Technical Briefing | San Diego Workshop

In the U.S., over 3,000 utilities serve roughly 140 million customers in 50 states with different regulatory, political, and geographic landscapes. This U.S. Department of Energy (DOE) ***Voices of Experience | Decarbonization Strategies and Grid Planning*** workshop was held on May 1, 2024, in San Diego, California. It allowed the 26 participants representing 12 electric utilities to discuss their insights and challenges as they grapple with balancing climate goals with affordability and the often changing state and local policies that shape their strategies. **Learn more about upcoming workshops and the Decarbonization Strategies and Grid Planning Series on energy.gov.**

Cost Implications and Rate Impacts of Utility Decarbonization

"Navigating regulatory and policy landscapes is increasingly complex and affects strategic decisions."
— Samantha Pate, San Diego Gas & Electric (SDG&E)

One of the challenges utilities face in meeting their clean energy goals is balancing the large investments in new technologies, customer programs, and necessary grid upgrades with the impact these investments will have on customer rates. The rate customers pay for electricity includes the various costs of generating and delivering power to the end user, plus other costs such as certain customer programs and a rate of return on grid investments. The policies that determine the rate design are largely determined by each state's public utility commission for investor-owned utilities (IOUs), city councils and voters for municipal utilities, and boards of directors for cooperatives. Each state's combination of political climate, electricity rates, policies, and resource availability determine how the utilities operating in each state approach decarbonization, the strategies that can be used, investments that can be made, and how the utilities can recoup the cost of those investments. Navigating changing—and sometimes conflicting—state and local policies and politics is becoming increasingly complex for utilities.

Key Takeaways

- ➔ **State and local policies and politics play a crucial role in developing utility decarbonization strategies**. Some states require least- or lowest-cost resource planning, whereas others take a more holistic view of energy systems and require utilities to include externalities such as carbon reduction and resilience. This is further complicated by state and local policies that may include mandates on resilience, public safety, or equity or incorporating the social cost of carbon in resource planning.
- ➔ **Utility grid planning sometimes requires navigating polarized political climates.** Utilities have adapted their strategies and resource plans in response to sometimes dramatic changes in regulatory commission priorities for balancing decarbonization goals with economic feasibility and grid stability.
- ➔ **Transparency and communication regarding the drivers of cost and rate increases is important.** This includes technology investments, grid updates, and the value of decarbonization

initiatives. Some utilities are exploring rate designs that balance cost recovery and clean energy incentives with equity, addressing debates around subsidy models and the fairness of funding mechanisms.

- ➔ **The environmental value of distributed solar diminishes as the grid becomes greener.** Tariffs originally designed to jump-start the rooftop solar market now present challenges for maintaining equitable and effective incentive programs in areas with high solar adoption.
- ➔ **Like the telecom industry, the utility industry may move toward value-based and fixed-cost rate structures.** Just as telecom customers no longer pay for long-distance minutes but for the quality and value of service, the utility sector is considering rate designs that reflect the value of electricity service rather than solely measuring consumption—making way for new pricing structures.

Policies, Politics, and Decarbonization

"It's a highly political and very charged environment." — Lynne Peterson, Tucson Electric Power (TEP)

State and local policies and politics tend to drive long-term resource planning decisions, and political shifts can significantly impact regulatory frameworks and decarbonization strategies. One example was the political shift in Arizona's Commission in 2022, which led IOUs to revise their integrated resource plans (IRPs) to extend coal usage and increase natural gas generation to avoid sharp increases in customer rates. In California, on the other hand, Senate Bill 100 mandates comprehensive renewable procurement and energy efficiency to reach 100% carbon-free electricity by 2045. This requires significant increases in clean energy production—primarily because of transportation electrification—that will increase consumer rates.

Senior Customer Relationship Manager at TEP Lynne Peterson shared that utilities work in a highly political environment. Samantha Pate, Director of Customer Pricing at SDG&E, echoed this sentiment, adding that utilities are navigating increasingly complex regulatory and policy landscapes that impact strategic decisions. Pate also noted that policies regarding hardening the grid against wildfire risk and extreme weather have added to their costs. As a result, both utilities stressed the need to be adaptable and prepared to navigate fluctuating climate policy.

