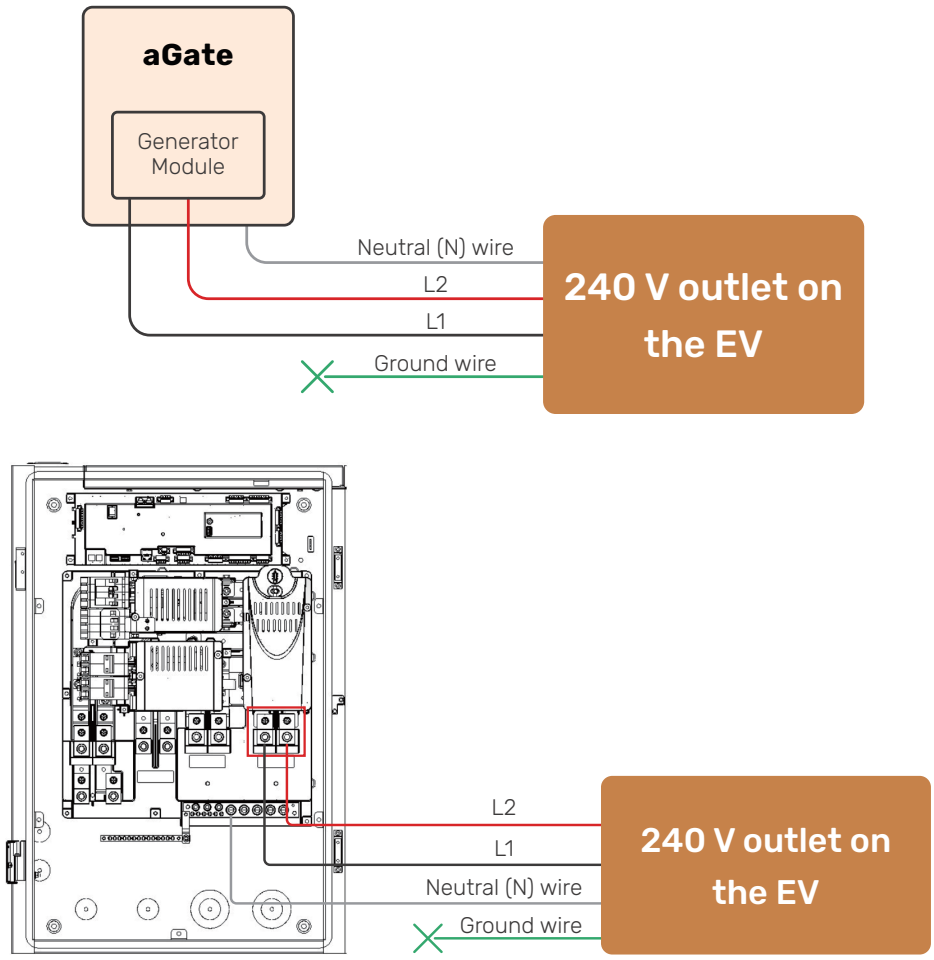


Figure 1. Configuration for EV truck and aGate

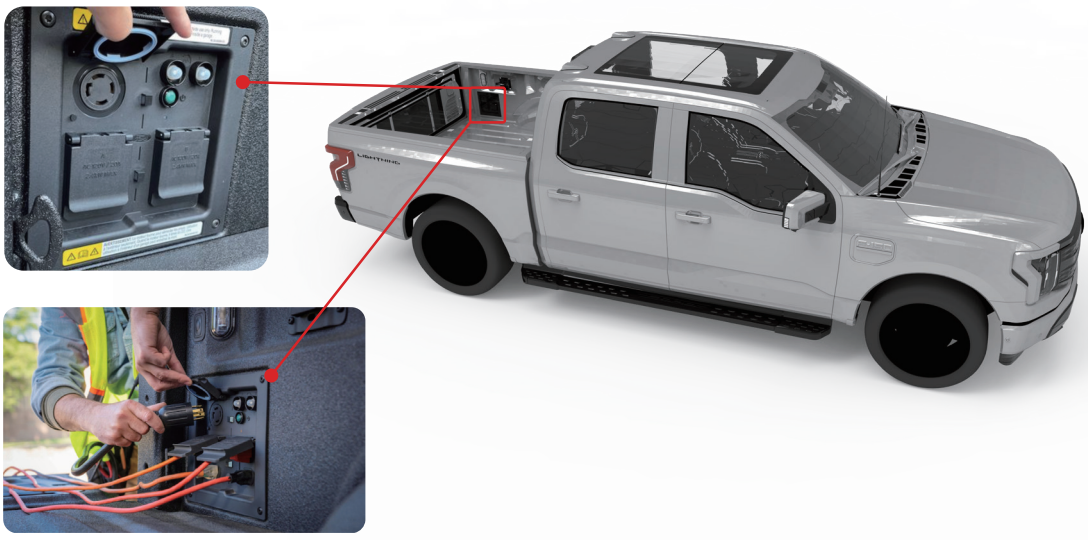


Figure 2. 240 V outlet on the bed of an EV pickup truck

Enabling V2L Through the aHub (for aGate and MAC)

The aHub serves as the interface that enables V2L integration within the FranklinWH Home Power system. By connecting a compatible electric vehicle to the aHub, the energy stored in the EV can be safely incorporated into the home's backup power architecture, allowing the vehicle to function as an additional distributed energy resource during grid outages.

The aHub provides a dedicated 240 Vac V2L input (Port 4) designed specifically for compatible EVs equipped with a 240 Vac V2L power outlet. Through its integrated CAN communications interface, the aHub establishes intelligent coordination between the EV, battery storage, solar PV, and household loads. This communications enables advanced V2L control while also supporting future generator integration. (Using the RS485 interface does not support these functions.)

