

# Application Note:

# SPAN Energy Management

Using SPAN PowerUp™ to avoid upsizing feeder conductors

## The Service Upgrade Challenge

When homeowners look to electrify their homes and vehicles for the cost, convenience, and environmental benefits, many discover electrification projects can come at a high cost if upgrades are required to their utility service. Adding electric vehicle charging (EVSE) on an existing 100-200 Amp service for example, often triggers service or feeder upgrades when conventional load calculations in the National Electrical Code (NEC) are followed.

There are provisions in the NEC however, that allow for Energy Management Systems (EMS) such as the SPAN Panel to automatically manage power, instead of relying on manual load calculations. These important allowances can help facilitate more electrification projects by saving homeowners time and money, without negatively impacting their home charging experience.

## SPAN: Listed Energy Management Equipment

The SPAN Panel is energy management equipment listed to UL-916 that “energizes or de-energizes electrical loads to achieve a desired use of electrical power.”

<b>Standard(s):</b>	Standard for Safety Panelboards [UL 67:2018 Ed.13+R:11Oct2019] Energy Management Equipment [UL 916:2015 Ed.5] Reference Standard for Service Equipment [UL 869A:2006 Ed.4+R:24Jun2020]
<b>Product:</b>	Smart Panel
<b>Models:</b>	1-00800- may be followed by 00 to 99.

Figure 1: SPAN Panel ETL Authorization to Mark

## SPAN: An Energy Management System (EMS) defined in the NEC

The NEC has dedicated an article<sup>3</sup> on Energy Management Systems since 2014. This article recognizes and defines Energy Management Systems (EMS) as “A system consisting of any of the following: a monitor(s), communications equipment, a controller(s), a timer(s), or other device(s) that monitors and/or controls an electrical load or a power production or storage source.”<sup>4</sup>

The NEC also states that an EMS “shall be permitted to monitor and control electrical loads” Additionally, an EMS “shall not cause a branch circuit, feeder, or service to be overloaded at any time. 750.30(C).” Thus, an EMS may monitor and control a wide range of appliances, including but not limited to heat pumps, air conditioners, resistive heaters, water heaters, and EV chargers.

<sup>1</sup>The SPAN Panel is certified to UL 916 (Energy Management Equipment)

<sup>2</sup>UL 916 (Scope 1.2)

<sup>3</sup>Article 750: Energy Management Systems (2014, 2017, 2020, 2023)

<sup>4</sup>NEC 750.2 (2014, 2017, 2020), NEC 100 Definitions (2023)

## Settings: For Qualified Persons Only

Setting up the SPAN Panel's Energy Management System may only be made by SPAN Authorized Installers during commissioning via the password-protected SPAN Installer App. Refer to the SPAN Panel and SPAN Drive [Installation Manuals](#) for complete instructions.

A SPAN Authorized Installer will set the control limit on the service conductors or feeders supplying the SPAN Panel during the commissioning process by selecting the rating of the breaker feeding the SPAN Panel. Per the NEC, this setting **"shall be permitted"** as it's **"password protected with password accessible only to qualified personnel."**<sup>5</sup> The homeowner does not have access to this setting, since it is a safety feature available only to qualified personnel.

## Managing an EV Charger (EVSE)

When an Electric Vehicle Service Equipment (EVSE) is connected to a SPAN Panel, the SPAN Panel can be set by an authorized installer to provide load management functions. The SPAN Panel contains factory-installed metering and control hardware at the mains and for every branch circuit (breaker stab). This allows the SPAN Panel to monitor total current draw on the mains, and control it to a defined limit.

The default continuous current limit for this EMS function is factory-set at 80% of the main overcurrent protection device (OCPD) for the SPAN Panel. For example, a SPAN Panel fed by a 200A main breaker would be limited to a continuous current limit of 160A. This is to align with NEC requirements. When this function is active, if the measured total current draw on either Line1 or Line2 feeder conductors exceeds the current limit for a short period of time, SPAN's EMS will take action to reduce total current. The action SPAN takes will depend on the specific EVSE that is installed:

1. For SPAN Drive EVSE: Drive will gradually throttle down EV charging load to as low 6 Amps, then pause if needed.
2. For all other EVSE: SPAN Panel will pause EV charging by opening the relays for this circuit.

