Enhancing the Customer Experience of Upgrading an Electric Service Panel

BUILDING DECARBONIZATION COALITION

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The opinions expressed in this report do not necessarily reflect those of the Coalition, its members, or others that supported or contributed to it. E Source bears sole responsibility for the report's contents.

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Background

An electric service panel (also known as a “breaker box” or “breaker panel”) tends to be out of sight, out of mind for the average customer. E Source’s market research indicates that when a customer wants to electrify their home, upgrading their service panel is rarely considered (see Figure 1) because they may not realize their home needs an upgrade.

Electrifying existing homes isn’t always a simple or straightforward process. In making the switch to electric appliances by replacing gas-fired equipment, some homes may or may not need a panel upgrade to accommodate the increase in power demand from in-home technologies. Those that do need an upgrade may include homes with 100- and 125-amp panels, which are common in homes built in the 1970’s or earlier. (Note: an amp is a measure of how fast electricity moves).

Older service panels may need to be upgraded to 200 - 400 amps, and may also require increasing the service capacity of the local distribution system by the electric utility. Service upgrades can occur ad hoc, or they may be planned around opportunities when the distribution system is being upgraded for other reasons, such as fire prevention and as a grid-hardening measure. There are, however, alternatives to avoiding a panel upgrade, such as purchasing a 120-volt heat pump water heater and using smart plugs or strips. For some homes, a panel upgrade will be necessary to support at-home electric vehicle charging.

While there are challenges, there is a strong need to improve the customer experience as more people adopt clean electric technologies. In highlighting this, a Pecan Street study suggests that tens of millions of homes in the United States will require panel upgrades in the coming years to help achieve building decarbonization and electrification targets.

As part of this study – aimed at helping remove barriers and minimize added costs, complexity, and time for the panel upgrade process – E Source surveyed 10 utility representatives and identified best practices and recommendations to significantly improve existing processes. Ensuring that these best practices are adopted broadly will take more than utility buy-in and investment, and also require policy makers within the legislative and regulatory spaces to recognize the need and support these measures.

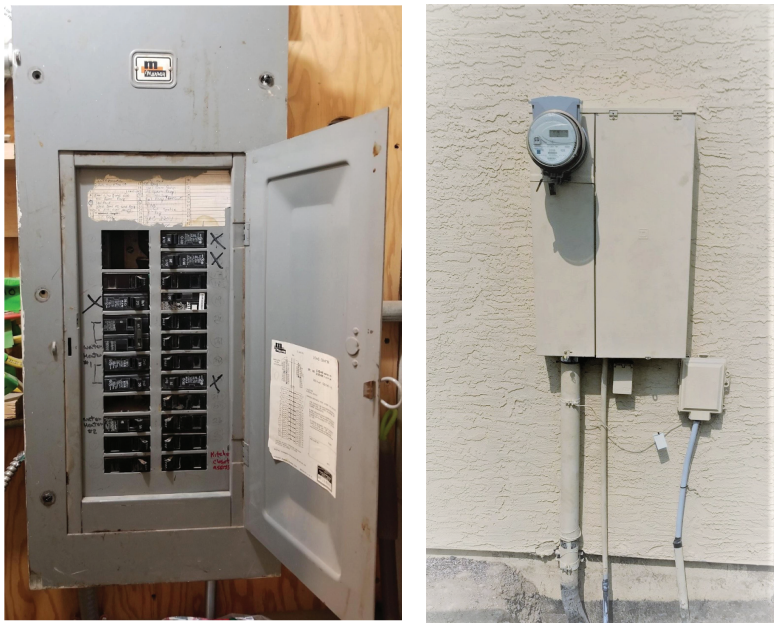
One key issue we found was that a number of utilities don't have streamlined processes in place for the efficient and timely servicing of customers as they embark on the panel upgrade journey. This is partly a legacy issue; utility jurisdiction, oversight, and liability usually end at the revenue meter. Since the service panel lies "behind the meter," i.e., on the customer side, utilities traditionally do not give much thought to what goes on at the electric panel. However, in order to meet building decarbonization goals along with other goals, like providing access to electric vehicle charging, utilities, local governments, and state regulators need to focus on the process of replacing or upgrading legacy electric panels.