What Utilities Are Doing

- ➔ **Adapting integrated resource planning.** Regular IRP updates allow utilities to adapt to rapidly changing market conditions and technological advancements. Senior Director of System Operations and Planning at TEP, Eric Bronner, shared utilities must adapt their IRPs every few years to reflect technological advancements and changing regulatory conditions.
- ➔ **Piloting emerging technology.** TEP noted long-duration battery energy storage holds promise for addressing the intermittency of renewable energy resources and enhancing grid reliability and flexibility but is not yet economic. Regulations and municipal codes must evolve as the technology matures.

- ➔ **Diversifying their resource mix**. Resource portfolios with diverse fuel sources, programs, and technology ensure flexibility and resilience. Participants stressed utilities should avoid overreliance on any single technology or "putting all their eggs in one basket" in their resource planning to mitigate risks associated with regulatory uncertainties.
- ➔ **Developing residential demand response programs.** Utilities are testing and refining their demand response programs to scale and become virtual power plants supporting grid reliability. One participant described her utility as "neophytes in demand response" but was happy with 8,000 thermostats in their program.
- ➔ **Using natural gas as a transitional resource.** Participants also noted natural gas is a necessary part of a broader decarbonization strategy as a transitional energy solution to support grid stability and manage costs.

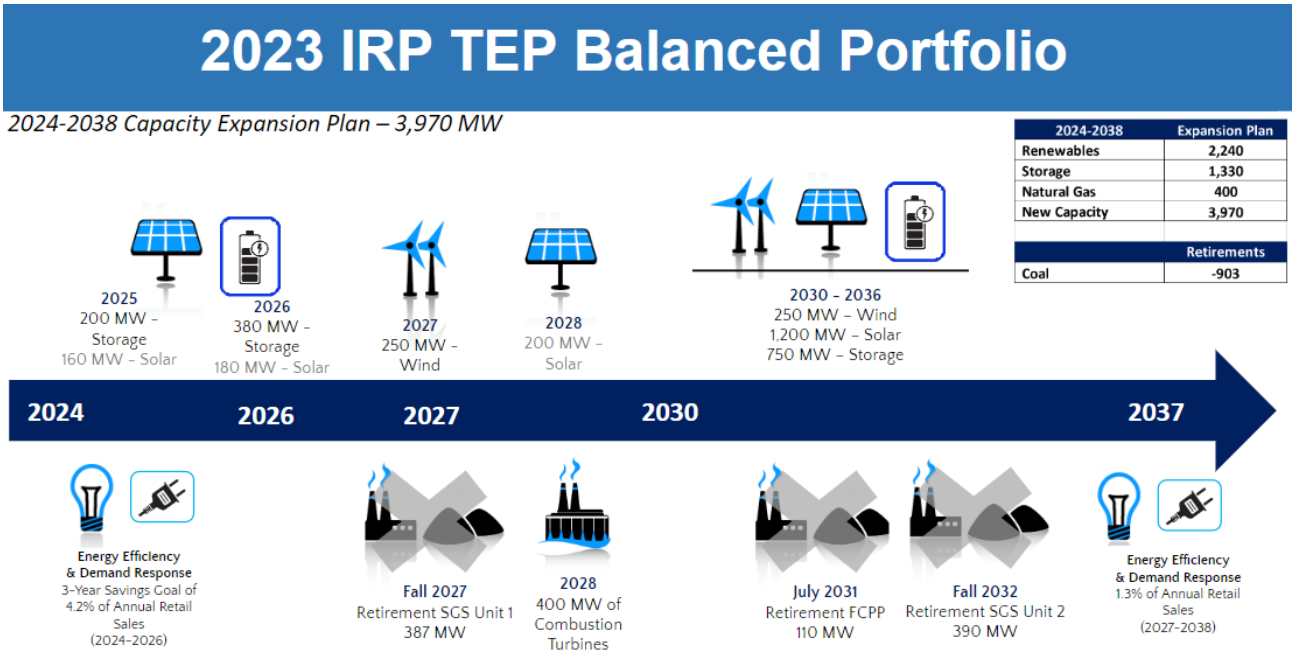

Figure 1. Tucson Electric Power 2023 Integrated Resource Plan
Source: TEP, 2024

"[Diverse resource portfolios] are somewhat analogous to a diversified investment portfolio—individual item performance will vary based on the market, but there's a mix with an optimum expected return. Best value might be achieved with balanced investment in multiple options." — Brad Chadwell, Tennessee Valley Authority.

Sustainability, Affordability, and Equity

"We do affordability by artificially making it affordable for everybody to buy fossil fuel at the expense of the planetary public." — Anonymous workshop participant.

