



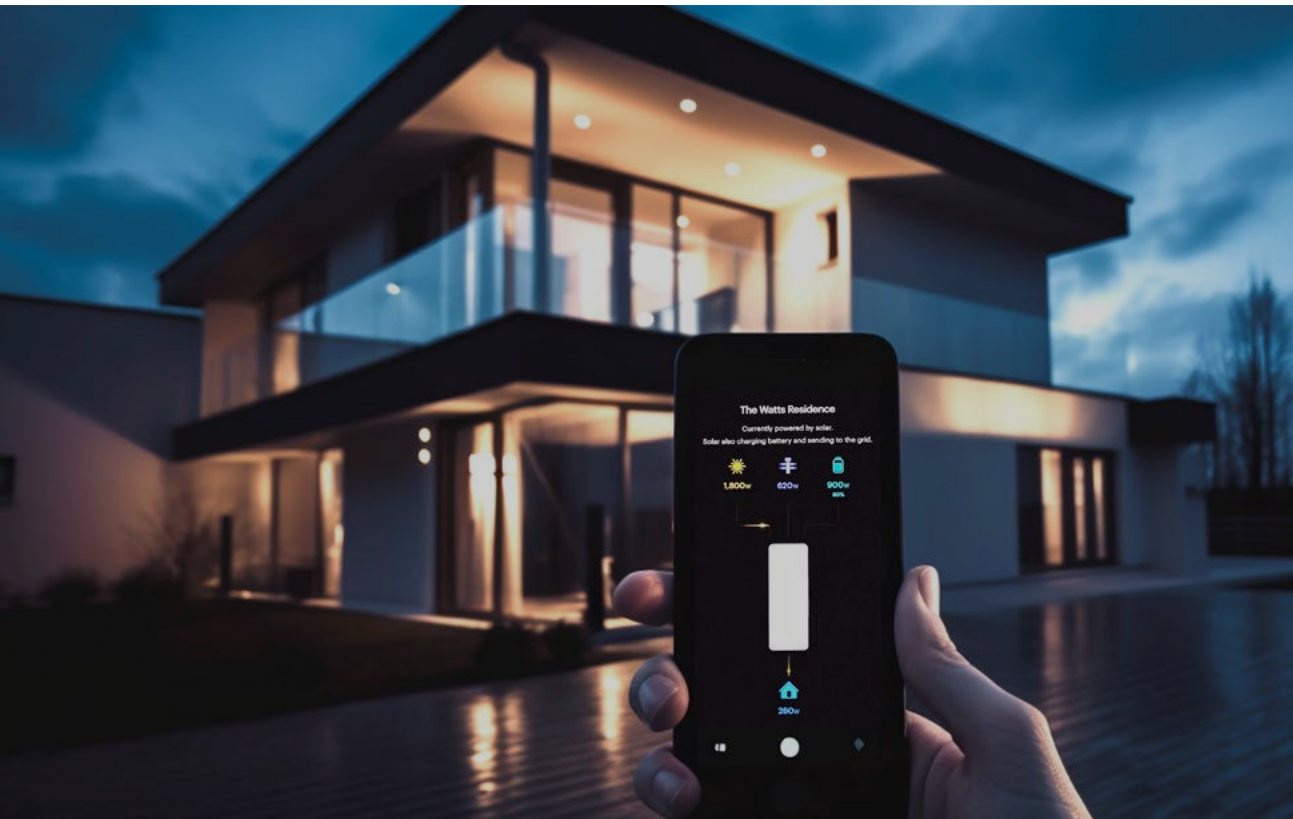
Smart Panels 101

CHOOSING THE BEST SOLUTIONS FOR HOME
AND COMMERCIAL BUILDINGS





Manage and control electric power usage in your home and business **in real-time.**



Smart panels are practical technological innovations that allow you to manage and control electric power usage in your home and business in real-time. They are a functional leap from traditional electric panels and offer several benefits to your home or business.

This article will explain the differences between smart and traditional electrical panels, their benefits to your home or business, and how to choose the right panels for your needs.