Another key issue we found was that, in the absence of thoughtful direction from regulators or legislators, the panel upgrade process is often more complicated than it needs to be, and this may lead to a number of preventable problems, such as:

- Higher costs
- Lower customer satisfaction
- Longer wait times; slower adoption
- Customers ultimately deciding not to electrify

Figure 1: A residential electric service panel and undergrounded service line

The image on the left shows a 200-amp electric service panel in an E Source employee's 1920s-era all-electric home. The image on the right shows a common, undergrounded 125-amp service line. Most residential customers don't have preexisting experience and the knowledge to know whether or not their electric panel or utility service need to be upgraded when considering the purchase of an EV or making the switch to all-electric appliances.



Source: Bryan Jungers

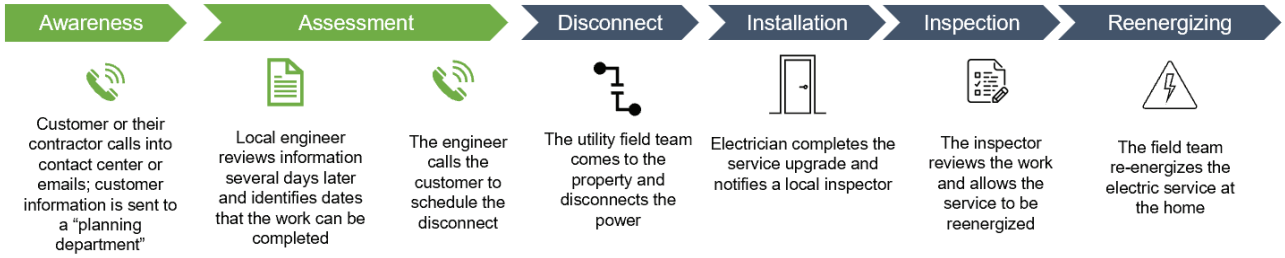
Creating a simple and affordable panel upgrade process will reduce costs of electrification and can ensure more equitable access to electrification technologies. A poorly designed panel upgrade process drives up the cost of electrification and can disproportionately affect disadvantaged communities and low- and moderate-income (LMI) customers. A process that isn't proactive and planned out will miss out on cost savings for the customer, and add additional hours spent by the electrician working in the home, waste time managing a confusing process, and create an unnecessary and overall negative experience with home electrification and the local utility.

In late 2021, E Source staff interviewed 10 utilities across the U.S. and Canada to understand their panel upgrade processes. Our analysis found that upgrade processes followed six common steps:

1. The customer or electrician contacts the utility to begin the process. The customer is assigned a job identification number and is referred to a local utility engineer. Many customers contact the utility without having the necessary information about the service required or the load change, which can delay the customer's project. If the customer is unable to fill out the paperwork themselves, they will need to pay for the electrician's time to estimate loads and fill out paperwork, unnecessarily increasing the cost to the customer and adding the burden to go through this process.
2. The grid distribution planner reviews load information and identifies dates for the work to be completed. The local planner, who may be an engineer or field representative, is responsible for informing the customer of any utility costs that the customer must pay.
3. The utility schedules and completes the disconnection of service to the home. The electrician may already be on-site when this happens. If not, they will typically arrive shortly after electrical service to the home has been disconnected.
4. The electrician upgrades the service panel. Once service is disconnected and the home's circuits are fully de-energized, the electrician replaces the existing panel with one rated for higher amperage. This may also involve replacing existing wiring and conduit behind the panel, particularly in older homes. The electrician also sizes and replaces individual breakers on each circuit, according to the estimated load requirements of the home.
5. The upgraded panel is inspected to ensure safety and code compliance. A licensed inspector approved by the local jurisdiction inspects the integrity of the electrician's work and certifies that it is compliant with prevailing electrical codes and standards (or not). Depending on local requirements, if there isn't proper planning, this step may be more difficult to manage and can result in the delay of some panel upgrade work and/or home re-energization. Delayed work can lead to higher costs to the customer (e.g., more electrician hours).

