2023 Joint Legislative Budget Hearing on Housing

March 1, 2023

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The climate crisis, the health impacts of pollution, the principles of economic and environmental justice, and the mandates of New York's climate law, the CLCPA demand swift, powerful action by NYS legislators to curb climate pollution from the state's buildings that produce more greenhouse gases in New York than any other source.

As a resident of an all-electric home with a ground source (geothermal) heat pump, I would like to draw the committee's attention to two aspects of building electrification in New York where the cost perceptions are generally more pessimistic than warranted.

Electrical service upgrade: The costs of service upgrade to 200 Amperes for older housing stock with a 100-Ampere service are often included in cost estimates of electrifying existing buildings. However, most such homes will not need a service upgrade and simply replacing the existing electrical panel with a smart panel will suffice. The reason is that even when the sum of the ratings of all electrical loads in a home exceeds the capacity of the service, it is rare for a majority of these loads to be active simultaneously. And during the rare occasions when they might, the software of a smart panel is able to manage the total load to within the capacity of the service through intelligent timing and prioritization. Furthermore, panel upgrades have significant incentives under the Inflation Reduction Act (IRA), and rapid electrification of our buildings during the next decade will enable the state to maximize the tax-credit incentives that it is able to capture.

The attached documents describe how smart panels work and the IRA incentives that they enjoy.

Ground-source (geothermal) heat pumps: The installation of GSHPs is indeed expensive, but certain considerations regarding the accounting of these costs are often overlooked. The fact that the costliest component of a GSHP installation is laying the vertical or horizontal ground loop with an expected service life of 80–100 years must be accounted for appropriately, and it often is not. For example, the first installation cost is in fact the cost of rendering a building GSHP-enabled – a one-time investment that will allow four to five consecutive heat-pump installations at the end of each one's service life. In comparison to a new gas hookup with a maximum CLCPA-bound service life of 20–25 years and costs that can run anywhere from $10,000 to $15,000 or more according to a joint NY DPS utility filing, a $20,000-50,000 hundred-year ground loop is a bargain.

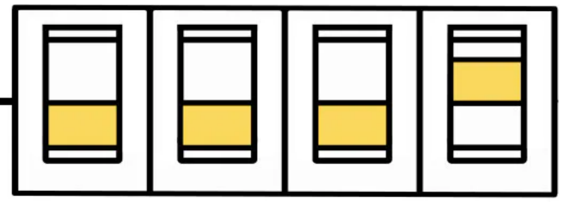
But there is more.

Once laid, a ground loop creates long-term value. For example, I'm enjoying the benefits of the comfort and low energy costs from my investment in the GSHP system in my home. However, when I eventually sell my house, I'd be able to recover a meaningful portion of my investment because the next buyer should be willing to pay a slightly higher monthly mortgage in exchange for a larger reduction in utility bills. In short, the net present value of a hundred years of reduced energy costs should be considered when evaluating the installation cost of a GSHP.

Finally, most GSHP systems are equipped with a desuperheater that is able to capture waste heat from its compressor's operation and/or heat from the unit's refrigerant in the cooling mode during summers. This heat is used for preheating water, thus reducing the cost and energy usage for supplying hot water during the months when the GSHP operates for considerable periods of time each day.

Circuit Breakers

Upending electrification myths



Electrification won't break the grid, it will make it smarter.

