MARKET PERSPECTIVE:

Evaluating the Cost of a Net-Zero Future

Bloomenergy®
What Powers You

Introduction

Today's markets are more volatile than ever.

The past three years have seen mounting challenges compound on a global scale – from the ongoing COVID-19 pandemic and supply chain disruptions, to fuel shortages, energy security issues, and extreme weather events – raising the stakes within an already complex purchasing environment.

The immediate, massive price surges we've seen in recent months are due in part to the supply shortages and sharply rising inflation stemming from recent geopolitical turmoil, however, this is a notable short-term increase that underpins a set of larger trends already in motion.

Demands of our digital economy coupled with the escalating consequences of our changing climate have created an unprecedented risk landscape. Energy challenges are on the rise and pressure is mounting for our electric system to get cleaner, faster.

This market perspective discusses what utilities face in this critical period of transition and the compounding market forces that have and will continue to impact customer utility rates for the foreseeable future.

Contents

How Rates Are Set

Ratemaking is grounded in the fact that utilities operate under a unique business model due to providing an essential service to society at large. They are natural monopolies that warrant regulation by state, federal, and local agencies.

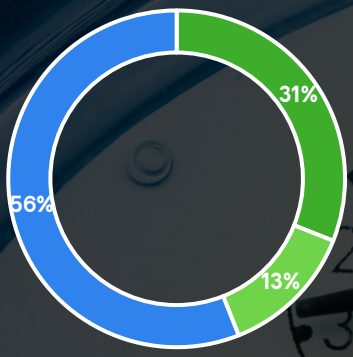
While the Federal Energy Regulatory Commission (FERC) exercises authority over interstate wholesale electricity transactions and oversees the reliability standards for the bulk power system, ratemaking is typically carried out through a state regulatory body, such as a public utilities commission (PUC).

There are many factors that influence electricity prices, but they generally reflect the cost to build, finance, operate, and maintain grid infrastructure. Regulators use a cost-of-service approach to determine a fair price, reflecting the total amount that must be collected in rates for the utility to recover its costs and earn a reasonable return.

Revenue requirements – the total amount of money a utility must collect from customers to pay all operating and capital costs – are set through the rate case process where utilities apply for their spending and profits through formal proceeding. Customer rates are then calculated based on the revenue requirement divided by sales of electricity.

The security of this regulatory model means that revenues are guaranteed each year, no matter how much electricity is sold. If utilities are selling fewer kilowatt hours, then they need to raise the cost of each kilowatt hour to hit revenue targets.

What goes into electric rates?



Supply

Prices determined by supply and demand in the wholesale market

56%

Generation

- Fuel prices
- Pollution controls
- RPS mandates
- Long -term planning

Delivery

Prices determined by investments and ongoing expenses, approved by regulators

31%

Distribution

- Line & pole work
- Storm hardening
- Grid modernization
- Losses

13%

Transmission

- Maintenance & repair
- Storm prevention
- Renewable integration
- Losses

If a utility feels it needs to raise its prices, they must do so by filing a rate case, whereby the state's PUC presides over hearings and determines an outcome. Rate cases are filed for numerous reasons, but the main driver of recent activity is capital expenditure. Aside from pandemic-related impacts, increased costs associated with environmental compliance, generation, transmission and distribution infrastructure upgrades and expansion, renewable mandates, climate disaster mitigation and recovery, and cybersecurity measures are actively contributing to rate case decisions.

Amid 2020's challenging economic landscape, utilities and state commissions found creative ways to limit the immediate impact of rate hikes. However, 2021 saw the highest combined increase[1] in electric and gas rate relief requests since the early 1980's. The sheer size of adjustments needed is so large, its impact on rates will be significant and felt by customers for the foreseeable future.

Market Forces Impacting Utility Rates

The necessary investments to strengthen the system and facilitate a clean energy transition are recoverable in customer rates. Customers have seen significant, sustained rate increases over time as these various market forces drive utilities to spend more money on repair, maintenance, hardening, and modernizing of their infrastructure.

1 Facing a new age of extreme weather

Wildfires, winter storms, flooding, hurricanes – nearly every geographic region across the nation is subjected to the new reality of extreme weather. U.S. grid outages have increased 60% over the past decade. These escalating events are causing frequent damage to our electric system, costing Americans and the economy billions each year.