Smart vs. Traditional Electrical Panels



A **smart panel** is an electrical panel with internet-connected sensors and a micro-processor that allows it to monitor and control the electrical loads of a home or building, hence the term “smart.”

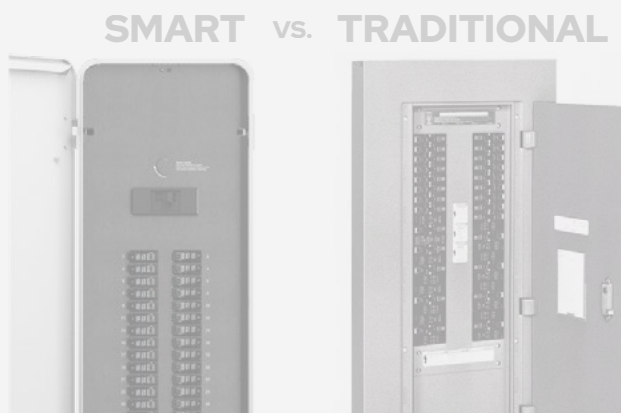
Alternatively, a traditional panel is functionally simple: it conducts electricity and prevents overload. Traditional electric panels are typically metal enclosures that house a collection of electro-mechanical switches commonly called circuit breakers.

Each circuit connects to incoming high-voltage electricity and has a circuit breaker load capacity that is measured in amps. When the power to the circuit exceeds its load capacity, the circuit breaker will open, stopping the flow of electricity. This action protects the circuit from overheating and causing a fire.

Smart panels, on the other hand, are multifunctional. They perform the same safety function but also use their sensors and **microprocessors** to determine how much each circuit draws at any time, making them efficient energy management systems.

You can program smart electrical panels to turn specific circuits off and on to fit the best usage times for your needs. Those sensors are tied into your smartphone or laptop using an application, creating a network and allowing you to see and control your electricity usage in real-time. A smart electrical panel will also monitor your loads and notify you if an appliance or motor is drawing excessive amperage, which could be a sign the appliance may need to be serviced or replaced.

Compared to smart panels, traditional electric panels seem like 100-year-old technology, and they are. In fact, [the first miniature circuit breakers](#) were patented in Germany in 1924.





Benefits of Smart Panels for Homeowners

Smart electrical panels vary by capabilities, and the older models are more straightforward and offer less functionality. In contrast, the newer models are more capable.

In our article, we're referring to more unique model panels.

You should keep in mind that many utility providers charge different rates depending on the [time of day](#):

- “Peak hours” are typically between 7 am -10 pm during the summer and 8 am -11 pm during the winter. During these times, utilities typically charge higher rates.
- “Off-peak hours” or “Non-peak hours” are typically between 11 pm - 7 am when demand is down. During this time, utilities may charge lower rates.

You can avoid these fluctuating charges by shutting off non-critical loads like outdoor or indoor lighting during peak hours, and even air conditioning during the early morning when temperatures drop.

The peak and low demand hours make the value of real-time monitoring obvious. Smart panels enable you to access this data for every circuit at any time or period and control them at will, and you can easily see and understand the results graphically on your smartphone or laptop.

This is a significantly improved and simplified process from traditional electrical panels, as previously you would need to measure loads using an amp meter for instantaneous readings or by attaching a recording device to track readings over time, typically requiring manual calculations and creating a time consuming and arduous process.

[Many smart panels provide alarm functions](#) advising you of an electrical system or appliance malfunction. They can even track maintenance due dates, so you always know how your system is working.

Smart panels also protect from power surges, such as from lightning strikes or transformer malfunctions.

Smart Panels, Solar, Battery Storage, and Emergency Generators

While smart panels can improve your energy management and help to create a more resilient



electrical system, other electrification technologies working in tandem with a smart electrical panel can further optimize your energy usage and even assist in creating energy independence from the grid.

SMART PANELS

The **benefits of smart panels** are clear when you have more than one source of power, such as solar, battery storage, emergency generators, or bidirectional EV chargers.

The smart panel is the brain that runs this network by providing interoperability – the ability of devices and software to communicate with each other and exchange files.