Sam Calisch
Special Projects

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Research

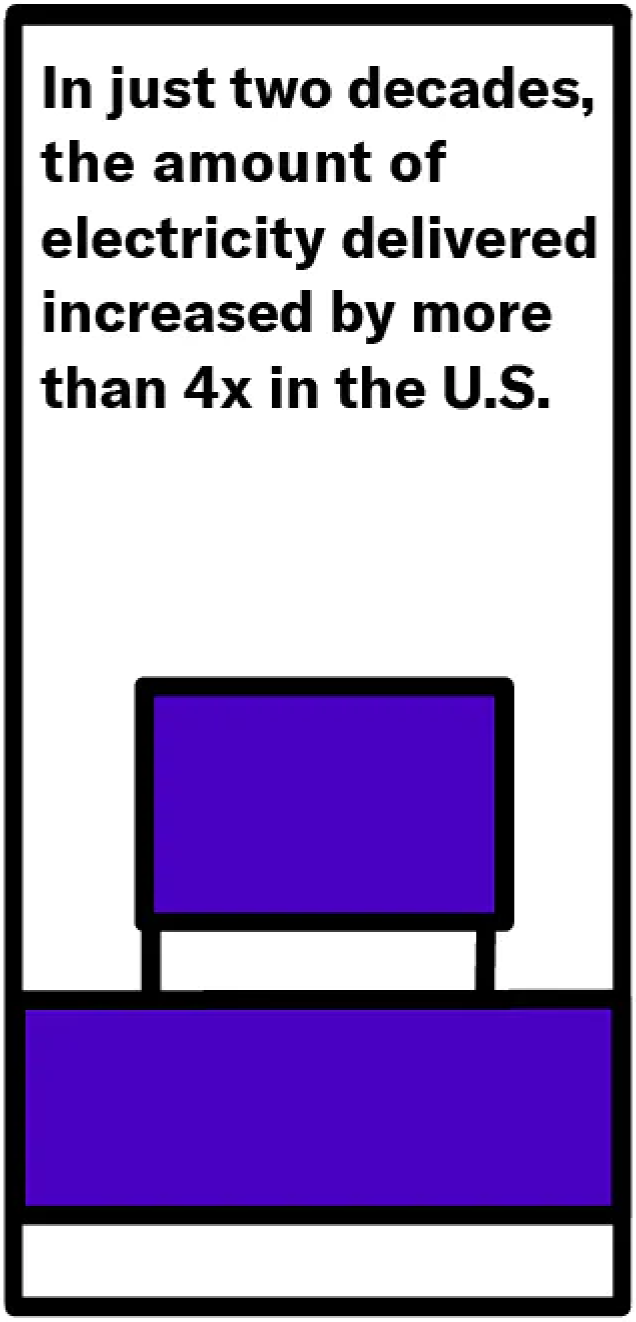
- **To meet our climate goals, we'll need to deliver two to three times as much electricity as today. Fortunately, we've scaled the grid faster than this before and can do it again [1].**
- **Smart grid technologies can allow more electricity to be delivered by the same infrastructure, reducing the amount of new grid build-out and increasing resilience.**
- **Smart electric panels can enable whole home electrification, including EVs and heat pumps, largely without upgrading upstream infrastructure like wires or transformers, cutting the cost and time required for electrification.**

To meet our climate goals, we must electrify nearly everything in our economy. That will require delivering about two to three times more electricity than we do today [2]. A share of this will come from clean solar energy generated right on our rooftops [3], but our grid will also need to grow significantly to deliver the remaining electricity demand. Skeptics of electrification say the grid won't be able to handle this [4], but history says otherwise. In just one decade, between 1950 and 1960, the amount of electricity delivered more than doubled in the U.S, and by 1970 it had more than doubled again [5], largely in response to the proliferation of uses for electricity beyond lighting [6]. As American households now similarly spur increased electricity demand to power electric vehicles and heat pumps [7], we can be confident that we can deliver, because we've done it before.

Text with Image (The Grid Circuit Breaker)

In order to grow the grid as efficiently and effectively as possible, we can leverage a host of technologies that make it smarter, more responsive and capable of delivering more electricity [8]. The cost of infrastructure – like wires and transformers – is driven by assumptions about worst case demand: the grid is typically designed to operate even if all consumers were to turn on nearly all of their devices at the same time. Because these events are so exceedingly rare, we aren't using these components to their full potential. A smarter grid would use the inherent flexibility of electricity demand [9] to avoid these situations altogether, allowing more electricity to be delivered by the same infrastructure.

