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Five Trends Energy Utilities Can't Ignore When Preparing for the Future

This is the second installment of Black & Veatch's three-part series exploring strategies deployed by multiple industries that are moving towards greater energy reliability, lower energy costs and a more sustainable future.

Decarbonization reduces (and eventually eliminates) greenhouse gas (GHG) emissions through a range of low-carbon fuel sources, technologies and processes. To put the urgency of decarbonization into perspective: for the United States to achieve just 50% of GHG emissions goals by 2030, industrial emissions would need to fall below 2005 levels.[1] A modernized grid integrates clean distributed energy resources (DERs), helping decarbonize energy across many industries — a necessary strategy to meet these ambitious goals. While we're on the right track, we must implement even more impactful initiatives to protect future generations.

So, what does all this have to do with energy utilities? Virtually every industry plays a role in carbon reduction, but energy plays one of the largest — accounting for 25% of GHG emissions in the United States.[2] Utilities often operate energy generation sources, which represent their "supply" part of the decarbonization equation. For their "demand" part of the equation, utilities make significant impacts with programs that incentivize their residential, commercial and industrial customers to accelerate vehicle and building electrification and renewable technology adoption. Utilities can choose to make renewables a larger part of their generation portfolios, creating a ripple effect as more clean energy is placed on the grid. For both environmental and economic reasons, the energy industry has significantly invested in the transition away from coal (and towards clean alternatives) over the last 10 years; in the United States, coal-fired generation has dropped from 45% to 19%.[3]

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The country's most progressive energy utilities are future-proofing their operations and maintenance processes to offer hyper-reliability for their customers. To achieve this, it's essential for energy utilities to consider the following five trends:

1. DERs disrupt traditional utility planning and operational approaches

DERs are smaller-scale and typically located on-site where the energy is generated as an alternative and dispatchable enhancement to the central power grid. There's a major shift happening where utilities are pivoting from simply serving their customers to embracing them as part of the decarbonization solution. Leveraging customer-owned DERs for grid resiliency requires novel approaches to customer education and engagement. Utilities must also implement strategies to: expand distribution planning and interconnection procedures to speed up DER integration; enable effective optimal operation and control by establishing DER interoperability and asset visibility standards; develop approaches to track and forecast DER load; and offer design-build and operational DER services. Examples of DERs that can be integrated into a decarbonization strategy include rooftop or pole-mounted solar arrays, wind turbines, combined heat and power systems, and battery energy storage systems (BESS). DERs are key elements of a decentralized energy system that is designed to optimize the use of renewable energy, increase overall efficiency, and reduce fossil fuel use and GHG emissions.[4] Decentralization makes utilities (and their customers with DER endpoints) active system participants, fundamentally altering traditional utility planning strategies, operations practices, business models, investments and technology capabilities.

2. Non-wires alternatives offer opportunities to increase grid capacity

With increased electrical loads due to population growth and vehicle electrification, energy utilities need more sources to meet future needs. Non-wires alternatives (NWAs) can reinforce the central power grid with DERs rather than relying on conventional transmission and distribution assets.[5] Federal Energy Regulatory Commission (FERC) Order 2222 is a key regulatory consideration for energy utilities, as it requires regional grid operators to revise their tariffs to include DERs as a market participant category.[6] FERC Order 2222 allows for the aggregation of several sources of distributed electricity to meet minimum size and performance requirements to participate in wholesale markets as generation assets. States where regulators are mandating utilities to identify NWA opportunities as part of their grid modernization initiatives include California, Colorado, Delaware, Hawaii, Maine, Michigan, Minnesota, Nevada, New Hampshire, New York and Rhode Island, in addition to Washington D.C.[7] A benefit of NWAs is that installation typically requires less capital spending than wired infrastructure; for example, utilities can use BESS to reduce peak demand and avoid building new transmission lines. Siting and permitting issues, in addition to the strength of relationships between energy utilities and DER providers, are major determining factors in whether NWA projects graduate from conceptualization to completion; it's up to utilities to proactively address obstacles in the planning stage and maintain these business relationships.

3. Emerging energy technologies require infrastructure upgrades

Diversifying energy resources, rather than relying on a single fuel type that could face disruptions, ensures greater resiliency by reducing outages.[8] The U.S. Department of Energy (DoE) estimates that outages cost the economy $28 billion to $169 billion each year; for example, the February 2021 blackouts in Texas cost the state more than $110 billion. Grid-modernizing infrastructure and capacity upgrades are needed to leverage the resiliency and reliability benefits of DERs and to mitigate power outages. Digital solutions (including smart metering, smart sensors, IoT devices, and remote controls) further enable real-time, automated communications and operations. While it's encouraging to see new technologies emerging to support ongoing resiliency efforts, they cannot be implemented overnight, considering the aging and deteriorating nature of our infrastructure. Fortunately, the Infrastructure Investment and Jobs Act (IIJA) has allotted nearly $65 billion to fund these power and grid upgrades around the country.[9] When making these substantial capital investments, utilities can avoid eventually making assets obsolete by selecting durable, scalable technology and identifying opportunities to transition equipment away from fossil fuels and increase energy efficiency, heat recovery and energy re-use.