SOLAR

Smart panels allow you to run on solar during more costly peak hours, reducing your costs. Your smart panel will automatically switch to solar during the day and take you off the grid.

If you also have battery storage, smart panels can use “free” solar energy to charge the batteries. Then, during off-peak hours, the batteries can run your designated off-peak loads, saving you money and helping you avoid grid reliance.

BATTERY STORAGE

When the batteries are charged, and solar is not practical, the smart panel can switch to using the power stored in your batteries essentially at no cost.

The panels monitor battery capacity when the battery is engaged so that it doesn't fall below the required amperage for backing up critical loads. The smart panel switches to solar or sheds loads if it gets close to reaching the maximum capacity threshold.

With battery storage, you can also program your smart panel to back up only the circuits for critical



devices, like minimal lighting, security systems, heating, and cooling. That programming ability keeps the size of your battery system easily manageable.

EMERGENCY GENERATORS

Some homes have emergency generators intended for protection from extended power outages. If you have an emergency generator, it can also be networked into your smart panel to provide optimal protection and management.

Additionally, if your EV is a compatible model with two-way DC charging, you can use the EV charger's excess capacity to power your home. Called **bidirectional charging**, this feature is available on newer EV charging stations and is becoming increasingly popular in newer EV models as well.

Your smart panel enables you to provide this power by tying in your system components and running them each at the best time for maximum performance.

When paired with available smart devices, the system will allow you to control not only the individual circuits but even on a more micro level of managing a single light or device from your phone.

Nanogrids and Smart Panels

If you own solar panels, battery storage, EV chargers, and a generator, you essentially have a power generation system called a nanogrid. A nanogrid



lets you become your own private utility operating independently off the main grid.

But that complex array of equipment requires modern technology to constantly monitor and coordinate optimal use. Smart panels provide the tech needed, giving you the real-time ability to run your nanogrid efficiently.

If you have a [nanogrid or a Level 2 home charger](#), you can network it with your smart panel to charge during optimal, off-peak times. As an alternative, you can use your battery to charge your EV in peak times and forego paying the higher peak rates. The smart panel can balance the capacity of your EV charger with that of your battery storage, so neither falls below the required limits.

You'll save money, and can even sell energy back to utilities, so your home power network becomes a revenue generator intelligently managed by your smart electrical panel.

Tax and Other Incentives

Did you know that you can also receive federal tax incentives for using smart panels?

Under the federal tax code, you'll receive a 30% [residential energy efficiency tax credit](#). It has a cap of \$1,200 (Section 25C) but 30% with no limit for rooftop

solar panels and battery storage (Section 25D).

State, local, and utility credits and rebates may also be available, so seek professional advice to learn how to apply them when filing your taxes.

If you sell energy back to your utility, check with your tax professional to determine whether your operating expenses associated with revenue generation are tax-deductible. Additionally, any equipment used in the process may also be subject to depreciation.

Supplementing the Grid

The [U.S. residential sector consumes approximately 22% of electrical energy](#) in the U.S.

According to [Rewiring America](#), a leading non-profit focused on electrification, the U.S. may need two to three times the current grid capacity to accommodate the spread of electrification. Because electrification [replaces carbon-based fuels such as natural gas with electricity](#), it leads to greater electricity consumption in the U.S.

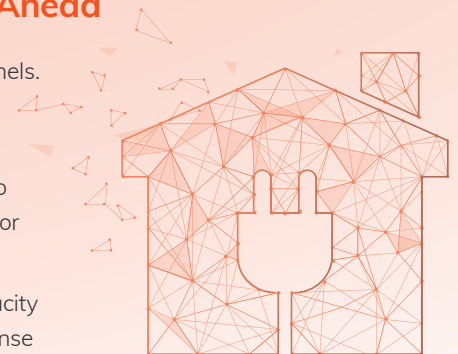
The use of smart panels reduces the demand on the grid. Additionally, microgrid efficiencies reduce the need and enable users to send energy back to the grid. In these ways, smart electric panels and microgrids can play a crucial role in electrification propagation and reducing grid demand.