While this may seem far-away and complex, there are significant opportunities hiding right in our basements and utility closets, embodied in the humble electrical panel [10]. These pieces of infrastructure are responsible for safely regulating the flow of electricity between the grid and loads in a building.



As homes electrify, adopting electric vehicles, heat pumps and electric stoves in place of fossil fuel machines, they may demand more electricity than the panel was originally designed for. Like other grid infrastructure, panels are sized for the peak electricity load: roughly the amount of electricity required if your electric vehicles, heat pump, water heater, stove and everything else is turned on at the same time [11]. This peak load, however, is 10-20 times higher than the average load over time [12]. Thus, if we can better manage peak events, substantially more electricity can be delivered without increasing panel capacity.

Fortunately, we have "smart panels", which are electrical panels designed to do just this, measuring the flow of electricity and allowing individual circuits to be automatically turned on and off to regulate a home's peak electricity demand. As an example, in Figure 1 at left, we show a peak event from an actual electrified home around dinner time, using data provided by SPAN, a leading manufacturer of smart panels. The householder likely arrived home from work, plugged in their car, started a load of laundry and turned up the thermostat. As a result, the total electricity drawn from the grid exceeded 80 amps for several minutes [13], exceeding a safe limit for a 100 amp panel [14]. If not for a smart panel, this household would likely have needed a 200 amp service upgrade when electrifying. On the right, we see the same event as could be mediated by the smart panel. By shifting 34 minutes of EV charging (shown in orange) with no inconvenience to the householder, the maximum load is kept below that 80 amp threshold at all times [15]. In data from SPAN's electrical panels covering all contiguous U.S. climate zones, over 80 percent of peak events [16] were less than 12 minutes long, and shifting the operation of just one of the water heater, dryer, EV charger, or HVAC system can mitigate 90 percent of all peak events. These data indicate that the vast majority of peak loads could be shifted without any noticeable effect to the household.

