ENERGY INNOVATION
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LET THE SUN IN: CLEAN ENERGY IS THE CHEAPEST WAY TO MEET RISING DEMAND

Policy Companion Report

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INTRODUCTION

Rapid electricity demand growth is bringing America's electricity system to a crossroads, and policymakers now face a choice between two paths for the grid. The electricity industry is making decisions today that will determine what gets built by 2030, and the stakes are high to get it right.

One pathway doubles down on fossil fuels, prevents retirement of aging power plants, and builds new gas plants – but meeting demand growth primarily with fossil fuels adds $29.7 billion annually to customer bills by 2030. The other pathway accelerates cheaper, cleaner energy deployment and allows old, deteriorating plants to retire – reliably meeting demand and protecting customers from volatile fossil fuel prices. This pathway cuts the incremental cost of meeting demand growth by $5.1 billion annually in 2030, a savings of 17 percent.

We modeled these two pathways through 2030 and found a clean energy scenario can meet growing electricity loads from data centers and other drivers while saving consumers money by reducing reliance on older fossil plants and expensive fuels.

This near-term time horizon is similar to the procurement and development timeframe for new resources, and this analysis can help inform procurement, permitting and policy decisions being made today that will shape the grid five years from now. In addition to this policy analysis, the full study is available online: https://energyinnovation.org/report/let-the-sun-in-clean-energy-is-the-cheapest-way-to-meet-rising-demand/

A spike in coal and gas prices like the U.S. saw in 2022—which could happen again due to events like booming electricity demand, geopolitical instability, and rising LNG exports—would push up electricity costs $40.5 billion per year under a fossil fuel-heavy scenario. Clean energy would cut this cost 21 percent, providing $13.5 billion in savings.

These results hold true even if demand growth from data centers does not materialize to the levels projected today; even then, using clean energy lowers consumer costs. Savings happen largely by reducing spending on the fuel, operations, and maintenance needed to keep fossil plants running, but they are not guaranteed.

A cheaper clean electricity grid is possible, even with demand growth. Policymakers can protect consumers by improving how we plan, procure, and build new resources.

Six policy actions can unlock a cheaper, cleaner electricity system with fewer customer risks. Leadership is needed at all levels of government, from federal energy regulators to governors and state legislatures, to utility regulators and local governments – tomorrow's industries need not rely on yesterday's electricity system. Accelerating clean en-

ergy deployment is a no-regrets strategy, lowering costs even if anticipated demand growth does not arrive as quickly.

This is a near-term outlook in a time of rapid transition. Our policy recommendations look toward the 2030 window to increase the chances of integration into the utility planning, permitting, and contracting process.

How America chooses to meet this moment will have long-term implications. If we prioritize affordability, we can meet the surging electricity needs of data centers and other growing loads in a way that costs less, produces less air pollution and contributes less to global climate change. If we fail to grasp this opportunity, consumers will instead be saddled with high costs and dirty air.