6. The utility reviews the inspection information and permit information if necessary and reconnects service to the home. The utility checks the inspector's report and other project documentation to ensure a safe reconnect can be performed. The time between service disconnect and reconnect can be anywhere between a few hours and a few days, depending on site conditions and upgrade needs. If the service is just being disconnected and then reconnected on the same day, this step tends to be simpler and typically can be completed by a single utility employee. However, if the service is being replaced or upgraded, at least two field crew members will be dispatched to support the projects. Service upgrades may also require their own inspection, in addition to that of the panel upgrade.

Figure 2: A visual representation of the steps outlined above



The various individuals described in the previous six steps each play an important role in ensuring a successful panel upgrade process. How each of these people behave, engage, and make hand-offs throughout the process have significant implications for project timing, cost, and customer satisfaction. Regulators can collaborate with utilities to ensure each individual proceeds through these steps as efficiently as possible. Consider the role of each individual:

Customer: initiates the project, pays for the project, and owns the property where the project takes place.

Electrical contractor scheduler: receives the customer request for panel upgrade, checks availability of field crew, assigns and schedules electrician to do the work, receives feedback, and notifies field crews.

Electrician: often initiates contact with the utility and requests/scheduled service disconnect, estimates load requirements, physically replaces the existing panel, coordinates with local inspector(s).
Utility field service representative: receives the request from the customer or electrician, and requests capacity assessment from the field engineer.

Utility engineer: receives the request for capacity assessment from the utility field service representative, conducts capacity assessment for the individual project/premise based on distribution grid constraints, and determines service upgrade requirements and associated constraints.

Utility scheduler: receives approval notice from the utility engineer, schedules and dispatches utility field crews, receives and manages notifications and updates from the customer/electrician.

Inspector: inspects the project for safety and local code compliance.

Inspector scheduler/field service representative: schedules the inspector to inspect project, dispatches inspectors to the field when the project is ready (e.g., electrician's initial work is done).

Key recommendations

From our survey work, E Source researchers identified a number of opportunities for improving the panel upgrade process. Below we identify eight best practices that utilities should incorporate in all panel upgrade processes and related programs.

Seek alternatives to avoid panel upgrades

Instead of treating the panel upgrade process as a purely reactive, "obligation to serve" activity, the utility and third party providers can help deliver alternatives tailored to different customer types. This may include, but is not necessarily limited to, the following:

- Energy audits, assessments, and "watt diets" to implement efficiency and reduce demand
- Battery storage backup that delivers peak-demand support
- Load-management measures to help shift peak loads, coordinate demand, and manage load from different electrical appliances/devices
- Weatherization (insulation and sealing) to reduce heating and cooling losses, demand
- Incentives for smart circuit breakers, circuit-sharing/splitting devices, smart plugs, smart panels, and other devices that reduce the total instantaneous/coincident peak demand
- Improve cost efficiency of implementing panel upgrade programs by deploying zonal electrification (e.g., similar to strategic smart meter rollouts)

Make the process as simple and easy as possible

Unnecessary complexity and redundancy in the overall process of upgrading the electric panel is a major factor in hindering panel upgrades. Every individual involved in the panel upgrade will benefit from a faster, simpler process, and basic information guides and training documentation (as applicable). Creating and updating consistent messaging and narratives for in-person and virtual training materials, guidance documents, and customer information and marketing materials will all help to simplify and improve the process for participants.

A consistent digital platform can help simplify the customer journey, but this will require careful process management and streamlining, particularly as panel upgrade requests increase over time to accommodate electrification goals.