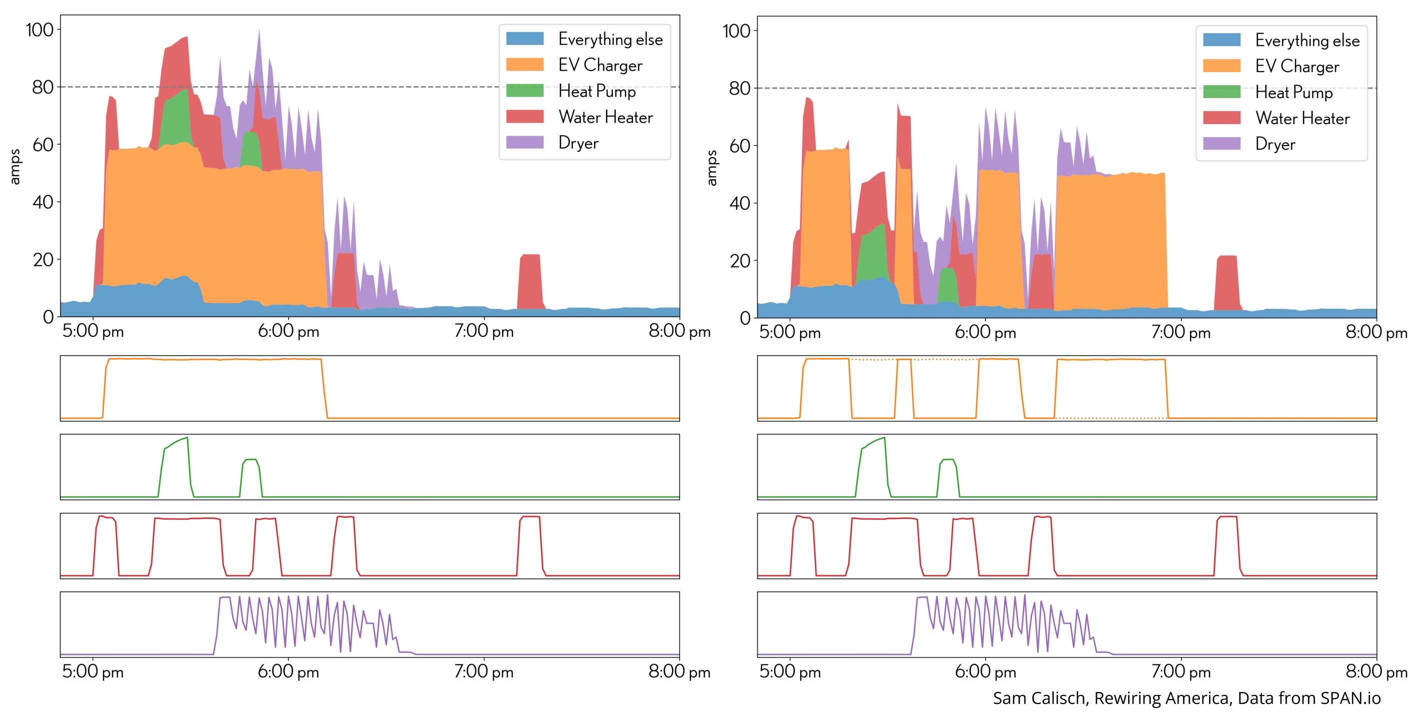


Figure 1: *Left) A real-world peak event of over 80 amps around dinner time, caused by an EV charger, heat pump, water heater, and dryer all cycling on at the same time. Right) The same event, with the current peak held below 80 amps by shifting 34 minutes of EV charging (orange). Data provided by Span.IO, Inc. and analyzed by Rewiring America.*

Today, approximately 50-60 million single-family homes (or approximately 60-70 percent) have electrical panels with ratings less than 200 amps [17]. If these households fully electrify (including two electric vehicle chargers, heat pump HVAC, heat pump water heating, electric range, and electric dryer), it is likely that most will need a new, larger electrical panel [18]. If this new panel is not a smart panel, a further upgrade to the incoming electrical service (that is, the wires carrying electricity from the street) may also be required. While buying a smart panel is incrementally more expensive than a conventional panel, the avoided costs of a resulting service upgrade can be hefty [19]. Particularly for households receiving electrical service through underground wires, the avoided costs are likely to pay for the smart panel upgrade many times over.

To encourage electrification, policymakers should provide incentives to homeowners to reduce the costs of panel upgrades, especially for low- and moderate-income households. For example, the climate provisions of the 2021 budget reconciliation bill passed by the House of Representatives [20] included direct rebates of up to $3,000 for this. The Senate should move quickly to pass this legislation with these measures intact. Utilities can also play a role, providing information on smart panels and incentives to defray the upfront cost premium when a customer applies for a service upgrade [21]. Further, the National Fire Protection Association's Committee on the National Electrical Code should modernize regulations on electrical panel sizing to clarify that smart panels allow extra load to be added to an existing electrical service. Finally, in cases where a service upgrade is unavoidable, utility regulators should reallocate subsidies for natural gas connections [22] to electrical service upgrades.

Our grid today is built for the worst-case scenario: the short, rare instances where households are using all of their machines at once. This is an inefficient use of electric infrastructure, and makes scaling our electric grid to support an increasingly electrified economy harder than it needs to be. Smart grid technologies like smart panels can maintain the necessary reliability and resiliency of the grid, while allowing us to scale our infrastructure more efficiently and cost-effectively.