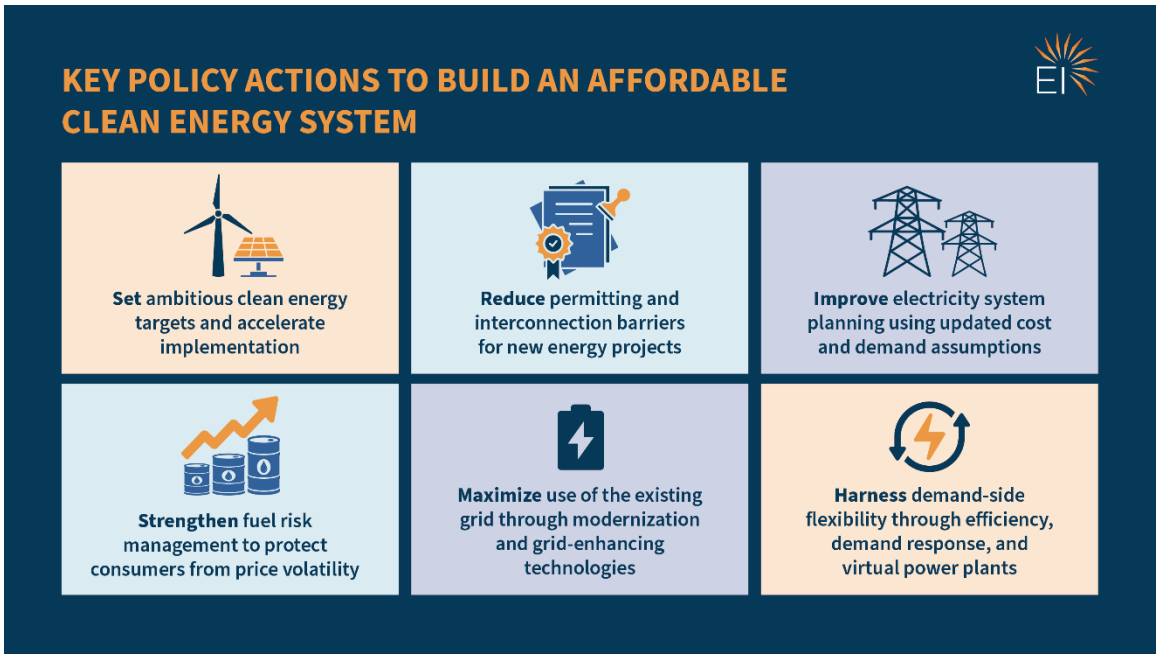

Table 1. Key policy actions to build an affordable clean energy system

Policy Action	Key Decisionmakers	Specifics
Set ambitious targets	• Governors • State Legislatures	• Set and retain targets for clean energy • Prioritize implementing and removing barriers to achieving these goals
Reduce barriers to building new resources	• Governors • State Legislatures • Utility Regulators • Local Governments	• Improve state and local permitting processes • Accelerate interconnection processes • Improve community engagement and benefits for communities that host infrastructure • Enable clean energy parks for faster energization and local economic development
Improve electricity system planning	• Utility Regulators • State Legislatures	• Use up-to-date, market-based planning assumptions • Evaluate economics of both new and existing resources • Utilize competitive procurement and allow different resource types to compete to serve grid needs • Enable customer-driven procurement of clean energy (clean transition tariffs) • Identify opportunities for regional coordination
Encourage better fuel risk management	• Utility Regulators • State Legislatures	• Evaluate fuel price risk and impact of price spikes during planning • Utilize fuel cost sharing to incentivize utilities to manage fuel price risk
Get more out of the grid	• Governors • State Legislatures • Utility Regulators • Local Governments • Federal Energy Regulators	• Measure and improve grid utilization • Incentivize flexibility from customers and demand-side resources • Use advanced transmission technologies to increase usable grid capacity at low cost • Use existing points of interconnection to connect new power plants
Harness the Demand Side	• Utility Regulators • State Legislatures	• Transparent distribution system planning to identify demand-side opportunities • Automate permitting for customer resources • Support flexible interconnection • Enable virtual power plants as a grid resource

POLICY RECOMMENDATIONS

Set and retain clean energy targets

Building clean energy to meet surging electricity demand can cut costs, air pollution, and customer risk. But significant uncertainty in the scale of demand growth, changing electricity generation resource costs, and federal policy leave clarity in short supply.

State policymakers can set and retain clean energy targets, which help orient state policy actions around achieving goals that create clear benefits for customers and communities. This clarity can help focus policy efforts on implementation – removing barriers and planning a competitive clean energy grid, while getting more out of the grid and harnessing flexibility to cut costs. Targets for clean energy include existing renewable energy standards and clean energy standards in 28 states,[1] as well as goals utilities have set for themselves, which state policymakers can codify in plans and policies.[2]

Improve electricity system planning

Proactively planning the grid around the lowest-cost, least-risk set of resources is the first step toward ensuring the best outcomes for U.S. electricity consumers. Planning looks different in states and regions, but the same underlying themes cut across planning processes to enable the cheapest and cleanest grid.

Transparency and updated assumptions

Like modeling exercises, planning processes are only as good as the assumptions that go into them. These assumptions include technology costs, fuel costs, grid reliability constraints, build rates for new resources, and demand forecasting.[3] Because clean energy technology costs are falling rapidly, utility planning processes frequently rely on stale, outdated cost assumptions. Realizing the potential of a lower cost, lower risk resource mix requires planners to use up-to-date, market-based information on resource costs and account for uncertainty by evaluating whether a plan will reduce costs and risks even if the future turns out differently than expected. Transparent planning processes and opportunities for input from outside groups is crucial[3] to ensure utilities use the most accurate planning assumptions.

