REWIRING AMERICA






Homegrown energy

How household upgrades can meet **100 percent** of data center demand growth

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Hyperscalers should pay for heat pumps, rooftop solar, and storage to get the capacity they need on the grid now, while setting us up for an affordable, reliable, and clean energy future.

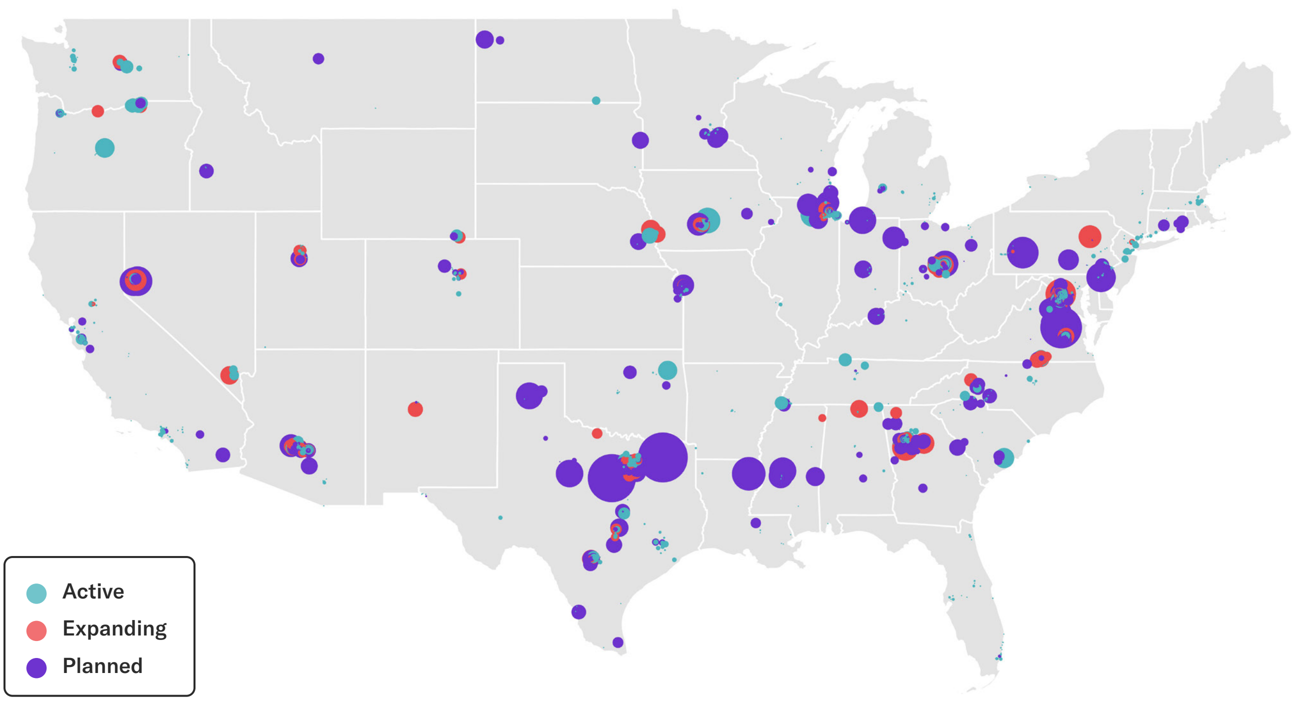
Increased demand from data centers is straining our electricity grid and driving up costs for everyone

Over the next five years, U.S. electricity demand is projected to grow by 128 GW.[1] This is an increase of 16 percent over today's national peak demand (the most electricity we use in the country at a given time) and marks a sharp departure from more than two decades of flat electricity demand. The primary drivers for this increase are hyperscalers, the tech companies building energy-intensive AI data centers at a rapid pace. **The data centers currently planned or already under construction across the country would add a total of 93 GW of electricity demand to the grid by 2029.**[2]

93 GW: That's more than the current generation capacity of California.

ON THE HORIZON

Active and planned data centers projected to be built through 2029[3]



This new demand, plus constrained supply, is driving up costs. Across the country, households have been opening their mail and discovering soaring monthly electricity bills. **Electricity prices have risen twice as fast as inflation over the last year,[4] and they are expected to keep rising.** Utilities have requested $29 billion in rate hikes so far this year alone.[5]

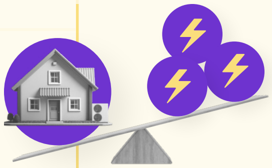
Electricity prices are expected to keep rising.

Rising electricity prices are squeezing American households at the worst possible time, with wages lagging behind inflation[6] and federal incentives for money-saving home upgrades disappearing. But this doesn't have to be a zero-sum game where households must compete with data centers and industry for limited power. Instead, households could serve as the foundation of an energy system that powers prosperity for families and a competitive, electric-powered economy.

Households can be the hero of this story

In response to this new era of demand growth, hyperscalers and utilities are currently looking to centralized, utility-scale solutions, like building fossil fuel or nuclear power plants.[7] However, there is an overlooked solution that has the potential to provide sweeping benefits: investing in the household as energy infrastructure.

Households have historically been seen as passive energy consumers, subject to rising prices. This is an outdated view. The world is moving toward a future where every household can be its own power plant or smart grid asset, generating clean electricity from rooftop solar and storing it to shift the loads from electric appliances and meet the needs of the grid. For example, heat pump water heaters can pre-heat water in the middle of the day, then supply ample hot water to a household during peak hours without drawing electricity from the grid. Electric vehicles can be programmed to charge overnight when there is less demand for electricity on the grid. Home batteries can send electricity back to the grid when our system needs it the most, and recent tests show that they can be incredibly effective at this.[8] Far from being passive consumers, households are now essential energy infrastructure that can be leveraged to solve our energy challenges.



