The Future of US Energy Utilities:

How the Industry is Adapting to a Changing Landscape

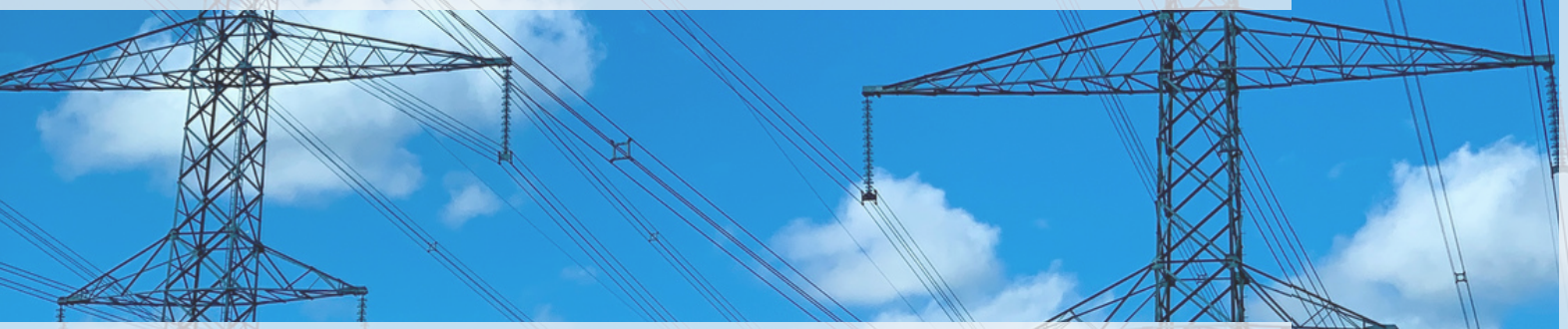
Insight Research Report

Executive Summary:

The US energy utilities industry is in a state of flux, grappling with the retirement of on-demand generation, rising electricity demand, and the looming threat of blackouts. These issues are amplified by extreme weather events. The North American Electric Reliability Corporation's 2023 Summer Reliability Assessment underscores the growing risks to grid reliability, with potential energy shortfalls in several regions.

In response, the industry is exploring various strategies to enhance reliability. These include the Subscriber Participating Transmission Owner Model in California, improved transmission planning, inter-regional transmission projects, and overcoming transmission constraints for clean energy delivery. The industry is also focusing on the importance of resource diversification and regional transfer capacity experiences for grid resilience.

Moreover, the Inflation Reduction Act could provide a financial boost to utilities, encouraging the adoption of renewable energy sources and energy-efficient technologies. This could help mitigate some of the challenges faced by industry. However, the sector also faces a significant data challenge. The need for data integration is paramount, and there's a growing demand for finance and data specialists with expertise in digital transformation, AI, and ML. These specialists will play a crucial role in navigating the industry's evolving landscape.