Like other industries, the electric power industry is experiencing rising costs that must be passed on to its customers through rate increases. Providing low-cost power—or *lowest-cost* power—has been a

regulatory mandate and a key driver of economic growth since the industry's inception. However, these economic considerations often conflict with environmental policies. Workshop participants discussed the correlation between the rising cost of electricity and decarbonization but noted it is not the sole driver of rate increases. Necessary climate adaptation investments such as grid hardening against extreme weather and wildfire mitigation efforts also contribute to rising costs.

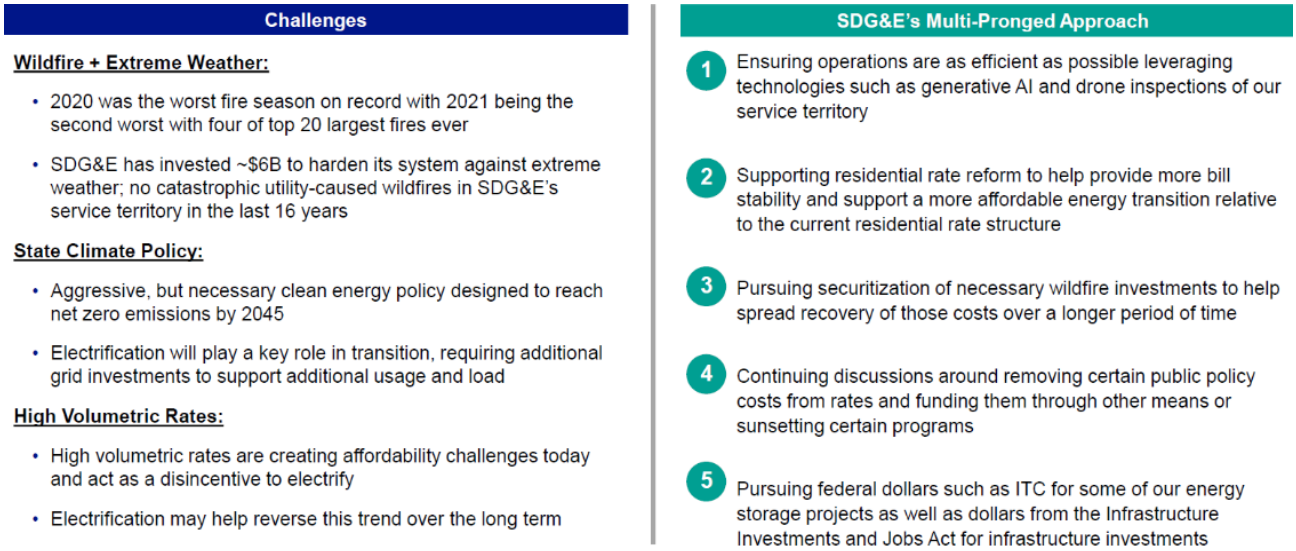

Figure 2. Challenges and Approaches for SDG&E's Path to Net Zero
Source: SDG&E, 2024

Rising costs are especially difficult for customers with already high energy burdens, leading to discussions around affordability, equity, and subsidization policies. State and local policies that influence subsidy models—or prohibit subsidization altogether—sometimes lead to contentious debates about the fairness and effectiveness of funding mechanisms for energy efficiency and renewable energy initiatives. The debate is not just about subsidizing energy efficiency and bill support programs for low-income customers; there are many examples of incentives to purchase electrification technology, such as electric vehicles (EVs) and installing rooftop solar systems that are effectively only accessible to wealthy households.

Affordability in the context of decarbonization must consider whether it is affordable for individuals or society at large and whether there is an equitable distribution of the costs and benefits. Moving toward best-value frameworks rather than focusing only on the lowest-cost options could support more sustainable and affordable decarbonization strategies, but there is more work to be done.

What Utilities Are Doing

➔ **Investing in new technology and resources to ensure efficient operations.** Utilities across the United States are beginning to hire meteorology and climate impact teams to guide grid planning. They are also investing in new technologies, such as drone cameras, to monitor and detect natural hazard risks such as wildfires.