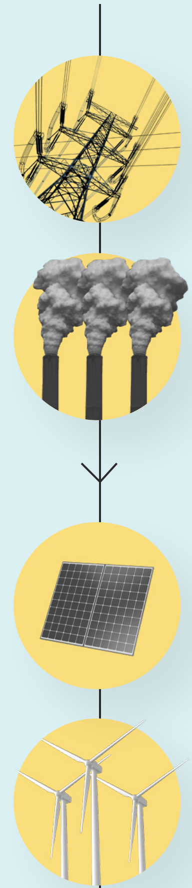
Households are now essential energy infrastructure that can be leveraged to solve our energy challenges.

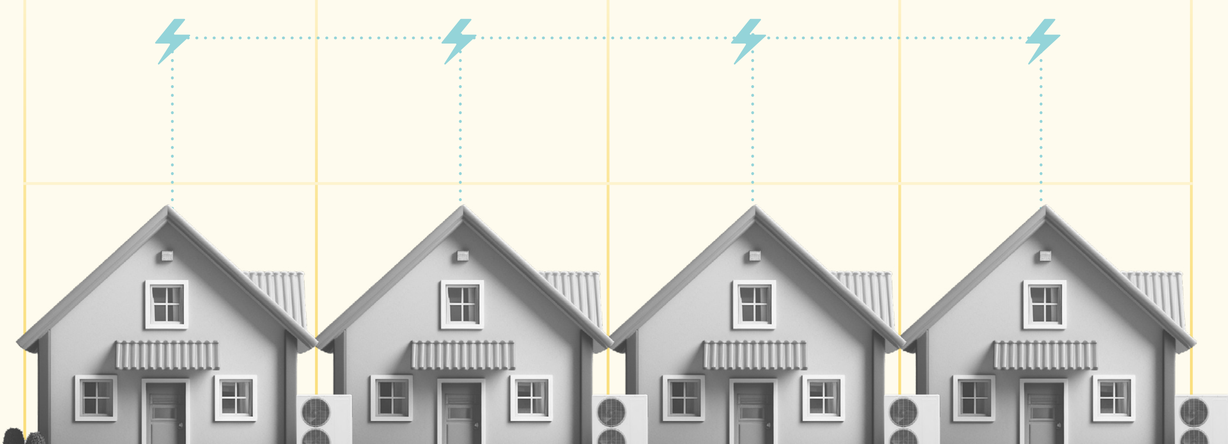
The connection between peak demand and electricity prices

The electrical grid is built with enough capacity to accommodate peak demand, which is the maximum amount of power used simultaneously by customers on the grid. This typically occurs on the hottest summer afternoon or coldest winter morning. Most of the year, we have excess grid capacity: meaning the total electricity we need is lower than the maximum electricity the grid can generate and distribute. However, if electricity demand at peak hours increases and exceeds the grid capacity, we need new infrastructure to avoid power outages and blackouts.

Infrastructure costs include the costs to build and maintain the poles, wires, and we need to support peak demand. Customers are on the hook for paying off the cost of adding those new power plants or electrical poles to prepare for peak demand, all year round.[9] These fixed costs get passed down to us regardless of how much energy we use, through the electricity rate that we pay on our bills.

Therefore, one way to minimize infrastructure costs is to **reduce peak demand**, which is equivalent to **creating capacity** on the grid. The household upgrades described in this report achieve that by either directly reducing electricity demand during peak times with more efficient electric appliances, or by generating electricity from solar panels and storing it in batteries to be discharged during peak periods, so that it doesn't have to be supplied by the grid.





If we shift our perspective to see households as energy infrastructure, households can be the hero of our energy story.

In the following sections, we provide a three-part roadmap for how hyperscalers and utilities can create capacity on the grid and pave the way to a better energy future by investing in U.S. households:

1. **Hyperscalers could meet one third of their projected additional capacity needs** by paying for heat pumps in select households that currently use inefficient electric heating, cooling, and water heating, thereby creating capacity on the grid from a subset of households.

2. **Hyperscalers could more than meet their total planned capacity needs** by paying for battery storage as well as rooftop solar for homes well suited for it. This will create new generation capacity on the grid.

3. **Hyperscalers' immediate investments in these solutions will forge the technological and economic pathways that transform America's entire energy system.** What starts as an urgent solution to AI's power hunger becomes the foundation for an all-electric economy — efficient, resilient, affordable for households, and perfectly suited to position the U.S. as a global leader in the industries that will define this century.

The first two solutions demonstrate that we can more than meet the projected hyperscaler capacity needs by upgrading households. If hyperscalers pay to upgrade households with heat pumps, rooftop solar, and storage, it will lower electricity costs for households, improve resilience to power outages, and drive down upfront costs by maturing the growing market for home energy upgrades. It is a true win-win.

We can more than meet the projected hyperscaler capacity needs by upgrading households.

This approach will also buy us time to invest in the grid to meet growing demand from electrification, and to conduct a managed transition from two energy systems — the gas system and the electric grid — to one. In this way, even though hyperscalers would only pay for upgrades in a subset of homes, these investments will facilitate the broader transition to a modern, all-electric energy system.

In the following sections, we expand upon and prove out each of these household solutions.[10] Ultimately, we show that the solution to our current energy challenges lies in investing in households — to unlock significant energy bill savings, improve health, and ensure grid reliability for our communities for decades to come.