Add financial incentives to other programs to upgrade wiring and panels

In addition to incentives for end-use equipment, utilities, governmental agencies, and nonprofits can offer financial incentives to lower the cost of panel replacements and technologies that would reduce the need for a panel replacement entirely. Southern California Edison (SCE) conservatively assumed in its pilot that each customer needing a panel plus new conduit, wiring, and circuit breakers would need to spend on average $4,530 per household. (Read more about this pilot study in the California Public Utilities Commission (CPUC) filing titled SCE Pilot Proposal Update.) While there are existing incentive programs that help California customers to cover these types of electric-ready costs, including the Self-Generation Incentive Program (SGIP) and TECH, regulators should seek to identify and secure funds to help cover customer cost of upgrading their service panels or investing in technologies that will allow for electrification with existing panels. This will be particularly helpful for serving LMI customers and help to accelerate the building electrification transition.

Consider spreading costs across multiple customers in a given area

Under existing practices, the customers arriving later to electrification are more likely to bear the cost of necessary upgrades to the distribution grid. Without proper collaboration between the market and state actors, those arriving later to electrification will more likely be low-income customers. Changing existing tariffs would allow utilities to spread upgrade costs across customers on the system, rather than placing costs on individual customers at the time they request a service upgrade. Spreading the costs of distribution upgrades, such as through neighborhood-wide electrification (e.g., zonal or locational program implementation), is consistent with cost causation and equity principles of rate making since these upgrades will ultimately benefit all customers.

Plan for electrification when making system upgrades

Regulators will need to require utilities to plan for building decarbonization ahead of customer demand. This should be done within general rate cases and other proceedings related to distributed energy resource (DER) deployment. This will help ensure that utilities are making capital improvements based on future needs and not past practices, and can leverage opportunities when considering distribution upgrades being made for other reasons, such as fire prevention, grid hardening, and storm resilience.

Offer a digital platform and single interface point

Perhaps the most important enabler of a successful panel upgrade process is a seamless digital platform that connects and informs all individuals involved. This includes a front-end system that lets the customer request a panel upgrade, check the status of their request, upload data and documents, and pay any necessary fees through a single interface point. It also includes a back-end system where schedulers, field service representatives, electricians, technicians, inspectors, and other parties can share information, receive notifications, and view and update the status for a given project. Such a platform can also be used to help assess and improve upon program performance, cost-effectiveness, and associated business impacts.

Communicate with the customer regularly

Through a single interface point – such as the digital platform described above – the utility should regularly communicate with the customer on the status of their panel upgrade request via the customer's preferred communication channel (e.g., text, phone, email). One of the most common causes of problems in the panel upgrade process is insufficient communication between the customer, utility, and other individuals involved in the process.

Panel upgrade processes

Upgrading the electric service panel at a typical home requires the customer or an electrician working on the customer's behalf to:

- Navigate local permitting requirements
- Interact with project inspectors
- Interface with the local electric utility

Based on responses to the interviews we conducted in late 2021, we identified several key trends that are driving panel and service upgrades, including:

- New end-uses added to the home, such as hot tubs
- Fuel switching, including electrifying gas furnaces and stoves
- Purchasing EVs and installing Level 2 chargers
- Moratoriums on new gas interconnects and extensions
- Whole-home remodels and additions

Below are each of the process steps for panel upgrades described in greater detail.

Customer or contractor contacts the utility to begin the process

The utility receives the project request and assigns the customer a work ID number. In many cases, the utility will ask the customer or contractor for more information related to the end-use equipment the customer is currently operating at the premises or intends to install. In some cases, the customer is informed of specific utility policies at this step in the process. This information is often found in the utility's electric standards guide and includes permitting and inspection requirements where applicable, electrical contractor requirements, and information relating to the project timeline (such as disconnection date and service upgrade details).

Some utilities have moved to digitize the panel upgrade process. Customers can submit the same information online to begin the process, including copies of required documentation where necessary. Customers can also check on the status of their work order/project request and pay any necessary fees.