Better regional integration

Utilities often plan systems as if they were an island, overlooking potential benefits of sharing resources with neighbors. More efficient usage includes taking advantage of existing transmission between neighboring states and utilities, and considering interregional planning to identify opportunities for better integration. In some instances, re-

gional resource adequacy constructs can create a framework for sharing resources over a wide area,[4] and the ability to move power from one part of the grid to another is a critical reliability asset during extreme weather.[5] While our modeling does not assume new transmission is built to facilitate region-wide sharing, it does assume existing transfer capability between regions is utilized effectively to reduce costs and meet grid reliability needs.

Link planning with competitive procurement

Planning is intricately linked with procurement, and competitive procurement approaches can lower customer costs and risks. Where resource planning is overseen by state utility regulators, concluded plans lead utility procurement as necessary. This involves advancing utility-built proposals to regulators for approval, or issuing a request for proposals (RFP), where third parties can submit their costs to meet the utility's needs.

In many cases, an RFP is technology-specific – for instance, a utility might only consider a combined cycle gas plant rather than letting all resources compete to meet the utility's capacity and energy needs. Since planning assumptions can be incomplete or outdated, this approach often precludes better and cheaper resource options.

Some states have changed this structure so all sources can compete to supply utility needs, frequently called all-source procurement.[6] For example, Colorado has an iterative planning and procurement cycle: Planning determines system need, then utilities solicit price bids from all providers to inform final resource selection with real market costs. This process is often conducted under the supervision of a third-party evaluator, with clear RFP requirements, transparent evaluation criteria and RFP results.

Enable customer-driven procurement

Customers can also directly drive clean energy development. For years, large electricity customers have signed long-term power purchase agreements with new clean energy projects to offset their grid power consumption. These corporate power purchase agreements have driven clean energy investment but were typically limited to markets where generators compete to provide energy to a wholesale market. More recently, large data center customers have pioneered new approaches to buy power through their utilities from specific projects, paying the full cost of those new resources while being credited for the capacity and energy those resources provide.

In Nevada, Google and NV Energy established a Clean Transition Tariff, enabling large customers to be directly supplied by specific clean energy projects.[i] Similar mechanisms have recently been proposed or approved in Colorado, Georgia, Kansas, Minnesota, Missouri, and other states.

In competitive markets with separate generation and retail electricity service, retail utilities often purchase electricity as a commodity in a wholesale market. Here, the barrier to procurement is the cost and burden of connecting to the grid. While retail utilities have significant opportunities to enter long-term contracts with clean energy projects that save money and provide stable pricing for customers, access to these benefits to keep pace with large load additions requires rethinking how we build low-cost resources quickly and efficiently connect them to the grid.

Reduce barriers to building new resources

Significant barriers can slow down energy projects and increase costs, particularly the interconnection queue and state and local permitting barriers – even for renewable projects that are already planned and in progress. Fortunately, several approaches can surmount these barriers.

Faster and more predictable interconnection

Interconnecting new resources often takes years and has become increasingly expensive as network upgrades to bring projects online have become more onerous. Tackling the interconnection queue is key to bringing more low-cost energy projects online. Jurisdiction over interconnection falls to transmission operators (TOs) under federal oversight. Some transmission operators are part of vertically integrated monopoly utilities and set their own interconnection processes. Most other TOs have delegated this to regional transmission organizations and regional markets.

Pushing grid operator reforms can help expedite the process. The Federal Energy Regulatory Commission's Order 2023 made important reforms to the interconnection process, including implementing timelines and grouping projects into clusters.[7] However, additional reforms are needed, particularly around the study process required to determine what grid upgrades are necessary. These studies' assumptions can be overly conservative and take years. Simplifying and automating the interconnection study process can help reduce these barriers, and several grid operators are working to identify opportunities for automation and more efficient processes.[8] More systemic changes to the interconnection process could unlock much greater benefits.

To improve the study process, policymakers should push for a fast track that lets projects connect to the grid with certain curtailment requirements when the grid can't accept power, also known as "connect-and-manage." Doing so could get projects online faster while sending clear economic signals to transmission owners about grid needs. Connect-and-manage interconnection is most common in Texas, but other regions have an "energy resource interconnection service" (ERIS) meant to serve a similar purpose. Reforming ERIS processes to reduce study timelines can help regions bring new resources online faster while grid upgrades are completed to ensure power can be delivered across the grid under all grid conditions.[9] Surplus interconnection, ex-

plored later in this report, is another important strategy to accelerate projects that can use existing interconnection infrastructure.