1

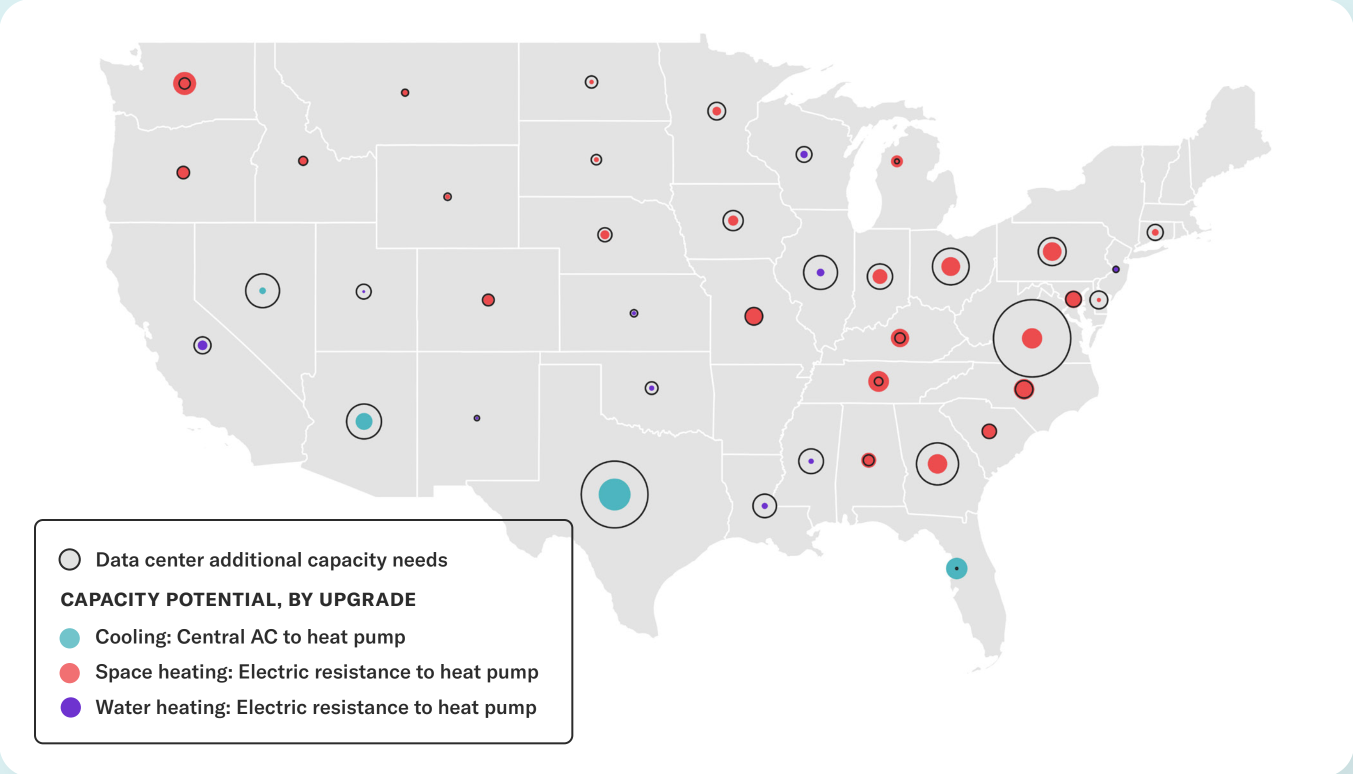
Hyperscalers could meet 33 percent of their capacity needs by paying for residential heat pumps

From load flexibility (adjusting, reducing, or shifting peak electricity usage outside of peak times)[11] to building new power plants, there are many possible utility-scale solutions for lowering or meeting peak demand. But an immediate, win-win solution to rising demand has largely been overlooked: installing heat pumps in the tens of millions of U.S. households that currently use inefficient electric heating, cooling, and water heating.

In every state, installing heat pumps can meet a significant portion of the expected increase in demand from data centers. In states that currently experience peak electricity demand in the winter, either due to cooler temperatures or high rates of electric resistance heating, we can upgrade inefficient electric resistance heating to heat pumps. In warmer states that currently experience peak electricity demand in the summer, we can create the most capacity by upgrading inefficient air conditioners to efficient heat pumps that both heat and cool homes. In states where the other two solutions are less viable, often in cases where the summer and winter demand are similar, converting inefficient electric resistance water heaters to heat pump water heaters becomes the best option, delivering a smaller yet still meaningful amount of capacity.

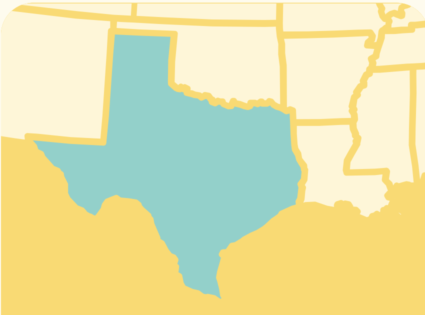
HEAT PUMP CAPACITY

Projected additional data center capacity needs (through 2029) compared to household heat pump capacity potential by state.[12]

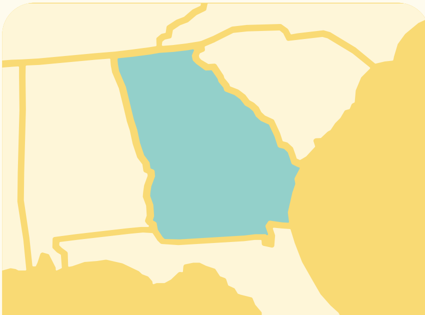


Across the country, these upgrades would create a total of 30 GW of capacity, approximately equal to 33 percent of projected additional data center capacity needs. The map above shows that there is broad alignment between states with high projected data center growth and states with high expected peak reduction from heat pump upgrades.