Nonnative English speakers may have difficulty with this step as the information the utility requests is often quite technical and forms have not always been translated into additional languages. Therefore it will be important to integrate multilingual individuals into this process on the utility side if they haven't already done so.

Overall, all utilities should adopt a transparent, multilingual online process that streamlines the paperwork requirements and allows for better coordination throughout the process.

The utility distribution engineer reviews load information and identifies dates for the work to be completed

During this step, an engineer on the utility's local grid distribution planning team will review any information that the customer has provided and assess potential impacts associated with the upgrade. In some cases, it may take the planner two or more weeks after the initial project kickoff to contact the customer. Often, the planner will need to follow up with the customer to ask for more information and to inform the customer of any challenges the project may present with respect to system overloading.

A common issue is trenching, as customers who have underground service to their meter may need to replace the wire connecting the pole to the home. Another common issue is that during the review of the load information, the planner will assess whether existing utility assets serving that area will be capable of safely serving the increased demand.

If upgrades to the utility-owned equipment connecting to the building or distribution system are needed the individual customer will normally be required to pay those upgrade costs. Over time, since the other customers on that distribution network will benefit from these upgrades, the costs should be socialized in utility rates rather than being paid for by a single customer.

The utility schedules and completes the disconnection of service to the home

The planning team works with their schedulers to get the disconnection of service requests on the calendar. Depending on the utility, and the time of year, the utility may schedule the disconnect between one and four weeks out. Each of the utilities we interviewed shared that they have a goal to make it on time to these appointments, but that emergency requests can sometimes come up and require their immediate attention. Unfortunately, if the utility is unable to make it to the worksite at the scheduled time, the customer may end up paying more for their contractor to wait for the utility.

The electrician upgrades the electric service panel

After the utility has disconnected the service, the electrician can safely begin their work. Depending on the upgrade or complexity of the replacement, the replacement can take four hours or longer. Utilities need to disconnect and reconnect the electricity service to the home in order for the electrician to safely complete the panel upgrade. All of the utilities we spoke with shared that rogue contractors may conduct work on electric service panels without having the service disconnected by the utility. This is a safety hazard and isn't recommended by any utility or licensed electrician.

The upgraded panel is inspected to ensure safety, code compliance

A licensed inspector approved by the local jurisdiction inspects the integrity of the electrician's work and certifies that it is compliant with prevailing electrical codes and standards. Ideally, this step occurs immediately following panel installation and related electrical upgrade work, so that the electricity to the building can be restored as quickly as possible.

Depending on local requirements, the inspection step may be more involved and require more careful management. This can result in the delay of some panel upgrade work and/or home re-energization. Delayed work can lead to higher costs to the customer (e.g., more electrician hours). Local jurisdictional inspection requirements should be carefully considered in the design (or re-design) of the entire panel upgrade process.

The utility reviews the inspection information and permit information if necessary and reconnects service to the home

Upon the completion of the inspection, the utility reviews the information to make sure it's correct and meets the utility's needs.

The utility then reconnects service to the home. Ideally all of the above steps happen in a single day, so that the building owner can have electricity restored immediately. The multiple parties needed to complete panel replacement in a single day makes coordination difficult and a lack of coordination will drive up the overall costs of replacing the panel.

Emergency panel upgrades

All of the utilities we interviewed shared that they distinguish between a customer's perceived emergency and an emergency affecting safety. For emergencies that affect safety, the utility will dispatch a crew to ensure that service is disconnected (and won't be reconnected) so that repair work can begin. However, if the service needs to be upgraded, the property could remain disconnected from the grid as planners determine if upgrading service will affect the grid. If the service is underground and requires trenching to upgrade the service, the timeline is extended as well. It's worth noting that customers are often allowed to do their own trenching, but the utility will still need to inspect the work before it's filled in.