Acknowledgement

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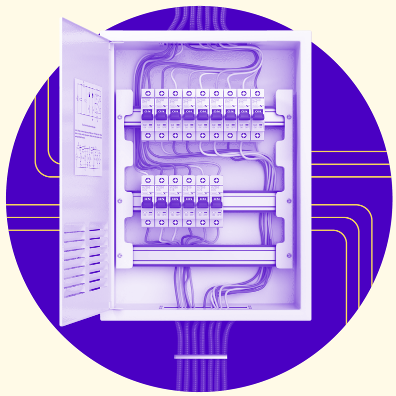
Notes

English Español

Back to Calculator



Electrical Panel

AVERAGE LIFESPAN

20-25 years

Electricity flows into your home through your electrical panel (or breaker box), like water flowing through a pipe. The panel size determines how much electricity can flow into your home.

A “smart panel” uses software to manage the flow of electricity through your home, and installing one can help you avoid a service upgrade.

Incentives and Costs

Expand each section to see amounts for different households.

You can combine Electrification Rebates with the tax credits for additional savings!

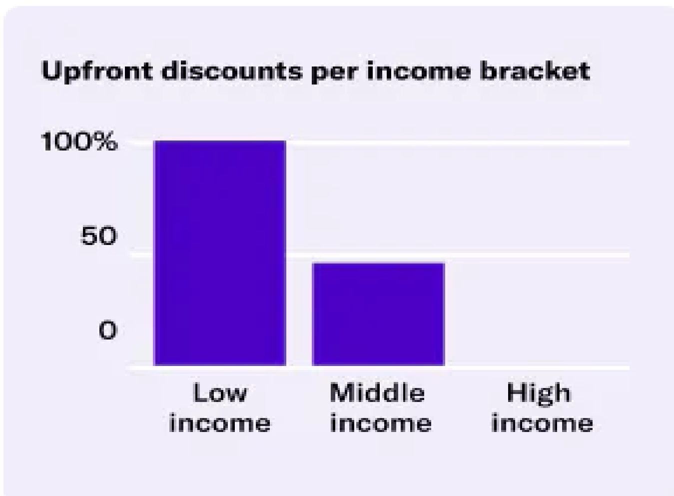
Electrification Rebate

Save up to $4,000

Depending on income

For low-income households (under 80 percent of Area Median Income), HEEHR covers 100 percent of your electrical panel costs up to $4,000. For moderate-income households (between 80 percent and 150 percent of Area Median Income), HEEHR covers 50 percent of your electrical panel costs up to $4,000.

Total HEEHR discounts across all qualified electrification projects are capped at $14,000.



25C Tax Credit

30%

$600 maximum per year

25C provides households a 30 percent tax credit for an electrical panel upgrade, capped at $600 per year, if it's upgraded in conjunction with another upgrade covered by 25C (like a heat pump or heat pump water heater). The credit resets each tax year, effectively becoming available again for additional projects.

Total 25C tax credits across panel upgrades and all weatherization projects are capped at $1,200 per year. Heat pumps and heat pump water heaters are subject to a separate 25C cap of $2,000 per year.

The tax credits for an electrical panel upgrade can only be claimed if the panel is upgraded in conjunction with another upgrade covered by 25C or 25D. In the case where both 25C and 25D are applicable for a panel upgrade (i.e., if you're upgrading your panel in conjunction with both a heat pump and rooftop solar), you cannot combine the two credits. You will pick the credit with the greater value—either $600 or the 30% tax credit.

25D Tax Credit

30%

Of equipment and installation cost

25D provides households a 30 percent uncapped tax credit for an electrical panel upgrade if it's upgraded in conjunction with rooftop solar.

The tax credits for an electrical panel upgrade can only be claimed if the panel is upgraded in conjunction with another upgrade covered by 25C or 25D. In the case where both 25C and 25D are applicable for a panel upgrade (i.e., if you're upgrading your panel in conjunction with both a heat pump and rooftop solar), you cannot combine the two credits. You will pick the credit with the greater value—either $600 or the 30% tax credit.

Ready to take the next step?

Get a guide right now, and we'll update you when new incentive details are available for your hometown.