Once the total load in the SPAN Panel drops below the threshold and has stabilized over several minutes, EV charging will throttle up (SPAN Drive), or resume (Other EVSE). The homeowner is notified via the SPAN Home App when charging has been throttled or paused, and again when operation resumes.

Therefore, when planning for the addition of EV charging loads to the SPAN Panel, the contribution of the EVSE does not need to be considered in the home's service or feeder load calculations. Because of SPAN's EMS controls providing automatic load management of the EVSE, the NEC allows the total load to be defined as **"the maximum equipment load on a service and feeder shall be the maximum load permitted by the EMS."**<sup>6</sup>

<sup>5</sup>NEC 625.42 (3) (2020) NEC 750.30 (C)(3) (2023)  
<sup>6</sup>NEC 625.41 (2014) NEC 625.42 (2017, 2020, 2023)

The graphs below show **before and after simulations** of coincident peak load events at sites with SPAN Drive installed. The SPAN Panel monitors the current and **throttles the power of SPAN Drive** until the coincident load is below 80A, protecting the feeders from overload.

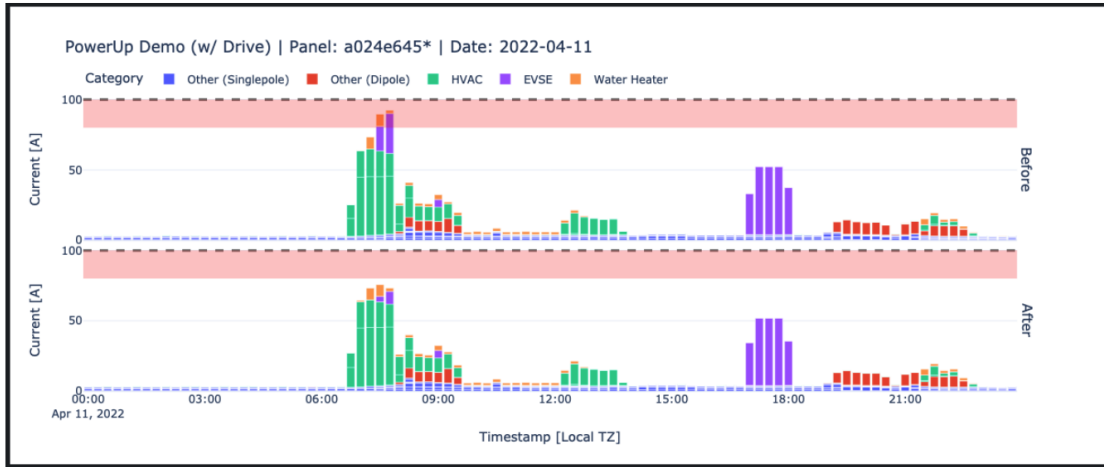


Figure 2 PowerUp scenario A (SPAN Drive)