In many cases, the customer is still required to gather the appropriate permits, work with a licensed electrician, and pass necessary inspections (where applicable).

One utility shared that if it's replacing, not upgrading, a panel, due to weather (i.e., a storm caused the panel to fail), the utility has a temporary inspection process where the electrician certifies the install and the relevant codes. This lets the utility reconnect service before a formal city, county, or state inspection takes place.

Potential barriers to participation

We found in our interviews with utility staff and electrical contractors that the most common barriers to upgrading a home's electric panel are:

- Cost. Panel upgrades often represent a significant unplanned cost for residential customers. SCE estimated in 2019 that an average home within its service territory would cost $4,530 for the upgrade. SCE's estimate includes only a panel, new conduit, wiring, and new breakers. If trenching is necessary, costs could be much higher.
- Timing. Many projects are completed in two to six weeks. However, depending on the complexity of the work, especially if the customer is dealing with underground service, the project may take longer. Other factors that influence project timelines include weather and seasonal delays, staffing constraints, age of the home, types of end-use equipment at the premise, condition of wiring, and need for a utility service upgrade.
- Property ownership rights. Customers living within multifamily units may need to coordinate their activities with their local homeowners association, building owner, or building management company to make these upgrades.
- Language barriers. Utilities tend to have customer service professionals who are dedicated to serving non-English-speaking populations. But planners, field engineers, and crews may need to coordinate with third-parties to interact with non-English-speaking customers. This can affect project timing and complexity.
- Changing electric service standards or building codes. Electric service standards and city codes are not static, and when a customer replaces an electric service panel, they must bring the entire project up to code. The older the home the more likely it is that additional upgrades will be needed to make it code compliant and electric ready. If, for example, the customer has overhead service that wraps around the building as part of their legacy utility service, the meter base and panel may need to be moved closer to the drop point to meet local electrical code.

Equity in electric panel upgrades

Based on the responses we received from utility staff, we expect a potential equity challenge when it comes to electric service panel upgrades if there isn't proper direction and planning. Generally, when a customer requests a service upgrade that pushes the local electricity distribution system past its current capacity limits, that customer is then responsible for paying for necessary upgrades – something that regulators and the state could change.

This is a potential challenge that comes when multiple people living in a local area upgrade their services at around the same time. In an example scenario, three neighbors electrify their homes at around the same time. If the first two customers don't push the local system over its limit, but the third does, the third customer is solely responsible for the costs associated with serving the higher load in that area. Meanwhile, the first two customer receive the same benefit but don't share in the cost, making them "free riders." This could cause long-term cost challenges for customers who don't have the means to upgrade their electric service panel today, and are later required to pay for system upgrades when they do decide to electrify.

Nationally, utilities haven't created programs that support equity considerations in the electric service panel upgrade process. During one utility interview, we heard that if customers were unable to pay for the upgrade, they were referred to the utility contact center. There, a customer service representative would refer the customer to community agencies that could assist with the cost. But this is very different from a dedicated focus on driving equity in electrification through support for low- and moderate-income customers.

Panel upgrade incentives

Incentives to upgrade electric service panels are usually tied to other programs, including:

- Fuel-switching (replacing natural gas end-use equipment with electric equipment)
- Electric vehicle (EV) charging
- The installation of new cooling or heating equipment

Roseville Electric residential retrofit

Roseville Electric offers residential customers a panel upgrade under its Residential Retrofit program. The program provides a rebate of up to $2,500. To be eligible, customers' panel upgrades must include dedicated circuits for Level 2 (240-volt) EV chargers, heat pump water heaters, heat pump air conditioners, induction cooktops, and heat pump clothes dryers.

Silicon Valley Power rebates

SVP's electric panel upgrade rebate is available to residential customers and provides a rebate of $1,000 for upgrading an electric service panel. The program offers an extra $1,000 to income-qualified customers and another $1,000 to customers who meet the incomes qualifications for the Low Income Home Energy Assistance Program. Regardless of income level, to be eligible, customers must upgrade their panels to 200 amps or greater, include an EV charger circuit and a water heater circuit.