To ensure coordinated energy management, non-relay-controlled PV systems must also be connected through the aHub. This allows the system to manage solar generation, battery storage, and EV power as a unified backup solution, ensuring stable operation during both grid-connected and backup modes.

From an installation perspective, the EV is connected to the aHub using a standard L1, L2, and Neutral interface. Installers may use an appropriate inlet box and cable assembly to simplify deployment, while maintaining electrical isolation of the outlet ground from the inlet enclosure where required.

The aHub's V2L architecture is designed to support code-compliant installation practices and aligns with applicable NEC Articles 625.60, 250.34, and 250.20 for vehicle-mounted generators with GFCI-protected receptacles connected through cord-and-plug V2L interfaces.

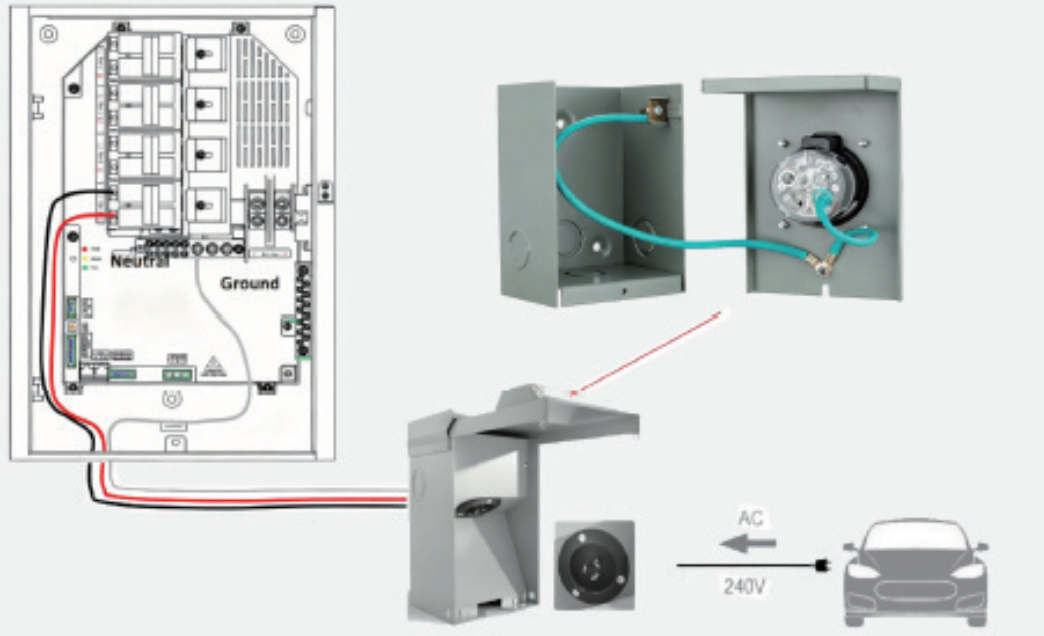


Figure 3. Configuration for EV and aHub

To conclude, the requirements for integrating V2L with the FranklinWH System are:

- Work performed by a FranklinWH Certified Installer
- aPower X, aPower 2, aPower S, and future models
- aGate 1.3, aGate 1.3.1, and future versions with either a Generator Module or an aHub, or MAC with an aHub
- Eligible EV with V2L capabilities and at least one 240 Vac outlet in the EV

Please note that the above-mentioned set-up does not require any additional hardware from the EV manufacturer and should only be used during an extended outage when other system generation sources (PV, Stationary/Mobile Generator) are not available or adequate to serve consumer demand. If ground fault issues are detected by the EV's onboard inverter, contact the EV manufacturer for guidance on any ground-neutral bond limitations. Every EV manufacturer has a different setup for V2L, please review the manual for more information. For reference when talking to EV manufacturer support, the FranklinWH System only isolates L1 and L2 lines and does not isolate the neutral conductor.

Grounding and GFCI Requirements

It is important to note that Electric Vehicle Power Export Equipment (EVPE) is the equipment, including the outlet on the vehicle, that is used solely to provide electrical power to loads external to the vehicle, using the vehicle as the source of supply. This is contrasted with EVSE (Electric Vehicle Supply Equipment) which is used for the charging of the EV.

As mobile generators and V2L (EVPE) use cases are considered non-fixed source inputs to the FranklinWH System Generator Module, the requirements for direct grounding electrode connections are unique to them and are specifically outlined in NFPA 70 (the NEC).

See 2023 NFPA 70 Article 625 “Electric Vehicle Power Transfer System.” EVs equipped with a receptacle(s) for the purposes of exporting power to supply utilization equipment must follow similar safety requirements as required by the NEC for other sources, such as portable generators.

Regarding the specifics of an EVPE outlet as mentioned above and used in accordance with Article 625.60 “AC Receptacle Outlets Used for EVPE,” and Article 250 for “Grounding and Bonding,” the details of Article 250.34 “System Grounding for Portable, Vehicle-Mounted, and Trailer-Mounted Generators” apply directly. The frame of a vehicle shall not be required to be connected to a grounding electrode (Article 250.52), as defined for a system supplied by a generator located on the vehicle under the conditions as mentioned in Article 250.34(B), and as shown in the FranklinWH Installation Guide.

To provide for GFCI requirements under Article 625.60(D), “various methods” can be used (e.g. the EVPE certified/integrated circuit protection, trip indicator, and reset control button). For more information on GFCI components and considerations, please contact the EV manufacturer. Please see the FranklinWH installation manual for all wiring details.

Frequently Asked Questions

Q: How can the FranklinWH System support V2L functionality?

A: V2L functionality is supported on the following FranklinWH System configurations:

1. aGate 1.3 and aGate 1.3.1 with either a Generator Module or an aHub
2. MAC with an aHub

In all cases, the system must be paired with a compatible V2L-enabled EV that provides a 240 Vac output. Please refer to the latest FranklinWH compatibility documentation for supported EV models and system configurations.

Q: Which EVs support the V2L functionality with the FranklinWH System?

A: As of 2Q2026, we have completed full testing with a Ford F-150 Lightning, Tesla Cybertruck, and Chevy Silverado with 240 V outlets. We plan to test additional vehicles for this feature and will continue to update our approved list. Please let us know which vehicle you would like us to test next by emailing us at ***engineering@franklinwh.com***. Note that the EV must have a 240 V outlet for the V2L feature to be enabled and check with the EV manufacturer for more on V2L capabilities.

Q: Will the EV charge my aPower to full state of charge?

A: Yes (configurable). The EV with V2L functionality behaves as a portable generator on wheels with the primary goal of feeding the home loads and using any excess capacity to charge the aPowers. For faster aPower charging, keep home loads under 1 kW.

Q: Can I use my portable generator if I have an eligible EV that can do V2L with FranklinWH?

A: Yes, however, you can use only one at a time.

Q: What's the output from the compatible EVs that can do V2L with FranklinWH System?

A: Check with the vehicle manufacturer regarding this. From our testing, some of the EVs have rated output of 9.6 kw and our system default setting will not take more than 80% of the rated power for use. The usable 7.68 kw will be used to power home loads and charge the apower batteries (depending on home load profile).

Q: Does FranklinWH support V2H as well?

A: No, it's important to note that the FranklinWH System supports V2L only and does not currently support V2H bi-directional charging. However, it is on the product roadmap of FranklinWH to support V2H.

www.franklinwh.com

FRANKLINWH

United States:

info@franklinwh.com +1 888-851-3188

1731 Technology Dr., Suite 530, San Jose, CA 95110

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