Proactive transmission planning is also key to faster resource interconnection – while this study assumes no new major transmission lines are built between now and 2030, building new transmission is key to meeting long-term load growth. States can facilitate development of new transmission lines by creating a "state transmission authority" to help identify needs, coordinate with state and regional stakeholders, and even help finance lines in the state's interest, similar to approaches in Colorado and New Mexico.

State and local permitting

State and local level permitting environments are varied, complex, and can be challenging even in states working to advance clean energy. Moratoriums on solar and especially wind have proliferated, with 24 percent of U.S. counties having some kind of restriction on them at the end of 2025.[10] States can help address this challenge several ways, including legislation requiring common sense rules around permitting giving landowners the freedom to make their own choices about renewable energy projects.[11]

Other potential changes to state and local permitting include implementing permit-by-rule schemes for renewables that automatically permit projects meeting specified requirements, for instance low-impact projects on brownfield sites. Helping projects navigate state and local permitting processes by creating one-stop-shops for permitting to combine multiple permits into one, and properly resourcing the entities responsible for reviewing and approving permits, can further cut red tape for new resources.[12] States like New Jersey, New York, and Oregon have accelerated permitting for clean energy to help projects pass approval in time to "commence construction".[13]

Local community incentives

Improving permitting and interconnection can decrease project timelines and costs, but providing incentives can be an important tool to build real community support. Clean energy project developers can offer community dividend funds or even provide utility bill credits for communities hosting energy projects. To further reduce community impact, states, counties, and cities can identify previously disturbed lands like brownfields then create additional incentives or smoother permitting for projects on those lands.

Other community support includes workforce development programs to train residents in clean energy industries, ensuring economic development benefits flow directly to residents. In states that have reduced property taxes for clean energy, leaders could create a fund to backfill property tax revenue for communities that host projects can ensure those cities and towns can meet local tax revenue needs.

Encourage better fuel risk management

Fuel prices are volatile, and our analysis shows clean energy protects customers from fuel price spikes. Fuel costs and wholesale electricity prices linked to fuel costs are often directly passed through to customers, meaning utilities and power plant owners rarely have incentives to reduce the risk of high fuel costs.

Several approaches can address this issue. As mentioned above, planning processes can be an important venue for regulators to scrutinize how a utility's plan performs when fuel prices are high, and how fuel price spikes impact customers. But this does little to change the actual incentive problem at play – utilities and power producers must bear some burden when prices differ significantly from expectations.[14]

Fuel cost sharing is a more systematic approach.[15] This creates a framework where a utility can recover fuel costs if they remain in a normal range, but when prices spike significantly more than expected, utilities cannot recover the full amount from customers. Instead, higher prices reduce utility profits, incentivizing utilities to manage high fuel cost exposure. In the long run, this incentive can also shape planning and investment decisions from utilities by placing a value on resources that protect customers from volatile fuel prices, including clean energy and storage with no fuel costs.

Get more out of the existing grid

The most significant barrier to quickly building renewable energy projects is the interconnection queue. The number of projects in interconnection queues has more than doubled since 2019, for myriad reasons, meaning projects cannot connect to the grid without long study periods and expensive upgrades. Reforming the interconnection queue is an important part of getting projects online faster, but in the meantime, several strategies can better utilize the existing grid and access additional transmission capacity while waiting for long-term upgrades. Getting more out of the existing grid also helps reduce electricity prices by spreading fixed costs out over a greater quantity of electricity sold.

Grid utilization

The first approach to getting more out of the grid is simple – create requirements to measure and improve grid utilization. Grid utilization is a capacity factor for the grid – what percentage of the total system's capacity is delivered as energy in a given time period, where system capacity includes generation, transmission, and distribution capacity. Much of the grid's capacity is built for a few extreme hours or held as backup for rare equipment failures. A recent Brattle Group report found the average U.S. generator fleet utilization is around 50 percent while a Western U.S. study found even during peak demand times, transmission system utilization remained between 18 and 52 percent.[16,17]

This means a few specific constraints are holding back the system, with significant potential to make better use of what we already have.