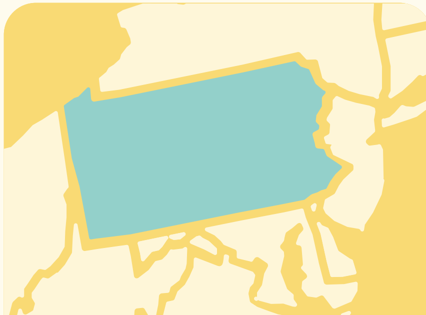
STATE EXAMPLES



→ **Texas** expects to see 17 GW of data center demand growth over the next five years, almost a fifth of all new national data center demand. But by upgrading the 4.5 million households in the state that use central air conditioners to heat pumps, we can create **3.9 GW** of capacity on the grid, about **23 percent** of the expected new data center capacity needs in the state.

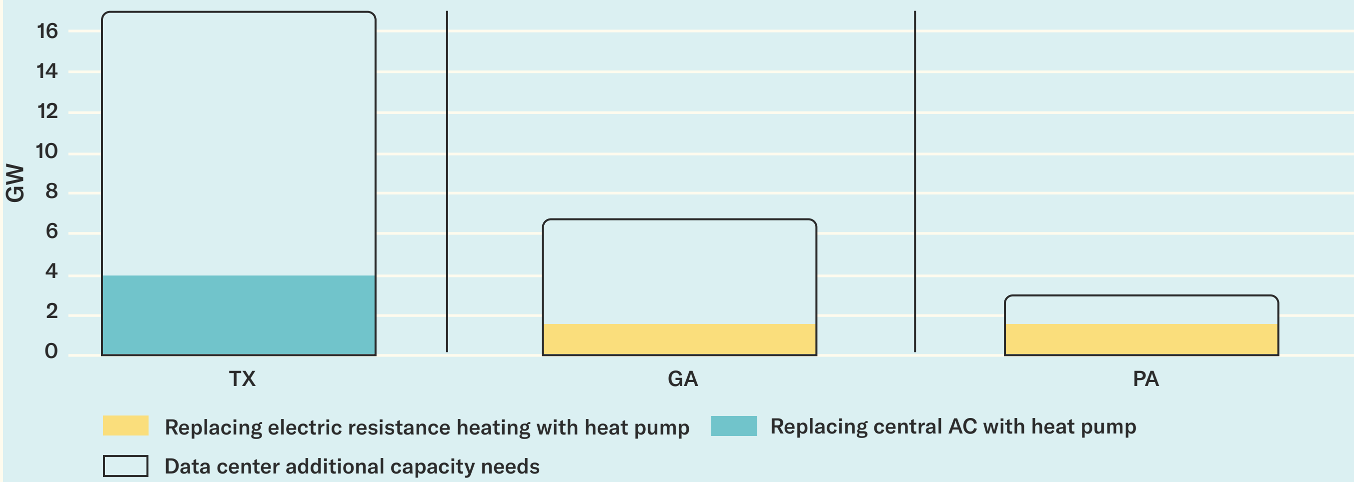


→ **Georgia** is projected to have **6.7 GW** of new demand from data centers over the next five years. By upgrading the almost half a million homes in the state that use inefficient electric resistance heating to heat pumps, we could unlock **1.5 GW** of capacity, about **22 percent** of the projected capacity needs.



→ In **Pennsylvania**, data centers will add about **3 GW** of new demand to the grid, and we have the opportunity to reduce current residential peaks by about **1.3 GW**, or **45 percent** of new demand, just by upgrading inefficient electric resistance heating to heat pumps.

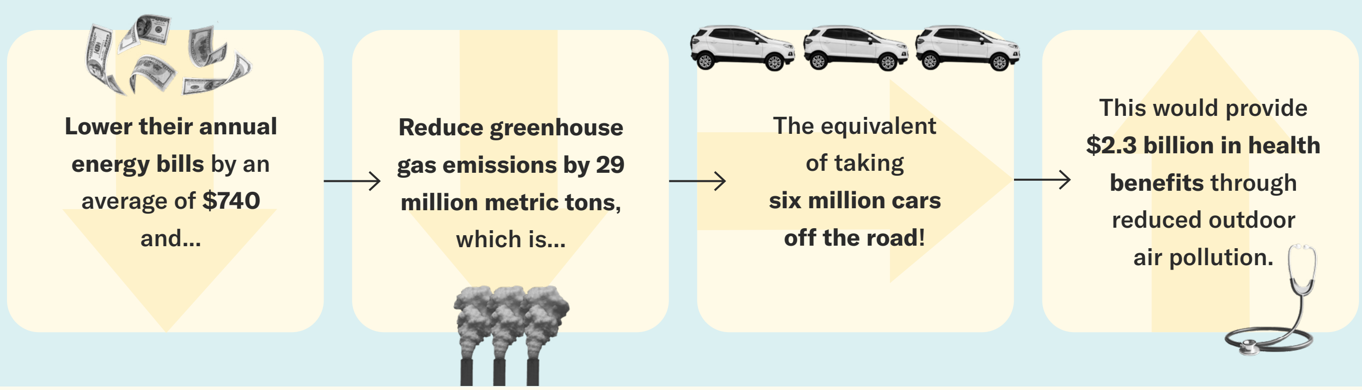
Potential for heat pump upgrades to fulfill new data center demand, by state.