2021 was yet another year of frequent and costly extremes. In the U.S. alone, there were 20 climate-related disasters with losses exceeding $1 billion each – second only to 2020, which experienced 22 separate billion-dollar disasters.[2] The rising frequency and intensity of these events in recent years underscores a critical need for greater grid resilience and has prompted utilities to spend significantly more money on hardening plans that mitigate future risk.

SPOTLIGHT

California: Harbinger for the Nation's New Normal

California, a state that has made tremendous progress towards achieving its ambitious decarbonization goals, found itself in an unprecedented situation last year when extreme compounding weather conditions caused sudden and severe energy shortages, forcing it into a state of energy crisis. The state severely underestimated the critical ability of natural gas generators to provide dispatchable power to balance out the intermittent nature of renewables.

A formal emergency proclamation, declared by Governor Newsom in July 2021, documented drastic measures that must be taken to secure sufficient capacity needed to avert catastrophic blackouts. The state suspended many standard environmental permitting rules and asked customers with diesel generators to run them – clear steps backwards for a state at the precipice of its clean energy transition.

2 Overcoming intermittency at scale

The cornerstone of the clean energy transition has undoubtedly been renewable resources. Climate progress across the nation has been enabled by increasingly low-cost solar and wind power. Yet, California's emergency order shed light on a very real predicament: how to manage the growing conflict between zero carbon aspirations and the physical realities that renewables thus far haven't been able to cover power shortfalls intensified by the reduction of dispatchable capacity resulting from natural gas plant shutdowns.

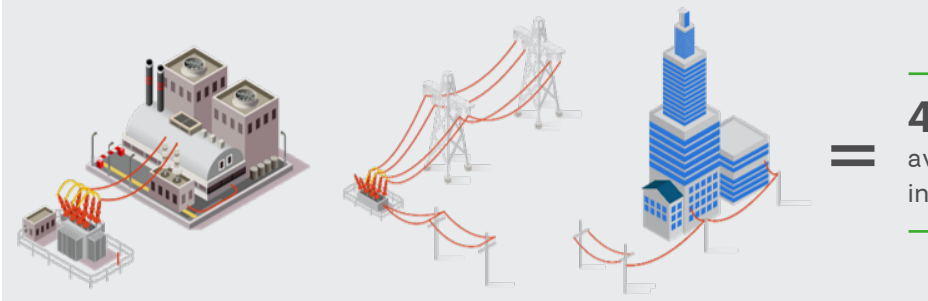
Renewable technologies are great for their zero-carbon profile but due to their inherent intermittencies, cannot practically solve reliability challenges. Their very nature requires some sort of energy storage and today's technology does not cost effectively support the massive load shifts from day to night, and certainly not from summer to winter. What's more, transmission and distribution infrastructure, upon which utility-scale wind and solar generation rely, has been at the center of grid hardening efforts in this new age of extreme weather.



3 Upgrading an aging bulk power system

The grid is a complex patchwork system of regional and local power plants, transmission and distribution lines and transformers that have widely varying ages, conditions, and capacities. Such infrastructure design created cascading vulnerabilities whereby a failure of any one component can result in disruption of service to end users.

In its last infrastructure review in 2015, the U.S. Department of Energy reported that 70% of transmission lines and large power transformers are more than 25 years old, and that the average age of all the installed infrastructure is about 40 years old.[3] For utilities, resilient service requires large-scale investment in infrastructure. Grid hardening plans are underway in every region, but the process is hard, expensive, and takes time to properly execute.



40+ years old
average age of all the installed infrastructure

The latest report from American Society of Civil Engineers (ASCE) found that, based on current trends, the cumulative infrastructure needs to "maintain a state of good repair" across all three major components of the bulk power system (generation, transmission, and distribution) amount to an investment gap of $319 billion through 2039.[4]

A far more sobering outlook comes from the Intergovernmental Panel on Climate Change's latest report on decarbonization pathways, which estimates that investments to facilitate the global electricity sector's low-carbon transition with no or limited overshoot would require approximately $2.3 trillion per year from 2023 to 2052.[5]