An emerging approach to increasing grid utilization is simply requiring utilities to measure and set targets to increase their grid utilization, by whatever strategies are cheapest for consumers. This approach is being pioneered in Virginia, where a 2026 bill requires utilities to report specifically on distribution grid utilization data, including the ratio of peak system load to capacity, and the rate of delivered load to capacity. Utilities must also propose programs to help increase grid utilization.[18] While studying grid utilization and proposing programs to increase it is a good start, the next step is aligning utility incentives around increasing utilization of existing infrastructure, using spare capacity when it is available. This could be done by using performance-based ratemaking approaches that tie utility returns to achieving certain utilization metrics

Surplus interconnection

Beyond aiming to broadly increase grid utilization, several specific techniques can better use existing infrastructure. The first is surplus interconnection, which is using already existing grid interconnections to connect additional resources. Since the existing generator fleet is only used 50 percent of the time on average, existing interconnections are not always at capacity.

This is often a good thing – the most expensive power plants should only be used when they are really needed. But it also means the rest of the time, a cheaper source of power nearby could use the same unused wires to provide electricity. This is an especially good fit at gas peaker plants that only run a small fraction of the year, or solar or wind projects that lack battery storage. Surplus interconnection benefits also include lower cost to interconnect for new generators, reducing overall project costs, and accelerated interconnection time frames which reduces project costs and adds new generation faster.

This process is already in use across the country. Proposals in multiple state legislatures including Indiana, Maryland, and Virginia aim to require utilities to evaluate surplus interconnection opportunities as part of their integrated resource plans. In addition to states, grid operators can also enable surplus interconnection by allowing standard surplus interconnection agreements, proactively identifying sites where surplus interconnection may be an option, and creating a pathway to permanent interconnection rights for resources connecting through surplus.[19]

Enable energy parks

Siting clean energy near new loads helps residents, developers, large energy users, and utilities by reducing the need for new infrastructure while maximizing renewable energy benefits by generating new economic activity beyond the project itself. This "energy park" configuration of siting load and generation in the same area integrates mul-

tiple renewable energy source and storage solutions like batteries, potentially co-located with electricity consumers such as factories or data centers, all connected to the grid.[20] This can speed up development, share costly onsite infrastructure, and directly connect complementary resources.

This version of the "bring your own clean generation" concept is gaining traction as utilities and commissions develop large load tariffs to connect new customers to the grid. Several policies can enable these arrangements, including establishing correct tariff structures, updating interconnection agreements for entities that can consume energy and provide it back to the grid, and clarifying ownership rules for generators within utility territories. Energy parks present huge potential to allow large loads to help pay for the generation needed to bring them online and create additional economic opportunities.

Advanced transmission technologies

Policymakers can also increase capacity from existing wires, which is particularly useful when specific transmission corridors become the limiting factor to get power where it needs to go. These strategies include high performance conductors, or new types of wires that can be used on the same transmission corridors to double the capacity of an existing line, as well as grid enhancing technologies that help grid operators run more current through the same transmission lines. Grid enhancing technologies include dynamic line ratings that allow more current to run through lines in colder temperatures, topology optimization that helps grid operators route current around lines that are at

capacity, and advanced power flow controllers that push current toward less congested routes.

In addition to increasing available transmission capacity, timelines to deploy grid enhancing technologies are significantly shorter than building new transmission due to reduced project scopes and permitting requirements. Reconductoring projects with high-performance conductors can be completed in 18-36 months, and dynamic line ratings can be implemented in two-three months.[21] These technologies can be incentivized multiple ways, and at least 15 states are advancing legislation to require advanced transmission technologies in transmission planning.[22]

Harness the demand side

As demand rises, demand flexibility should play a larger role delivering a lower-cost, more reliable grid. Annual distribution system costs have risen rapidly – doubling over the ten-year period between 2013 and 2023[23] – even as generation costs have decreased with reduced coal use and increased renewable energy. With inflation rampant in the power sector, especially for distribution infrastructure,[24] policymakers can hedge against rising prices by embracing demand-side resources.

The prevalence of energy resources sited at homes and in communities has risen as technology prices drop and opportunities for customers to save money proliferate. The potential for demand-side resources or distributed energy technologies (DERs) has been estimated to be around 80-160 gigawatts (GW) during peak times by 2030[25]. This requires preparing the distribution system for DERs and properly considering how DERs can contribute to the distribution system during planning processes, incentivizing increased uptake of DERs, and helping connect them to the grid faster.

DERs have historically been challenging to incorporate into utility planning processes because utilities have strong incentives to build and own large-scale generation. But fast-growing demand and limits on large-scale generator deployment have created new urgency around incorporating DERs. Because distribution level resources typically fall squarely into state and local jurisdiction, they present significant opportunity for state policymakers.