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4. Energy prices are increasing at an alarming rate

In 2022, United States electricity prices increased by 14.3% from the previous year — double the overall inflation rate.[10] While energy prices are increasing, grid reliability is decreasing due to extreme weather events. DERs such as microgrids, solar and BESS provide localized resiliency and may allow for more predictable energy costs. Microgrids can disconnect (or "island") and connect to the central power grid as independent entities, allowing the connected loads to continue running during outages.[11] Since microgrids are intended to be installed locally where energy will be consumed, they reduce energy loss in transmission and distribution — increasing delivery efficiency and enabling operational cost savings to potentially offset the initial investment.[12] Although microgrids haven't been widely adopted by energy utilities just yet, interest is growing as customers demand more reliable energy in the face of climate change. Initial installations have been mostly in residential communities and remote areas, but the energy industry is starting to view microgrids as enhanced reliability tools and coordination mechanisms for renewables. As of April 2023, the California Public Utilities Commission (CPUC) implemented a Microgrid Incentive Program (MIP) to build community resilience against power outages; the MIP sets rules for Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas and Electric (SDG&E).[13] The DoE maintains a growing microgrid installation database; there are installations in almost every state, with the majority concentrated in California, Texas and the Northeast.[14] As customers seek lowered costs, access to "green" energy, and increased reliability, utilities have opportunities to market and monetize redundant supply sources (such as conventional generation with renewable backups).

5. Transportation and buildings are becoming electrified

We're seeing electrification across almost every industry, especially in transportation and the built environment. Major funding from the federal Inflation Reduction Act is also accelerating these trends, providing billions of dollars in consumer incentives for electric vehicles (EVs) and making more of those vehicles and their components in the United States.[15] State regulations are also on the rise — in 2020, the CPUC proposed a transportation electrification framework that requires energy utilities to develop long-term plans for infrastructure investments, as the EV load is predicted to increase 10 times by 2030.[16] California is aiming to put five million zero-emission vehicles on the road by 2030, and other states are considering following suit. Referring to both commercial and residential spaces, building electrification is the transition away from fossil fuels to electricity (ideally generated from solar, wind, and other sources). Like transportation electrification, building electrification is essential to decarbonization because building operations are responsible for 31% of our country's energy-related CO2 emissions and nearly half of residences rely on natural gas as their primary heating fuel.[17] Energy utilities must account for these load increases in their grid modernization plans to support and profit from electrified vehicles and buildings.

Energy Utilities' Decarbonization Success Stories

San Diego Gas & Electric's Path to Net Zero

San Diego Gas & Electric (SDG&E) is an electricity and gas utility in Southern California. The study objective was to develop a comprehensive decarbonization roadmap to meet California's goal of achieving carbon neutrality by 2045. Black & Veatch led the project and provided technical advising, subject matter expertise, economic and power market modeling, and stakeholder management. The modeling approach enabled strategic recommendations and technology forecasts for the decarbonization roadmap. In tandem with these efforts supporting SDG&E, Black & Veatch modeled pathways to net zero with recommendations for the full state of California.[18]

Sacramento Municipal Utility District's 100% Carbon-Free Resource Planning

Sacramento Municipal Utility District (SMUD) is a community-owned electric utility serving Sacramento County and beyond. Their goal was to develop a comprehensive decarbonization roadmap to eliminate 100% of GHG emissions from all electric generation by 2030 and achieve carbon neutrality by 2045. Black & Veatch analyzed the full range of zero-carbon technologies available for procurement. The advisory team performed cost and performance assessments of the following: zero-carbon technologies including biomass and biogas; carbon sequestration and storage; geothermal energy; long-duration energy storage; onshore and offshore wind generation; renewable hydrogen; and solar photovoltaics. Black & Veatch also evaluated technical and economic feasibility, estimated the Levelized Cost of Energy (LCOE), and identified challenges and mitigation strategies. These decarbonization initiatives will accelerate the energy transition for SMUD's more than 1.5 million customers.[19]

Next Steps: Collaborate with an Expert Advisory Partner to Guide the Future-Proofing Journey

Decarbonization is essential to protect our world for future generations. As emphasized by the major trends outlined previously, energy utilities have the power (and the obligation) to significantly reduce GHG emissions, embrace emerging technologies, bolster grid resiliency, invest in infrastructure improvements, mitigate rising energy costs and support electrification of adjacent industries. To accomplish all of this, energy utilities benefit from collaborating with expert advisory partners (particularly those with design-build capabilities) to guide the future-proofing journey through grid modernization and decarbonization strategies. Advisory partners can help utilities create scalable business use cases, adapt current processes to overcome challenges, and develop impactful, cost-effective decarbonization roadmaps. These strategic decarbonization roadmaps include current state assessments and cost modeling — solving for optimal sustainability, reliability, resilience, and low-risk emissions reductions. When seeking an advisory partner to inform future-proofing strategy development, utilities should look for the following qualities:

- Strategy insight to design a practical decarbonization roadmap with attainable milestones to achieve faster emissions reductions
- Energy and technology expertise to develop economically feasible strategies and select scalable technologies with better cost management approaches
- Cross-industry experience to base feasibility studies on real-world situations with a focus on enabling infrastructure to ensure uninterrupted utility operations
- End-to-end capabilities to quicky transition from strategy to front-end engineering and design, specifically with program management services for multiple sites

Building operations are responsible for 31% of our country's energy-related CO2 emissions.

Be on the lookout for our third and final installment of this educational series exploring future-minded resiliency strategies deployed by multiple industries. **Visit our website to learn more about Black & Veatch's advisory solutions.**

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[1] Energy & Climate Intelligence Unit
[2] Environmental Protection Agency
[3] Asset Allocation & Management Company
[4] Economic and Social Commission for Asia and the Pacific
[5] Wood Mackenzie
[6] Federal Energy Regulatory Commission
[7] Lawrence Berkeley National Laboratory
[8] State of California
[9] The White House
[10] Utility Dive
[11] U.S. Department of Energy
[12] United States Office of Electricity
[13] California Public Utilities Commission
[14] U.S. Department of Energy
[15] The White House
[16] Utility Dive
[17] U.S. Green Building Council
[18] San Diego Gas & Electric
[19] Sacramento Municipal Utility District

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