

# POWER DISTRIBUTION 101:

# KNOW YOUR SMART PANELS

Incoming neutral wire .....

..... Incoming power from utility

Incoming ground wire .....

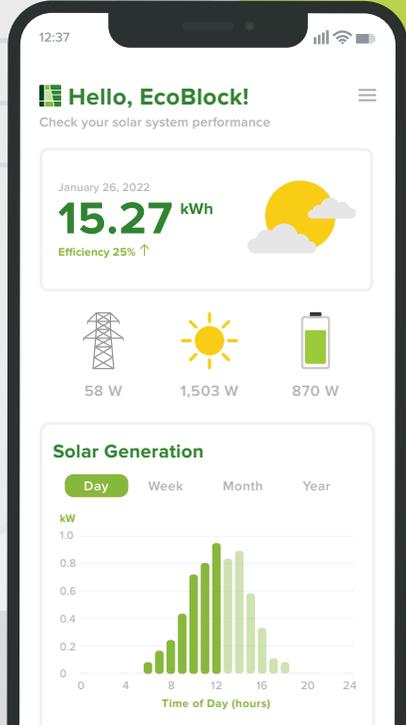
..... Main breaker/disconnect

CIRCUIT DIRECTORY	
Generator	2 Microwave
Stove/range	4 Solar PV
Dishwasher	6 Clothes washer
Washing machine	8 Garage
Water heater	10 Air conditioning
Refrigerator	12 ??
Bedroom	14 Master bedroom
Room 1	16 Bathroom 1
Room 2	18 Bathroom 2
Living room	20 Storage
Staircase	22 Water heater
Basement	24 Crawlspace
Lighting	26
	28
	30
	32



Regular circuit breaker .....

Circuit breaker slot .....



## 01 WHAT ARE SMART PANELS?

Smart home electrical panels, or smart circuit breaker panels, are responsive devices that manage power distribution. They act like a **home energy management (HEM) system** that provides **remote energy monitoring and/or control** at the individual circuit breaker level.

From providing **real-time consumption data**, enabling **flexible load control**, and integrating with **solar plus storage**, smart panels allow homeowners to optimize the efficiency and efficacy of their residential energy systems.

## 03 ELECTRICAL TERMINOLOGY



+ **Home energy management (HEM) system:** A combination of advanced technologies (e.g., smart sensors, thermostats, and appliances) that **monitor, control, and optimize** residential energy consumption and distribution.



+ **Main panel:** A metal service box that connects the main power line to a building. It is the **primary source of electrical distribution** and contains the **main circuit breaker**, which can disconnect power to the building when needed.



+ **Subpanel:** A **secondary electrical panel** that draws power from the main panel to direct electricity in a specific part of a building.



+ **Circuit breaker:** An automatic switch designed to **safely interrupt the flow of electricity** in case the current is abnormally high. This can happen when there is **too much load** and the wires might overheat, or if something is **broken** and makes a faulty electrical contact.



+ **Circuit:** A **closed path of connected components** (e.g., batteries, switches) that conduct electricity.

## 02 HOW DO THEY WORK?

Electricity from the main utility grid travels to the smart panel, which is composed of (1) **smart circuit breakers**, (2) a smart panel that **connects** to an existing circuit breaker panel, or (3) a **complete replacement panel**. As the central access point for a building, the panel distributes electricity to individual **circuits** and/or **subpanels** that supply the various outlets and appliances in a home. Some smart panels come with a **mobile app** that can reconfigure backed-up appliances, optimize battery storage during power outages, and more.



+ **Load:** The **amount of power** (voltage times current) demanded by electrical appliances at any given moment. Load is measured in units of **watts (W), kilowatts (kW), or megawatts (MW)**. Residential voltage is generally **120 volts (V) or 240 V**. The maximum current for a single circuit in a house is typically **15 or 20 amps (A)**.



+ **Critical load:** Uses of power that are **essential** and should be supplied, if possible, even during a power outage. Smart panels can act as a dynamic **critical load panel**, allowing utility customers to prioritize their loads as needed.



+ **Load management:** The ability to **shift and adjust** the amount of power supplied to **building loads** and other **Distributed Energy Resources (DERs)** at any given moment to meet electrical demand.



+ **Solar plus storage:** A combination of **solar photovoltaic (PV) technology** and **backup battery storage**. During the day, solar panels power the building and charge the battery, which powers critical loads when the panels do not produce enough energy (e.g., at night, on a rainy or cloudy day, during a power outage).

## 04 MAJOR BRANDS

SPAN

LEVITON®

Schneider  
Electric

lumin®

## 05 WHY SMART PANELS?

### Pros

- + Real-time **energy use monitoring**
- + **Flexible load control**
- + Potential for full **solar plus storage** integration
- + May integrate with **existing electrical infrastructure & software**

### Cons

- + Higher **initial cost**
- + Initial **learning curve**
- + Potential **security & privacy concerns**