Converting electric resistance households to heat pumps is particularly well matched with regions that are expected to see high data center growth, including the Southeast and the Pacific Northwest. This solution alone would create 24 GW of capacity nationally. If hyperscalers paid for 50 percent of the upfront cost of installing heat pumps in homes with electric resistance heating, they could get capacity on the grid at a price of about $344/kW-year — a similar cost to building and operating a new gas power plant, which currently costs about $315/kW-year.[13]

Purely comparing the upfront cost of heat pumps to the upfront cost of a new gas power plant doesn't capture the significant immediate benefits that heat pumps bring to households. The upgraded households (select households currently using inefficient electric heating, cooling, and water heating) would lower their annual energy bills by an average of $740. Across these 21 million households, each year, heat pump upgrades would reduce greenhouse gas emissions by 29 million metric tons. That's the equivalent of taking 6 million cars off the road.[14] The switch would also provide $2.3 billion in health benefits through reduced outdoor air pollution.[15]

If select households currently using inefficient electric heating, cooling, and water heating upgraded to heat pumps, they would...



From a household's perspective, a 50 percent hyperscaler discount on the upfront cost would enable them to get a heat pump for around $9,000. This brings the heat pump cost below the cost of a like-for-like alternative, such as an electric resistance furnace and a central air conditioner. It also makes the decision to upgrade to a heat pump an easy choice, and lets the household start saving money on Day 1. Pairing these investments with additional negotiated discounts or standardized installs that achieve economies of scale will create a virtuous feedback cycle that further lowers upfront costs for households and makes existing local incentives more efficient and effective.

Hyperscalers seeking capacity on the grid should first pay for home heat pump upgrades. This is faster than building new power plants. Since many of the power plants proposed for new construction or repowering burn coal or gas, it is significantly cleaner, and more insulated from future volatility in fuel prices. This is a win-win solution for hyperscalers, utilities, and households.

2 Hyperscalers could more than meet their capacity needs by paying for rooftop solar and storage

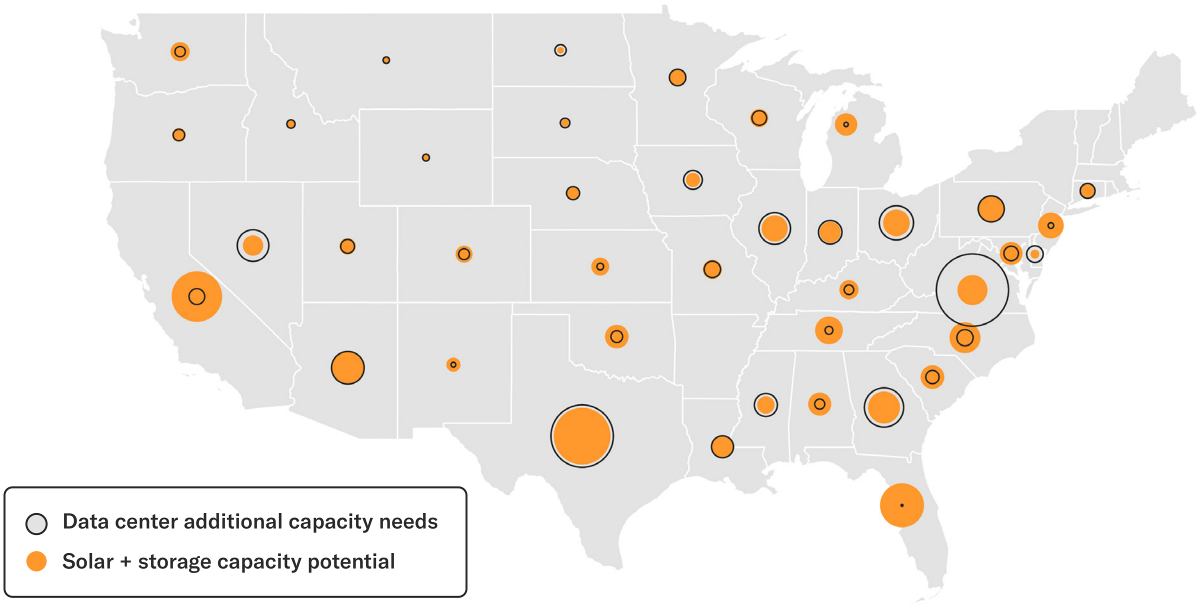
We have multiple options for adding electric generating capacity to meet growing peak demand. We can build new power plants, but the timeline to bring a new gas plant online is currently seven years, and the timeline for a new nuclear plant is even longer and more uncertain. We can invest in utility-scale renewables, which will be needed, but are currently bottlenecked by long interconnection queues. Or, we can leverage the household as energy infrastructure and invest in installing rooftop solar and storage in U.S. households to meet our needs quickly.

If every single-family household in the U.S. installed a home battery, and those with a suitable roof[16] installed a 5 kW solar system (about 11 solar panels), they could collectively generate 109 GW of increased capacity on the grid. We assume that households charge the battery off-peak, either from the grid or from rooftop solar, and they discharge the battery during peak periods to reduce the household's contribution to peak demand.

That would free up significant space on the grid — and total more than the 93 GW in projected additional capacity needs from data centers through 2029. With solar installations sized to meet a home's post-electrification load, or home batteries sized to provide multi-day backup during power outages, the peak demand reduction could be even higher.

SOLAR + STORAGE CAPACITY

Projected data center additional capacity needs (through 2029) compared to rooftop solar and storage capacity potential by state.