4 Accelerating the transition to net-zero

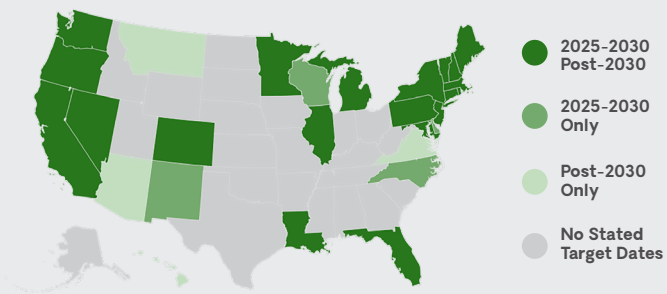
Key players across the energy sector are working to align on a strategy that accelerates the transition to net-zero. A modernized, decarbonized power system must be able to accommodate huge surges in demand resulting from increased electrification and widespread EV adoption, while safeguarding against the reliability, resiliency, and capacity issues stemming from increased dependence on renewables.

In the U.S., states that have been driving increasingly aggressive renewable targets have been joined by a renewed federal effort to address climate change. The Biden administration aims to achieve a 65% reduction in greenhouse gas emissions by 2030 and reach net-zero emissions by 2050. The scale of commitment is unprecedented – the contributions that renewables are poised to make will have major implications for the structure of tomorrow's net-zero system.

Efforts to achieve these targets are already increasing the costs of transmission projects to bring remote renewables to customers, however, transitioning to a fully decarbonized economy will require significantly more money than what is being allocated now.

Federal GAG Reduction Target Dates

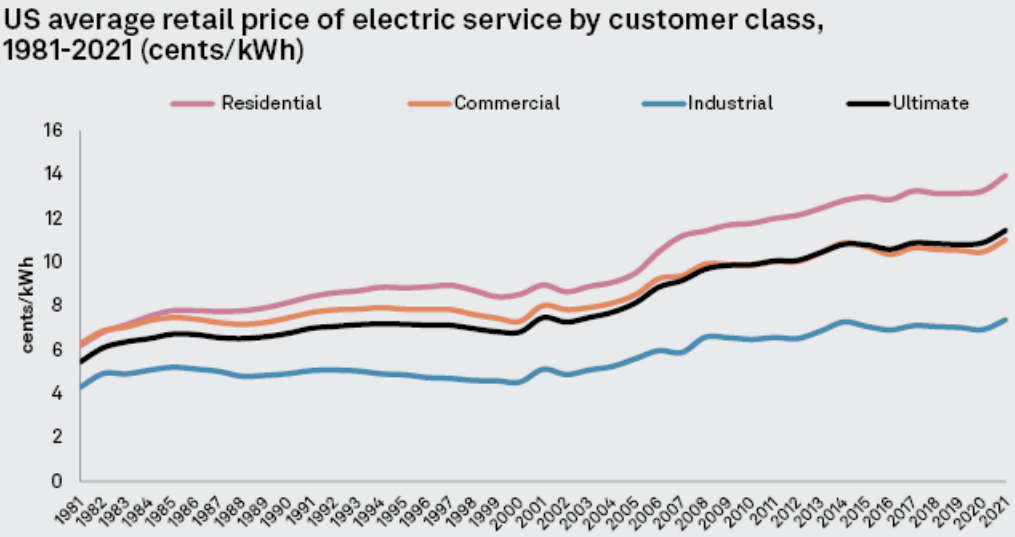
U.S. States with GHG Reduction Target Dates



Source: https://ccci/berkeley edu/states-climate-action-map

Shaping the Outlook

While electricity prices vary widely based on geography and customer class, the 2021 overall electric price at the ultimate customer level rose 5.24% on a nominal basis, or 1.1% on a real basis. The higher real price marked the first time in three years that real prices had grown on an aggregate basis.[6]



Balancing major spend while sustaining affordable rates is more challenging as Investor-Owned Utilities (IOU) rate bases grow. In California, the rate bases of all three IOUs are increasing – growth that is primarily driven by rising T&D investment associated with its expanding renewables portfolio as well as increasing levels of wildfire mitigation spend.

Southern California Edison's (SCE) latest request – characterized as a "bridge funding" proceeding associated with its 2021 general rate case – seeks a rate recovery of $971 million to "provide the company with an appropriate and necessary forecast revenue requirement for 2024."