Distribution planning

Integrated resource planning has long been used to help utilities evaluate the cheapest future generation portfolio, but distribution planning is a newer practice. Increased electric appliance use and an aging distribution system that needs significant upgrade and repair makes distribution planning more important than ever. Good distribution planning can ensure DERs come online without delay while also finding strategic locations where grid upgrades can be deferred or avoided by adding DERs like batteries.[26] 22 states have implemented integrated distribution system planning processes, includ-

ing Minnesota, New Mexico, Oregon, and Pennsylvania,[27] and some have combined this planning process with generation and transmission planning to create integrated system plans to optimize costs across the electric grid.

Several states are pursuing distributed capacity procurements, which allows utilities to plan, deploy, and manage distributed front-of-the-meter resources like batteries. Minnesota is implementing a distributed capacity procurement model that would allow the utility to own and operate these resources.[28] Similar models could allow third-party ownership of DERs through the procurement process. These models integrate DERs as a core part of utility procurement, and could become national models, particularly if expanded to defer distribution costs

Permitting

Distributed solar and storage in the U.S. are significantly more expensive than in many other countries, including Australia and Germany. This is largely due to "soft costs" including permitting and customer acquisition, while the cost of the actual technology is very similar – cutting red tape can significantly reduce consumer DER costs.

Standardized permitting across localities and online permitting tools like the National Laboratory of the Rockies'[29] SolarAPP+ could accelerate permitting processes. Permit Power found reducing soft costs could add nearly 200 GW of solar and nearly 50 GW of batteries at the residential scale, saving $245 billion in electricity system costs by 2040. Additional DER permitting reforms include remote inspection protocols to approve permits via submitted photos instead of in-person inspectors and automatic interconnection approvals for projects that meet standards like using smart inverters and technical screening requirements.[30]

Incentivizing flexibility

Flexibility is key to reducing costs. Research shows large electricity consumers decreasing electricity use during just a few peak hours of the year can significantly reduce electricity costs for the overall grid.[31] Pricing that encourages flexible loads to behave in a grid-friendly way, or requiring flexibility in order to interconnect faster are two ways to ensure large loads contribute to flexibility. In addition to flexible pricing, tying performance around DER connections to utility returns via performance-based ratemaking strategies can also help connect these resources.[32]

Flexible interconnection

Like transmission-connected generator interconnection queues, DERs including generation and loads can face long lead times to connect to the grid. These lead times mirror those at the transmission level because they are often due to a lack of capacity on the distribution grid. However, utilization on the distribution grid is often significantly

lower than that on the transmission grid, meaning capacity is typically available most times even on congested grids. A flexible interconnection allows a new generator or load to connect, with the caveat they can't deliver energy back to the grid (or pull from the grid) during specific hours of the year.[33] By implementing flexible interconnections, the United Kingdom was able to reduce DER interconnection times by up to five years compared to business-as-usual.[34] U.S. utilities are implementing flexible interconnection, including PG&E and SCE in California and Avangrid and ConEd in New York as a key strategy to quickly help new loads access the grid.[35]

Encourage virtual power plants

While planning, permitting, and interconnection can all accelerate DER deployment, coordinating them to provide energy, capacity, and ancillary services on demand creates true value. Creating the right incentive structures and programs for utilities to incorporate distributed capacity into their planning and operations can help reduce the number of centralized power plants that need to be built. Different strategies can promote virtual power plants, including updating wholesale market rules to enable easier access to wholesale markets for DER aggregation resources, incorporating planning strategies like distributed capacity procurements for utilities, and including virtual power plants as a part of integrated resource planning.

CONCLUSION

Utilities are deciding now what will be built to meet growing demand in the next five years. Our analysis looks toward the 2030 window so that policy recommendations can be integrated into the utility planning, permitting, and procurement processes.

These six types of policy actions detailed here flow from one another, creating a coherent framework of short- and long-term actions to help expand the grid now while setting up lasting success. Setting goals, then planning, procuring, and building clean energy resources is the most comprehensive way to ensure U.S. electricity consumers get the best possible electricity price.

Getting the most out of existing grid resources and harnessing the demand-side can provide near-term relief to rising rates and protect against future uncertainty. Underlying it all is ensuring utilities, not just customers, bear some risk for future fuel price spikes, creating the structural incentives needed to protect against global uncertainties and promote energy security at home.

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