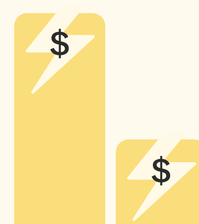


By analyzing the potential for cost compression in the U.S. rooftop solar and storage market, researchers estimate that installations at this scale, paired with targeted interventions to lower costs, would reduce the cost of rooftop solar and storage by at least 40 percent. These targeted interventions include streamlining the permitting process and reducing customer acquisition costs.[17] At this reduced cost, hyperscalers could pay for 30 percent of the cost of rooftop solar and a home battery and get capacity on the grid at costs comparable to building a gas power plant.[18] However, the advantages of investing in the household extend far beyond just cost. First, it could be implemented on a much quicker timeline, on the order of months rather than years. Second, rather than building a polluting power plant, hyperscalers would provide community benefits directly by helping households install rooftop solar and a battery at a significant discount. When states and utilities invest in household electrification and streamline interconnection processes, they build trust in communities while creating an environment that invites business investment.

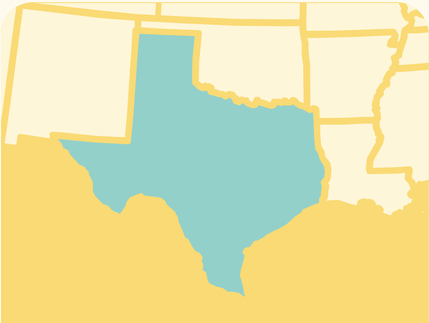
Finally, this arrangement provides significant financial benefits for the household. Households would pay about $11,000 for the solar plus storage system up front, then get free or discounted electricity for the lifetime of those systems. After 40 percent cost compression, and with a 30 percent hyperscaler investment in solar and storage, we estimate that households could effectively pay about $0.11/kWh for electricity, about 30 percent lower than today's average prices. This locks in low electricity prices for households for decades to come, shielding households from volatility in fuel prices.

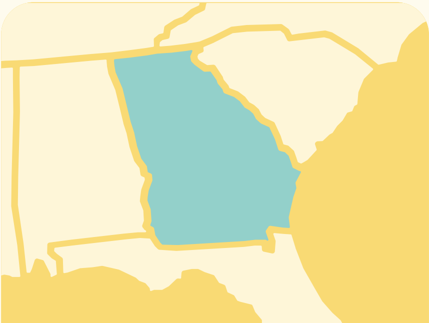
While hyperscalers could pay for home batteries alone, pairing them with rooftop solar is far more advantageous. The two solutions work together to more effectively create capacity by both producing and storing energy. Rooftop solar also provides a unique economic benefit to households while ensuring the battery is charged with clean energy, preventing potential increased emissions related to grid charging.

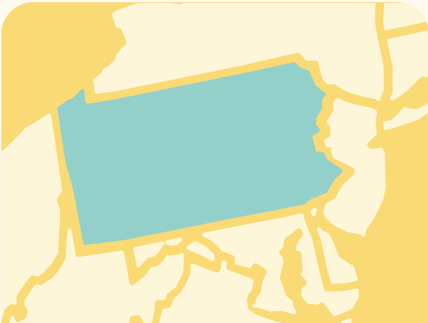
We estimate that households could effectively pay about $0.11/kWh for electricity, about 30 percent lower than today's average prices.



STATE FOCUS





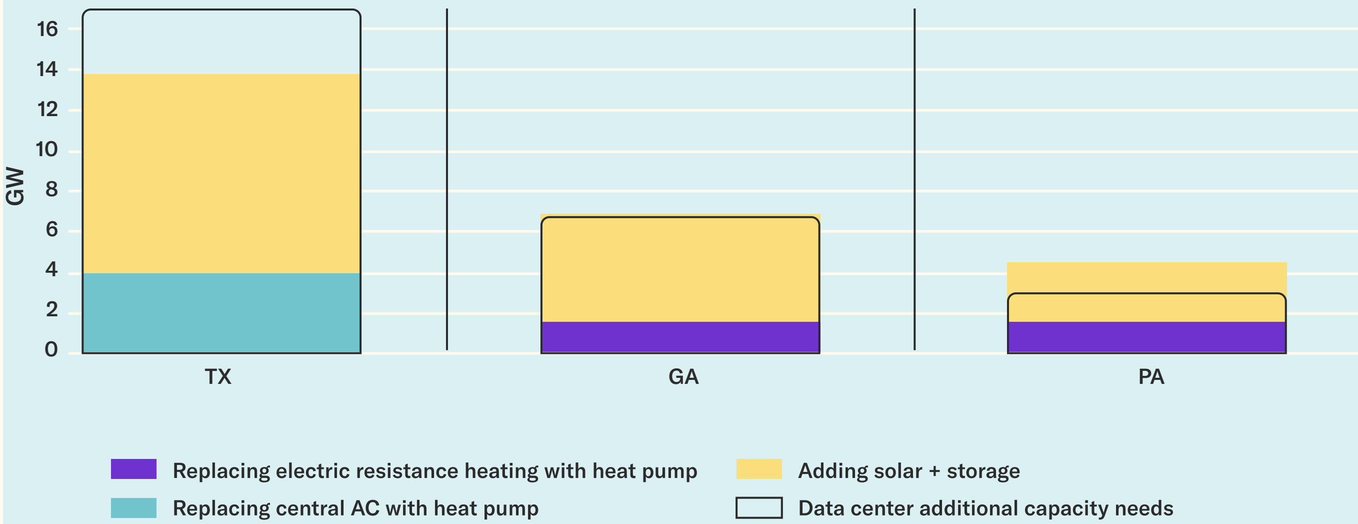


→ In **Texas**, alongside the **3.9 GW** of capacity created by upgrading central air conditioners to heat pumps, solar and storage could unlock another **10 GW** of capacity. That means these residential solutions alone would total about **80 percent** of projected new data center demand in the state.

→ In **Georgia**, if we can unlock **1.5 GW** of peak demand capacity by upgrading inefficient electric resistance heating to heat pumps, rooftop solar and storage could provide an additional **5.4 GW** of peak demand capacity. This would total **more than the 6.7 GW of new demand** from data centers over the next five years.