- **Engaging with disadvantaged communities.** Utilities are tailoring programs to meet the diverse needs of their customer base, including vulnerable populations with high energy burdens. IOUs often engage with community stakeholders during formal and informal proceedings to better understand their needs and the potential impact of investment decisions.
- **Supporting rate reform to provide more bill stability and lower energy burdens for vulnerable populations.** Sacramento Municipal Utility District (SMUD)—referred to by participants as the "gold standard" for rate design—is working to develop billing methods to recover decarbonization costs, such as surcharges for efficiency programs.
- **Pursuing securitization of some investments to help spread cost recovery over longer periods to lessen rate impacts.** In May 2024, the California Public Utilities Commission approved a new billing structure that will allow utilities to charge a fixed monthly rate to customers to keep rates more affordable as the utilities continue to harden grids against severe weather and to facilitate the clean energy transition.
- **Pursuing federal money such as investment tax credits and programs funded through the Infrastructure and Jobs Act.** Utility participants cited the U.S. Department of Energy (DOE) Grid Resilience Innovation Program (GRIP) and Energy Improvements in Rural and Remote Areas (ERA) as two programs supporting utilities in de-risking innovative grid investments.

Solar, Externalities, and the Value of Service

"The environmental value of solar actually declines over time as the underlying utility system gets more decarbonized." — Bryan Hannegan, Holy Cross Energy.

Incentives for residential customers to purchase rooftop solar PV systems have been an important strategy to increase the adoption of distributed solar energy. However, as the grid becomes greener, the environmental value of distributed solar diminishes because it no longer replaces fossil-fueled generation. According to NC Clean Technology Energy Center DSIRE Insight's 50 States of Decarbonization, 56% of electricity generated in California came from carbon-free resources in 2023. The largest contributor to this mix was solar, meaning residential rooftop solar photovoltaic (PV) systems are increasingly providing less carbon reduction by displacing the grid's electric generation mix. In addition, tariffs originally designed to jump-start the rooftop solar market present challenges for maintaining equitable and effective incentive programs in areas with high solar adoption. There is also recognition that the absence of sunset dates for net metering policies has led to public favoritism toward rooftop solar despite its impacts on nonparticipating ratepayers and grid stability. One utility participant pointed out that people with rooftop solar don't want to pay for their grid services because we [the utility] failed to communicate what was happening in that process. In addition, the significant variation in payback periods for rooftop solar PV across different states underscores the economic implications of policy and rate differences. It indicates a need for more consistent and equitable approaches to incentivizing renewable energy adoption.

Incorporating Externalities into Utility Planning and Ratemaking. Utilities are increasingly asked to balance hard costs with qualitative considerations such as equity, resilience, and environmental impacts in their resource plans. They are also debating whether current rate designs sufficiently address the cost

of the externalities related to decarbonization. Though affordability remains at the forefront, sustainability, equity, and resiliency considerations are starting to impact policy development—and are difficult to quantify. Colorado, for example, has legislation that requires IOUs (i.e., Xcel Energy) to include the societal cost of carbon in their electric resource plans. The Colorado legislation uses the Interagency Working Group's valuation of $43 per ton in 2022, increasing to $69 per ton in 2050. (Other published valuations and online calculators can be used to assign a value to carbon.) Even with its range of values, including a carbon cost in a resource plan will impact what is considered the least-cost option. Developing methodologies to quantify the costs and benefits of externalities could facilitate more holistic and equitable energy planning.

What Is the Social Cost of Carbon?

> The social cost of carbon (SCC) is an estimate, in dollars, of the economic damage that would result from emitting one additional ton of carbon dioxide into the atmosphere. The SCC puts the effects of climate change into economic terms to help policymakers and other decision-makers understand the economic impacts of decisions that would increase or decrease emissions. The SCC is currently used by local, state, and federal governments to inform billions of dollars of policy and investment decisions in the United States and abroad. [Resources of the Future]

Shifting to Value-Based Ratemaking and Regulation. When the telecommunication industry deregulated, landlines and long-distance minutes were replaced by pricing that reflected the value of service. Innovation and customer-centric business models led to the wireless services we have today. Would deregulation spark similar innovation in the electric power industry? When we asked the workshop participants, there were plenty of ideas about innovations and services that could accelerate their decarbonization efforts, especially using different pricing models that better reflect customer preferences.

What Utilities Are Doing

- **Evaluating the shift away from volumetric-based rates to value-based and fixed rates.** Value-focused utility pricing could increase power systems' economic and environmental efficiency. A flat rate for electricity is analogous to unlimited data plans in telecom, where customers pay for stability and predictability in billing rather than strictly for consumption. However, the downside is that a flat rate does not incentivize customers to reduce consumption or shift consumption to off-peak hours.
- **Moving toward more customer-centric and flexible service options.** This could enable utilities to adapt more quickly to changes in electricity generation and consumption patterns and design products to better meet customer needs. Customer preferences and value could also drive the evolution of rate structures, allowing utilities to design rate plans that meet specific customer needs—including those of low-income and other vulnerable groups.
- **Considering the proximity of energy generation to load in siting projects rather than solely lowest cost.** This approach considers the broader benefits of local generation, such as reduced transmission losses and increased grid stability, which are crucial for long-term sustainability.