Preparing Homes for Future Electrification and Planning Ahead

The [spread of home electrification](#) will generate higher demand for residential electrical panels.

A new generation of appliances is bringing new energy-saving features to the market. For example, we'll begin to see ovens that self-optimize cooking temperatures and refrigerators that set themselves at the ideal internal temperature. However, converting your gas range to electricity and adding an EV charger will require more power and further drive the demand for robust electrical infrastructure.

Adding these appliances may drive electrical demand past a traditional electric panel's capacity and require a higher capacity upgrade. Upgrading to a smart electrical panel now makes sense if your current panel is old or close to its total capacity.





Smart Panels for Your Business

Smart panels have the same value for your business but on a larger scale since commercial building loads occupy more space than homes

Greater Complexity

Electrical equipment is more extensive, and most businesses have complex electrical service types and voltages.

Voltages are 120/208 (240) volts and up to 277/480 volts for equipment. In addition, residential power typically is single-phase rather than three-phase.

Commercial buildings, especially those with larger HVAC systems, use three-phase wiring. Three-phase wiring uses three or four conducting wires.

The takeaway is you may need a smart panel that accommodates higher voltage than residential. Plus, you may need multiple panels, depending on the size of your distribution system. Qmerit experts can help you to determine your needs.

Benefits of Smart Electrical Panels for Your Business or Commercial Building

All the benefits of smart electrical panels for homes apply to businesses or commercial buildings. These include:

- Optimal timing for lowest-cost utility consumption.
- Lower costs, a lower carbon footprint, and additional potential revenue streams from energy sales through integrating solar, battery storage, and even emergency generators.
- Optimized battery storage to shut off non-essential loads in the event of a utility outage.
- An off-peak power supply by networking your Level 2 EV chargers. You can also set Level 2 EV chargers to use solar or off-peak electricity to charge at a lower cost, as in homes.



The larger scale of commercial electrical systems makes energy management almost impossible without the technology provided by smart electrical panels.

The larger scope complicates maintenance management, but smart electrical panels provide maintenance tracking and failure alarms. The tracking and alarms are especially critical because an electrical failure can interrupt your business and cost you substantial revenue.

Lighting is an example of an area where smart electrical panels can save your building money. Lighting is zoned for large-sized businesses, with parts of floors controlled by one panel. As not all lighting is required at all times, you can program smart panels to turn off unnecessary lighting automatically.

You can network emergency backup equipment like battery storage to charge on off-peak hours and to provide power to other areas instead of utilities. At the same time, the smart panel ensures that there is always enough battery capacity for emergencies.

Nanogrids for businesses can provide cost-efficient power and a potential revenue source (like home systems) with smart electrical panels as a critical component.

As your business and electrical loads grow, you can expand quickly by adding another panel.

Tax Incentives

Energy efficient equipment and installations for certain businesses are subject to federal credits through [Section 48C](#) of the federal tax code. [Colorado provides business rebates to fund increased energy and water efficiency.](#)

California and other states have robust programs as well. Check with your tax expert for details on tax considerations, as some of these provisions for green tech may be relatively new in your state.

Supplementing the Grid

[Commercial buildings consume around 18% of electrical power in the United States.](#) Smart panels and intelligent energy management can reduce the demand on the grids, just as they do with homes. Businesses can help ease the load by reducing energy consumption through smart electric panels, solar equipment, and storage batteries and by facilitating EV charging stations.





Choosing the Right Smart Panel

We recommend you start by reading our article on the **Top Trends for Smart Electric Panels**. Next, get a preliminary idea of what you want to accomplish with your smart panel in the long run. Keep the long-term in view because you want to plan to avoid doing something now that will complicate plans.

Ask yourself key questions to get focused:

- Are you looking to get to nano grid status over time?
- Are you planning on complete electrification?
- Do you have an EV charger now?
- How about solar?
- Do you want battery storage?

Get Smart About New Technologies

Ask your expert about recent advances in technology. The open communication protocol is one such development. Given the trend for connectivity between devices on your electrical system, this development is particularly well-timed. Processors have a language or protocols by which they speak to each other, for example, networked laptops in your office.