Sacramento Municipal Utility District electric rebates

SMUD offers residential customers the Go Electric bonus rebate. Under this program, customers can receive up to $2,500 for upgrading their electric panel. To be eligible, the panel upgrade must include an EV charger circuit and a water heater circuit.

Southern California Edison electric infrastructure upgrades pilot

SCE's pilot offers incentives for various electric infrastructure upgrades, but not for complete rewiring to bring a home up to code. In 2019 SCE conducted a pilot upgrading home electric infrastructure in three disadvantaged Central Valley homes. Some of these upgrades include replacing the electric service panel, adding new wiring, and making to-code updates (e.g., proper electrical load-to-circuit balancing within the panel, circuit grounding, minor in-home wirings like a new outlet for the stove or dryer). SCE conservatively assumed that each pilot participant would require a panel upgrade, new conduit, new wiring, and a new breaker for each appliance at an expected average cost per household of $4,530. (Read more about the pilot in the CPUC filing titled SCE Pilot Proposal Update.)

Public Service Electric & Gas Company commercial charging program

PSE&G offers an Electric Vehicle Charging Program to its commercial, multifamily, and residential customers. Under this program, residential customers can receive up to $1,500 for Level 2 charger installation and up to $5,000 for pole-to-meter service upgrades. On the commercial and multifamily side, customers can receive up to $30,000 for behind-the-meter Level 2 installation and up to $10,000 for pole-to-meter service upgrades. These customers can also receive up to $100,000 for behind-the-meter Level 3 charger installation and up to $50,000 for pole-to-meter service upgrades for Level 3 charging.

Public Service Company of New Mexico charger rebates

PNM's EV Level 2 Charger Rebate provides residential customers up to $1,000 for electrical upgrades if the customer is installing a Level 2 charger. The program also includes a $300 rebate for an ENERGY STAR–certified Level 2 charger.

Michigan Saves residential financing

The residential financing program by Michigan Saves allows customers to add wiring and panel upgrades to a project cost if it's required by code or when necessary to install a qualifying air conditioner.

Innovative approaches to streamlining the panel upgrade process

The utility panel upgrade process has experienced few changes over the years. This is partly because utilities don't own customer electric service panels, and utility scope of responsibility and consideration typically ends at the meter. However, with new technologies entering the market – including emerging electricity end-use applications like heat pumps, induction stove tops, EV chargers, and monitoring, management, and control capabilities – we've noted that customers, regulators, and advocacy groups are all placing more pressure on utilities to understand what's happening at the panel (i.e., beyond the revenue meter).

Below are some of the innovative approaches we've seen utilities and other organizations take to:

- Streamline the panel upgrade process
- Lower the cost of home electrification
- Eliminate the need for a panel upgrade while still enabling building electrification

Web and mobile-based applications

We found several utilities that use a new construction portal to manage the panel upgrade process alongside other new construction tasks. These portals streamline the process, allowing customers to upload documents, provide load information, and view real-time status of their projects. Frequently, the customer's contractors can also use the portal to assist with scheduling and quality assurance. Utilities that have created customer-facing portals have invested time and effort into improving their construction and permitting processes. These improvements have focused on roles and responsibilities to make sure the utility process can be easily presented to a customer.

Home energy audits promoting "watt diets"

Home energy audits are a common element of utility energy-efficiency incentive programs, often implemented with weatherization incentives (e.g., conducting blower door tests before installing insulation or envelope-sealing measures for buildings). At most utilities, different departments manage upgrade requests for electric service panels and conduct home energy audits. Audits are also commonly conducted by third-party implementers.

Tying home energy audits to electrification programs, incentives, and panel upgrades isn't yet common practice but could become popular as electric utilities increasingly seek new approaches to managing electrification load growth over time.