→ Finally, in **Pennsylvania**, in addition to the **1.3 GW** of capacity created by upgrading electric resistance heating to heat pumps, solar and storage can offer another **3.2 GW** of capacity. This will total more than **150 percent** of the expected **3 GW** in new data center demand.

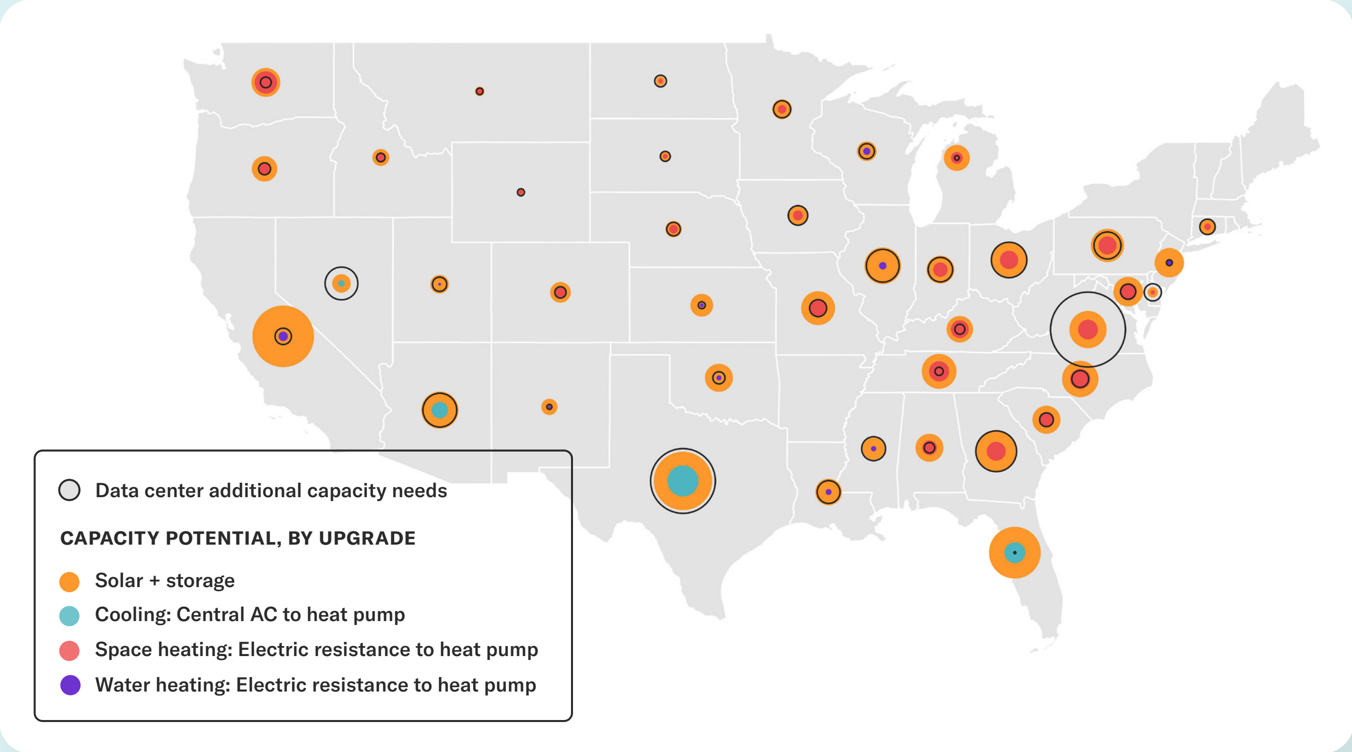
Potential for heat pump, solar, and storage upgrades to fulfill new data center demand, by state.



Pairing rooftop solar and storage also improves the long-term economic benefits for the household. Some states have reduced or eliminated credits for households that send electricity generated by their panels back to the grid. As a result, households now have an incentive to store electricity generated by their solar panels during the day for use in the evening.[19] Installing rooftop solar and storage together ensures that households will see the economic benefits of rooftop solar long into the future, regardless of how their state decides to compensate for solar credits.

COMBINED UPGRADE CAPACITY

Projected data center additional capacity needs (through 2029) compared to capacity potential from heat pump upgrades paired with rooftop solar and storage by state.[20]



States, utilities, and hyperscalers should be looking to households as a critical part of the strategy needed for the U.S. to lead on AI. In many states, the potential capacity created from targeted residential heat pump installation, solar, and storage more than meets expected additional data center capacity needs. In all of those places, homes can be more than the hero of the data center demand growth story; they can also power further affordable electrification of homes and businesses. With the combined efforts of hyperscalers, utilities, regulators, policymakers, and advocates, we can harness the power of the household to stabilize runaway electricity rates, and prevent the expansion of costly new fossil fuel plants. Household electrification can provide a faster and more cost-effective solution to our energy challenges, while providing immediate benefits and economic relief to Americans. This approach should be on the “do now” and “do first” lists for hyperscaler and utility investment.

3 Hyperscaler investments in heat pumps, solar, and storage pave the way to a modern, all-electric energy future

Meeting the capacity demands of new data centers in the coming years is a challenge, but it is also an opportunity to build for an economic future that will require abundant and affordable energy. Other economies are choosing to build out all-electric energy systems powered by renewable energy, and the U.S. must do the same to remain a global leader.[21] American households can be the hero of the current moment, meeting the capacity that new data centers require on the grid. In addition, investing in households will make it possible for us to shift to this modern future by completely electrifying home energy use, upgrading our grid, and managing the phase-out of the duplicative gas system. **Hyperscaler investments in household upgrades lay the groundwork for this larger transformation to an all-electric energy future.**

Household upgrades lay the groundwork for an all-electric energy future.