Until recently, various devices used in energy management with smart panels may have used different protocols. The consequence is the hassle of selecting devices with consistent communication protocols, and failure to do so led to functional headaches from lack of interoperability, which cripples smart technology.

Open protocol easily solves the problem of lack of interoperability. Although it is relatively new, several companies are moving to use open communication protocols on their devices at this writing. Doing so will [simplify connectivity for smart homes](#).

Be sure to fully discuss this topic and other new technology with your expert partner to include it in your initial build. Knowledge of new technology is a significant value-add to using expert help. Be sure to buy the most advanced smart panel you can afford.





Hire an Expert You Can Rely On

The next step is where you'll call in expert help. They will survey your home or commercial building to determine the configuration and condition of your electrical system and find out the following:

- What is the state of your panel and distribution?
- What is the panel's capacity, and what is the current load? Are you nearing capacity?
- Do you have a single-phase or 3-phase supply feeding your panel?
- Where is your current panel located? [You can retrofit smart panels](#) to existing traditional panels, but you need to provide additional space. Is there room for add-on panels? (As a side note, the best time to install a smart panel and other gear is with new construction).

This is not a DIY project. Many of the technologies are new or evolving, and you want an electrical contractor fully engaged in the electrical panel field and ahead of the curve.

Measuring loads involves specific equipment and may involve going into your electric panel, exposing you to high voltage that can injure or kill you. It is best to leave that work to a licensed electrician.

Your next conversation should be with your third-party expert. Review your initial goals with them for economic evaluation considering local utility

rates and other factors. Take the time to review your understanding of smart electrical panels is correct and ask questions. An expert will be able to clarify your knowledge and make your conversation much more productive.

Get a Budget

In addition, they will take the current load measurements they made, calculate the total future design load of your "dream" configuration, and determine the scope of work to budget. Have them explain in more detail how each component will work and how they can be networked.

Make sure that the new technology you will be adding is compatible with any existing technology that will remain, as well as all aspects of your electrical system, including your utility service. For instance, a home EV charging station will require a 40-100 Amp, 240 Volt circuit.

Finally, have your electrician create a quote for your desired system and give you a predicted expense report and preliminary schedule. If it exceeds your budget, discuss how to scale back now but build expandability in the future, and it is crucial to think this through now.

Your expert will propose the smart panel and other technology that they deem best for your application. Before making a final selection, make sure you understand the warranties offered by the manufacturer and installer. Be clear on the duration of the warranty and what is covered.

In addition to warranties, determine the scope of customer support for your panel and related technology. Find out and confirm guaranteed response times for service calls, how they will perform periodic maintenance, and at what cost.

Be sure to have your expert partner explore the financial incentives available at the federal, state, local, and utility levels since these can significantly impact affordability.

When you decide on what you want to install, finalize a contract with a qualified installer.





Making the Smart Decision

Whether you're looking to upgrade your home or building, a smart panel can offer a range of benefits that traditional panels do not. Performing routine smart panel maintenance is challenging on your own.


Smart panels and electrification are complex fields, and knowledge and innovation are constantly developing. As we've pointed out, unless you are an expert in the area, you will need expert help to navigate the risks successfully. Mistakes can be expensive, time-consuming, and even dangerous.

So, finding a partner whose business is smart technologies and electrification installations makes sense. More importantly, you need one with an established track record of success and who is acknowledged as a leader in the field.

Qmerit is that partner. Our track record tells our story:

With more than 269,000 EV charging station and 18,500 battery storage energy systems installations, 53,000 solar panel system integrations, and 86,700 electric panel upgrades, no one is more experienced with installing and implementing energy transition technologies and solutions than Qmerit.

Qmerit's **Certified Network** of trained, qualified, licensed electricians specially trained and certified in electrification installations gives you confidence in professional installation and maintenance.

 **Contact Qmerit today** to learn how a smart panel can help you save money, increase efficiency, and reduce your environmental footprint in the future.