The company indicated that in addition to wildfire mitigation work driving the increase, the impact of "historic inflation has materially increased many elements of its cost of service", stating that this factor alone represented $578 million of the rate request.

Baseline total incremental revenue requirement resulting from wildfire costs between 2021 and 2030 for each of these IOUs, estimated by the CPUC,[7] are as follows:

$20.2 B PG&E | **$14.8 B** SCE | **$3.9 B** SDG&E

The Path Forward

Utilities have complex systems they are working to improve and as investment grows, affordability and how that trickles down to the customer cannot go unchecked.

Unlike other goods or services, which customers may forego if prices rise too high, utility services will remain essential and be consumed regardless of price. The facets of our lives that require electricity have expanded considerably such that tomorrow's electricity supply will have to account not only for what powers our homes and businesses, but also for what powers transportation, heating, industrial processes, and the global interconnectivity needs of the future. Investment in this future without the appropriate regulatory guardrails exposes ratepayers to risk. Recognizing this risk is one thing. Having a strategy to mitigate it is another. Doing so requires a deeper understanding of these issues at hand and how to address them from the top down.

Distributed generation has changed the entire paradigm of what is possible as a consumer of electricity. Businesses and communities alike are opening the aperture on their energy strategies as they look to gain more control over energy supply and the costs associated with it.



Bloom Energy's fuel cell technology fills a unique niche, providing a platform for more predictable power. Our technology avoids the vulnerabilities of conventional transmission and distribution by generating around-the-clock power onsite, where the electricity is consumed.

This type of onsite generation is an extremely effective way to eliminate price risk and hedge against rising rates, offsetting the amount of power the utility would be contracted to provide, alleviating capacity constraints, and delivering significant financial value from avoided utility costs. Though we offer multiple purchase options, virtually all our projects are financed and require no upfront capital to engage which is compelling for customers who want to invest their capital in their core business.

Conclusion

Ultimately, utilities are exposed to the same energy landscape and challenges we all are facing. They are on the front line of implementing the requirements necessary to bridge the gap from where we stand today to actualizing tomorrow's vision of a net-zero future. Ratepayers, along with taxpayers and utility investors, will be fundamental in their efforts to do so. Now is the time to make a strategy for diversification. Bring cost, resiliency, and sustainability under your control, while working together with the broader system to address larger challenges.

Endnotes

[1]Amid ongoing virus challenges, 2021 was a year of records in rate case arena. https://www.capitaliq.spglobal.com/web/client?auth=inherit#news/article?KeyProductLinkType=2&id=68401211

[2]NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2022). https://www.ncei.noaa.gov/access/billions/, DOI: 10.25921/stkw-7w73

[3]Quadrennial Technology Review 2015. https://www.energy.gov/sites/prod/files/2015/09/f26/QTR2015-3F-Transmission-and-Distribution_1.pdf

[4]Failure to Act: Economic Impacts of Status Quo Investment Across Infrastructure Systems. https://infrastructurereportcard.org/wp-content/uploads/2021/03/FTA_Econ_Impacts_Status_Quo.pdf

[5]Climate Change 2022: Mitigation of Climate Change. https://report.ipcc.ch/ar6wg3/pdf/IPCC_AR6_WGIII_FinalDraft_FullReport.pdf

[6]US retail electric prices rose markedly in 2021, may repeat in 2022. https://www.capitaliq.spglobal.com/web/client?auth=inherit#news/article?id=70163423&KeyProductLinkType=14&utm_campaign=top_news_3&utm_medium=top_news&utm_source=news_home

[7]Utility Costs and Affordability of the Grid of the Future. https://www.cpuc.ca.gov/-/media/cpuc-website/divisions/office-of-governmental-affairs-division/reports/2021/senate-bill-695-report-2021-and-en-banc-whitepaper_final_04302021.pdf

About Bloom Energy

Bloom Energy has been at the forefront of the energy sector since its inception, working to offer better alternatives to energy generation and delivery for nearly two decades. The versatility of its core solid oxide platform creates distinct advantages that enable applications across the entire energy value chain.

From its unparalleled history of innovation to its scale, experience, and continued cost improvements, Bloom Energy is positioned to deliver the greatest value and provide the solutions needed to propel its customers towards a better energy future. For more information, visit www.bloomenergy.com

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Accelerate your path to a net-zero future.

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