What Is Performance-Based Regulation?

Performance-based regulation (PBR) provides a regulatory framework to connect goals, targets, and measures to utility performance, executive compensation, and investor returns. For some enterprises, PBRs determine utility revenue or shareholder earnings based on specific performance metrics and other noninvestment factors. Noninvestment factors can be particularly important for state-owned utility enterprises, such as providing low-cost service and being responsive to government mandates. For utilities of all types, PBR can strengthen utilities' incentives to deliver value to customers.

(NREL and RAP) PBR has been gaining momentum in U.S. states such as Minnesota, New York, California, and Illinois and is prevalent in the United Kingdom and abroad. Next-Generation Performance-Based Regulation (NREL 2017)

Rates, Fairness, and Communications

"There is a need to better communicate the benefits and complexities of renewable energy and grid modernization to the public." — Samantha Pate, SDG&E.

A rate increase essentially means customers pay more for the same product or service—and no one wants that. However, the telecommunications industry has taught us that customers are willing to pay for additional value, such as the convenience of a mobile phone that can do much more than simply carry your voice.

Customers associate cost increases, expensive grid upgrades, and subsidization with the clean energy transition, and the messages around the benefits of reliability, resilience, and decarbonization sometimes get lost—as do non-generation expenses included in the rate. In California, for example, climate adaptation and wildfire mitigation costs constitute a substantial portion of utility bills, overshadowing the direct costs associated with clean energy policies.

Discussions around rate increases, fairness, and equity can become contentious and polarizing. Communicating rate increases to customers is further complicated by negative public perceptions of some utilities' operations and services from past outages or litigations. Workshop participants stressed transparency around the costs and benefits of maintaining and upgrading infrastructure, which can reduce misunderstandings that lead to resistance to adopting clean technology. Utilities care about their customers' perceptions of rates, fairness, and the value they provide, and communicating the value of decarbonization is key to reaching their goals.

What Utilities Are Doing

- ➔ **Learning to communicate about value and benefits in addition to costs and rate impacts.** SCE's Pathway 2045 and SDG&E's Path to Net Zero campaigns exemplify the hard work necessary to evaluate and communicate how carbon reduction strategies will impact customer

billing and the importance of being transparent about grid investment costs and bill impacts. In addition to renewable energy investments, electric ratepayers in California are experiencing increased rates because of necessary investments in grid hardening, wildfire prevention, and other climate-adaptation-related projects.

- ➔ **Making information about rates and decarbonization goals easily available and understandable to their customers.** SMUD's website is one example of a utility that provides rates and rate design information. They also offer consumer-friendly information, green energy options, and services such as EV charging, rooftop solar, and their Greenergy® program.
- ➔ **Educating consumers about energy choices empowers them to develop and adopt new technologies and sustainable behaviors.** For instance, utilities are educating EV owners about how EV charging affects the grid to influence customers to charge during off-peak times.
- ➔ **Supporting policy changes that align energy prices with their environmental and social impacts.** Policymakers in California have enacted comprehensive renewable energy procurement, energy efficiency, and transportation electrification mandates that are driving many utility initiatives. Similarly, in Colorado, policymakers have targeted aggressive net zero requirements for the building sector, prompting discussions around the evolving components of a customer's "energy wallet." In contrast, regulators in Arizona have been resistant to aggressive decarbonization because of affordability concerns, which has put downward pressure on energy rates compared to other states.

Additional Resources

- ★ Real Reliability: The Value of Virtual Power (Brattle, 2023)
- ★ Analysis of the Incremental Value of Rooftop Community Solar + Storage in California (Brattle, 2023)
- ★ Benefits and Costs of Net Energy Metering in Washington (E3, 2023)
- ★ Integrated Distribution Planning: A Framework for the Future (SEPA, 2020)
- ★ The Path to Net Zero (SDG&E, 2022)
- ★ 100 x 30: Our Guide to 100 (Holy Cross Energy, 2023)
- ★ Pathway 2045 (SCE, 2024)
- ★ Path to Net Zero (SDG&E, 2024)