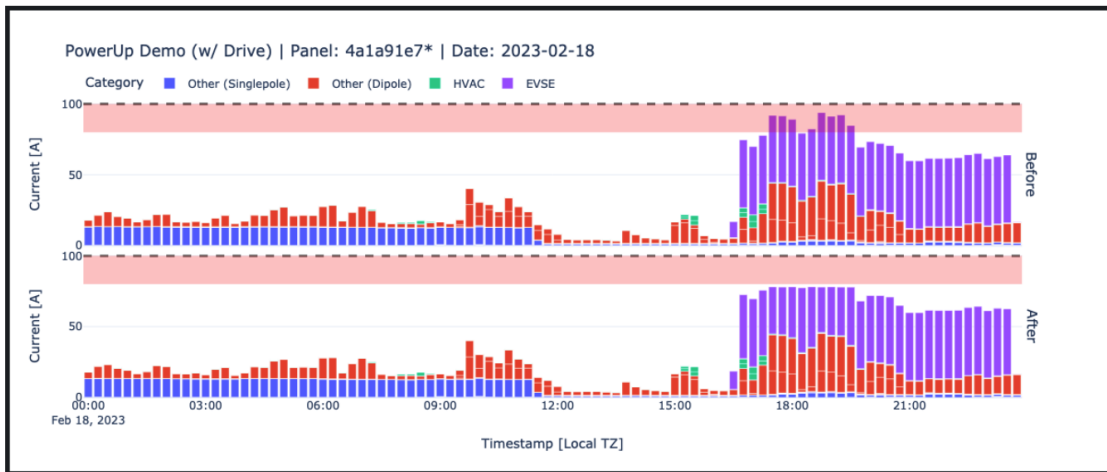


Figure 3 PowerUp scenario B (SPAN Drive)

# Managing non-EVSE circuits using SPAN EMS

When the SPAN EMS is providing overload prevention, It may be necessary to temporarily pause circuits that are not EVSE circuits. SPAN will monitor and control circuits that contribute to coincident power peaks. Through the commissioning process, the SPAN Authorized installer will select circuits to be monitored and controlled during a peak power event. Qualified Circuits are load classes which SPAN has tested and deemed appropriate for frequently and autonomously powering on and off via SPAN's internal branch relays, without significant risk to occupant comfort or convenience.

An example of a qualified circuit is an Electric Floor Heater. Pausing this circuit temporarily will not significantly impact the comfort of the home and can be effectively controlled by the SPAN Panel EMS.

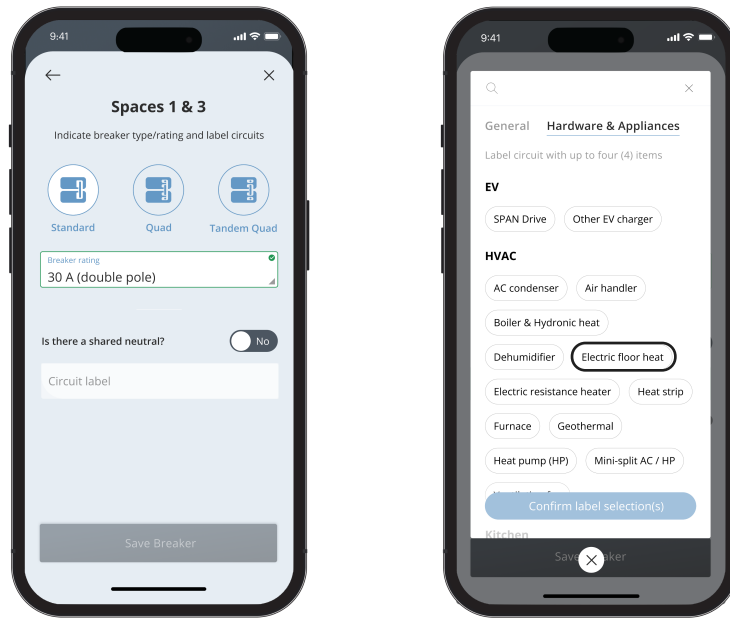


Figure 4 - PowerUp commissioning - Enrolling qualified circuits

The graph below shows a before and after simulation of coincident events involving a non-EVSE circuit, such as an Electric Floor Heater. In the simulation, this circuit is labeled Other (Dipole) and is paused for no more than 15 minutes per event, protecting the feeders from overload.