Initial investments in residential heat pumps, solar, and storage catalyze further changes in several ways. First, as discussed above, rooftop solar and storage will provide electricity to households at an effective cost of $0.11/kWh. Access to electricity at a fixed and affordable rate relative to gas prices will ensure that households save money on their energy bills when they switch from fossil fuel to electric appliances.

Second, home solar and storage will overcome concerns about household resilience to power outages after widespread electrification. All-electric homes powered by solar and storage will be able to operate their appliances, staying comfortable and livable, even when the power goes out.[22]

Third, by installing a high volume of heat pumps in homes currently using inefficient electric heating, cooling, and water heating, we will mature the already-growing market for heat pump installations. We will grow the workforce and increase contractor comfort with heat pump installs, driving upfront costs down and making heat pumps more affordable for everyone.

Finally, installing residential capacity now will make it easier to meet continued load growth — both by extending our timeline and freeing up resources to make the transition possible. We will certainly need new utility-scale generation alongside rooftop solar and battery storage to support this increased demand. But in contrast to the current surge in demand from data centers, this increase in demand will not happen overnight. We have decades to plan for this transition and build out the grid. At the same time, we can transition from two energy systems to one. We are currently paying to build and maintain two increasingly redundant systems: the gas system and the electric grid. Utilities are pouring more than $20 billion each year into aging gas distribution infrastructure, and costs are increasing.[23] If these trends continue, utilities will have to spend more than $1 trillion over the next 25 years just replacing aging gas distribution pipes. We can avoid this costly future. Instead, to provide the capacity required to electrify everything, we can invest the $1 trillion that would otherwise be invested in the gas system into upgrading the electric grid and electrifying households.

Utilities are pouring more than $20 billion each year into aging gas distribution infrastructure, and costs are increasing.

There are many exciting solutions that we have not analyzed in depth in this report that would help keep electricity prices stable and avoid ongoing increases in peak demand. In brief, some of these include:

- Charging electric vehicles at off-peak times, which has already driven down electricity prices by increasing the amount of electricity we use without increasing peak demand, thereby spreading grid costs over more kilowatt-hours of electricity.[24]
- Load shifting, or rescheduling electricity use from high-demand (peak) periods to low-demand (off-peak) times, which can also improve grid efficiency and drive down electricity prices.
- Curtailment, or turning off less essential loads during peak periods or emergencies, which can limit growth in peak demand.
- Installing more power-efficient appliances, like heat pump water heaters that plug into a standard 120-volt wall outlet, which can limit growth in peak demand.

The impact of these solutions on peak demand and electricity prices in an all-electric future will be the subject of future work.

Invest in households first

We urge hyperscalers, utilities, and other decision makers to **first look to the household** when they are solving the energy system challenges of our time. Leveraging households as energy infrastructure rather than passive or competing consumers is the fastest, cleanest, and most beneficial way to meet surging electricity demand.

Between installing heat pumps in homes with inefficient heating and cooling, and installing rooftop solar and storage, we can more than meet the projected load growth from data centers. This sets us up for a more affordable energy future, where our economy is powered by a single resilient and clean energy system, and we are no longer spreading money between both the electricity grid and the gas system.

When we invest in home upgrades to meet surging demand, everyone wins. Hyperscalers get the power that they desperately need to build new data centers. Policymakers and utilities can meet demand and keep the lights on — with a flexible, resilient, and cost-effective grid resource that can be deployed much faster than alternatives. Most importantly, households get to experience the win-win of affordable, reliable, and clean energy.

Leveraging households as energy infrastructure rather than passive or competing consumers is the fastest, cleanest, and most beneficial way to meet surging electricity demand.

ENDNOTES

1 "Strategic Industries Surging: Driving US Power Demand." Grid Strategies, December 2024. https://gridstrategiesllc.com/wp-content/uploads/National-Load-Growth-Report-2024.pdf

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11 Zeitlin, Matthew. "One Weird Trick to Build New Data Centers Without Breaking the Grid." Heatmap News, 14 August, 2025. https://heatmap.news/energy/ai-flexible-loads

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13 Based on current costs from Cohen, Jesse et al. "Gas Turbine Supply Constraints Threaten Grid Reliability; More Affordable Near-Term Solutions Can Help." RMI, 18 June 2025. https://rmi.org/gas-turbine-supply-constraints-threaten-grid-reliability-more-affordable-near-term-solutions-can-help/. For more details, refer to technical methodology.

14 Based on the Environmental Protection Agency estimate from "Greenhouse Gas Emissions from a Typical Passenger Vehicle." Environmental Protection Agency, 12 June 2025. https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle

15 Rewiring America internal modeling. For more details, refer to the technical methodology.

16 Battery is represented by a Tesla Powerwall 3. Solar suitability derived from modeling done by the National Renewable Energy Laboratory. About 81% of single-family homes nationally are considered suitable for solar, varying by location. For full methodology, refer to the technical methodology.

17 Hastings, Colby et al. "Tesla Energy: Breaking the Cost Barrier in Residential Energy." Tesla, August 2025. https://energylibrary.tesla.com/docs/Public/Solar/Retrofit/WhitePaper/en/Tesla_Energy_Breaking_the_Cost_Barrier_in_Residential_Energy.pdf

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See technical methodology here.

Homegrown energy: How household upgrades can meet 100 percent of data center demand growth

Hyperscalers should pay for heat pumps, rooftop solar, and storage to get the capacity they need on the grid now, while setting us up for an affordable, reliable, and clean energy future.

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