The concept itself — placing a home on a “watt diet” before simply increasing service capacity at the breaker panel — isn’t new. For decades, installers have been recommending "watt diets" to residential customers before investing in solar panels. (For more details on the "watt diet" alternative to panel upgrades, see Redwood Energy’s A Pocket Guide to All-Electric Retrofits of Single-Family Homes.)

Although a "watt diet" can save the time and cost of upgrading the panel and service, there are potential risks. Many "watt diets" require new and extremely efficient equipment to be installed to reduce the total electric load at the property. To support a "watt diet," adopting these appliances can be significantly more expensive than conventional equipment, even with utility and government incentives. A "watt diet" could also pose a challenge for a new homeowner or occupant if they don’t know how the "watt diet" is meant to work and have no baseline for comparison (e.g., historic utility bills, load data).

Circuit splitting or sharing

Another practice that holds promising potential but isn’t common is splitting or sharing individual circuits across different loads, rather than dedicating individual circuits for each large electric load in the home. From a safety perspective, it’s obvious why dedicated circuits have become common practice. However, as electrical devices are becoming smarter over time, safely splitting or sharing circuits among multiple large end-use electric loads is now a viable option in most homes. It’s important to ensure that, at minimum, circuit-splitting devices meet UL or similar safety rating requirements (and we’ve already seen examples of products that don’t).

By splitting the use of individual circuits on an existing panel, it’s possible to serve more individual electric loads without the need to upgrade the customer’s panel. Circuit splitting is a job best left to licensed electricians, but customers and utilities should be aware of this option when considering electrification measures. Utilities can do more to innovate in this area by helping to test and pilot market-driven solutions that include circuit-splitting technologies, and consider these technologies for inclusion in field trials, pilots, and programs.

Smart circuit breakers or panels

While these products are just emerging onto the market and unfamiliar to most utilities, they have the potential to alleviate the need for a panel or service upgrade in electrified homes. Some smart panel products sit in parallel with an existing breaker box, while others replace the existing circuit panel entirely. In the case of smart breakers, the existing panel stays, and the individual circuit breakers are swapped out. In all cases, added communication and control

capabilities can help manage loads around the home and prevent overloading of the service panel. While smart panels are currently more expensive than standard electric service panels, they represent a comparable or even less expensive option in some cases (such as where they alleviate the need for a pole-to-meter service upgrade).

While a number of early-stage research studies and field pilots have been run over the last several years to assess smart circuit breaker and panel technologies, we've seen little activity when it comes to scaling these efforts to serve broader customer needs through utility programs and incentives. Though it probably does not make sense for the utility to pay for the installation of a high-priced smart panel for every customer, some technologies have enough potential to deliver stacked benefits for existing utility programs that incentives are likely warranted. One such example: offering incentives on smart circuit breakers that can be used to support utility demand response (DR) programs, EV managed charging objectives, as well as electrification initiatives and goals more broadly.

Conclusions and next steps

The electric service panel upgrade process will continue to be placed under increased scrutiny as more states move to encourage electrification to reduce carbon emissions. A more holistic approach to electrification that encourages customers to find the most efficient end-uses while electrifying their home is likely to pay dividends for the utility and the customer in the long-term. Failing to improve existing processes and procedures could drive up the cost of electrification and disproportionately affect disadvantaged communities and LMI customers.

As an increasing number of customers request panel upgrades to enable electrification, it is increasingly critical that utility programs and processes be fast, simple, and affordable. Simplifying this process and finding more funding to assist LMI households to make the transition will ensure a more equitable electrified future.

If the utility wishes to improve the process for panel upgrades, we recommend examining:

- The estimated costs and timelines for projects within the service territory. Many of these costs are driven by labor hours and could be lowered with a focus on economies of scale. This may require a separate commission-approved program or initiative.
- The end-to-end customer journey for panel upgrade processes.
- Ways for the utility to integrate wiring and panel upgrade assistance and planning into its overall efficiency and electrification incentive program portfolio.

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