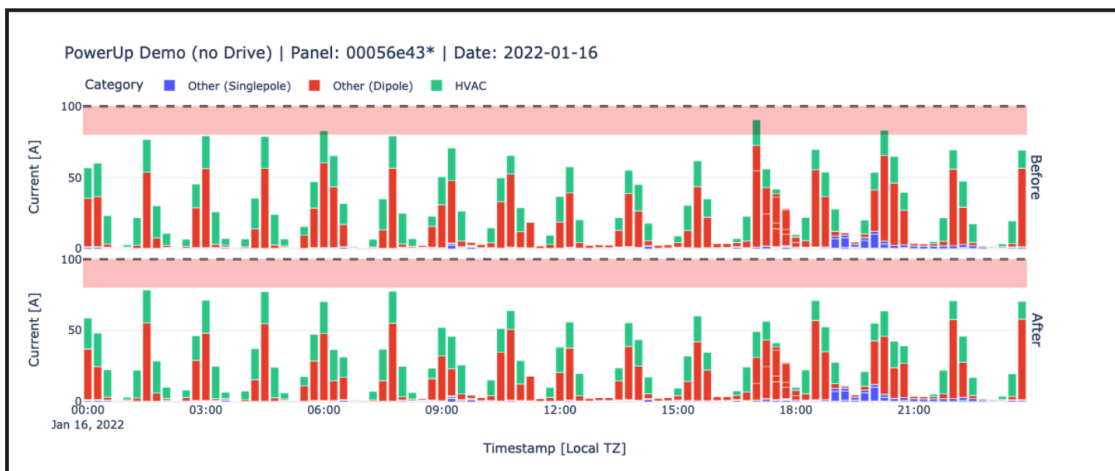


Figure 5 - PowerUp scenario (non-EVSE)

## Whole Home Energy Management in the NEC

The SPAN Panel Energy Management System (EMS) **monitors and/or controls an electrical load.**<sup>7</sup> As shown in the simulations above, when the SPAN Panel is commissioned to control current to a maximum setpoint, the EMS will monitor the coincident peak current, and manage power in order to avoid overloading the conductors connected to the mains.

This SPAN EMS orchestrates home power such that where multiple loads operating at the same time could create an overload, SPAN EMS will ensure that these **two or more loads will not be in use simultaneously.** The NEC states that where loads like these are noncoincident, like in a SPAN EMS, **it shall be permissible to use only the largest load that will be used at one time for calculating the total load on a feeder or service**<sup>8</sup>. Through the sophisticated load management performed by the SPAN EMS, the largest load that can be operated coincidentally is determined by the setting of the EMS. Unlike simple switches that prevent two specific loads from operating, SPAN manages all loads in real time, calculating the load and intelligently pausing appropriate circuits to keep the total current on the feeder or service conductors within their ratings.

Prior to the NEC 2023, these applications were only addressed in language addressing noncoincident loads. In the 2023 edition of the NEC, an Energy Management System<sup>9</sup> is explicitly permitted to control multiple loads to a single **current setpoint**, which is equal to **a single value equal to the maximum ampere setpoint. . . for calculating the connected load per 220.70.**<sup>10</sup> In the SPAN Panel, this setpoint is selected by the installer at commissioning based on the breaker and related conductors supplying the panel. This setpoint, once made, cannot be changed by any user without authorization by SPAN.

NEC 220.70 (2023) repeats the allowance found in Article 750, stating **If an energy management system (EMS) is used to limit the current to a feeder or service in accordance with 750.30, a single value equal to the maximum ampere setpoint of the EMS shall be permitted to be used in load calculations for the feeder or service.**<sup>11</sup> This code is located within Article 220, in Part III: Feeder and Service Load Calculations, the area of the NEC which determines how to size service or feeder conductors.

SPAN reinvented the 100 year old electric panel in order to accelerate the decarbonization of our homes. The SPAN EMS, PowerUp, enables many features that allow homeowners and communities to achieve this goal.

<sup>7</sup>NEC 100 (2023) NEC 750.2 (2020, 2023)

<sup>8</sup>NEC 220.60 (2014, 2017, 2020, 2023)

<sup>9</sup>NEC 750.30 (2020, 2023)

<sup>10</sup>NEC 750.30(C)(1)(1) (2023)

<sup>11</sup>NEC 220.70 (2023)