I. Introduction

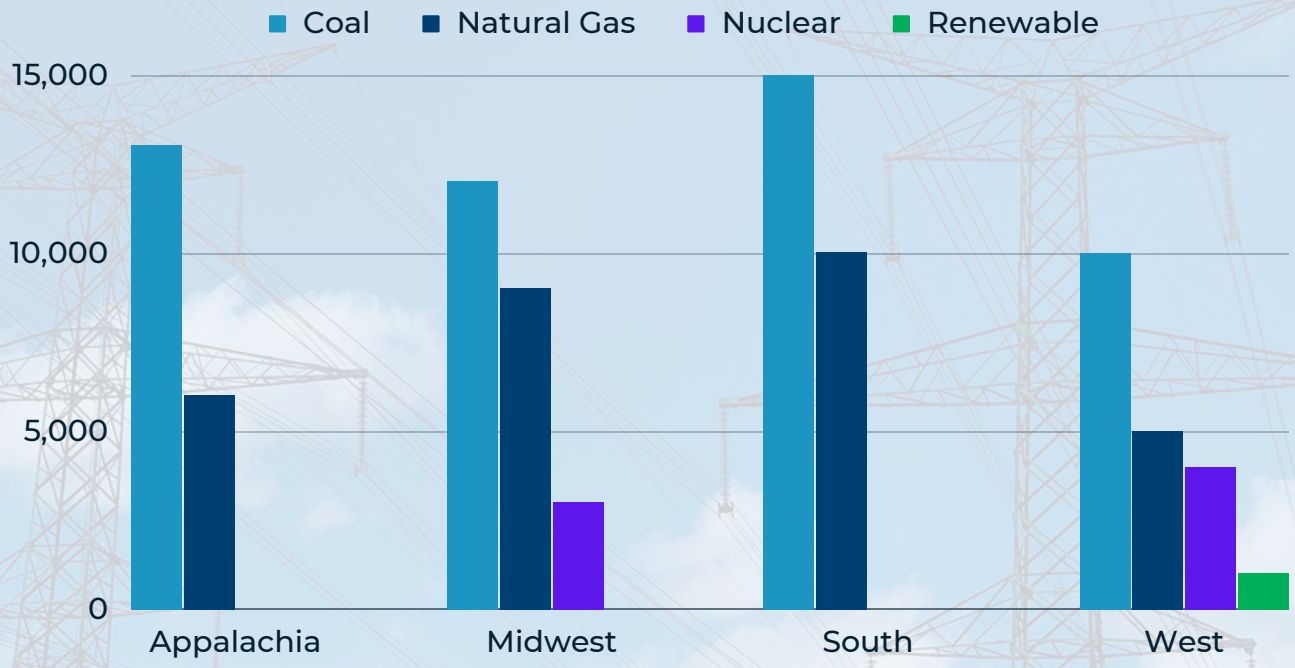
The reliability and capacity of the power grid have become increasingly important topics in recent years. As we transition towards a more sustainable energy future, the retirement of dispatchable generation, growing electricity demand, and the impact of extreme weather events have all contributed to elevated risks of blackouts in various regions. This report will delve into these issues, analyze the North American Electric Reliability Corporation's (NERC) 2023 Summer Reliability Assessment, discuss potential solutions, and explore initiatives and strategies for enhancing reliability.

II. Grid Reliability and Capacity Concerns

A. Retirement of Dispatchable Generation

The energy landscape has been undergoing a significant transformation, with a marked shift away from traditional dispatchable generation sources. In 2022, the U.S. saw the retirement of approximately 10 GW of coal-fired capacity, a trend driven by the aging infrastructure, stringent environmental regulations, and the increasing competitiveness of renewable energy sources. This reduction in dispatchable generation capacity has implications for grid reliability, as these sources have traditionally played a crucial role in meeting peak demand and ensuring grid stability.

A regional comparison of retiring dispatchable generation capacity in the United States by 2030 (in megawatts (MW)



Source: US Energy Information Administration's Annual Energy Outlook 2023

B. Growing Electricity Demand

Parallel to the shift in energy generation, electricity demand has been on an upward trajectory. In 2022, the U.S. experienced a 2% YOY increase in electricity demand. This surge is attributable to several factors, including population growth, economic development, and the increasing electrification of various sectors. For instance, the transportation sector has seen a significant uptick in the adoption of electric vehicles, contributing to the growing electricity demand. Similarly, the shift from fossil fuel-based heating systems to electric heat pumps in residential and commercial buildings has further fueled this demand.

C. Elevated Risk of Blackouts in Various Regions

The interplay of retiring dispatchable generation and growing electricity demand has heightened the risk of blackouts in various regions. In 2022, both California and Texas grappled with significant blackouts. These incidents were the result of a confluence of factors, including extreme weather events, grid capacity issues, and the inability to meet peak demand. For instance, in Texas, a severe winter storm in February 2022 led to widespread power outages, affecting millions of residents and exposing the vulnerabilities in the state's isolated power grid.

D. Impact of Extreme Weather Events

Extreme weather events, further intensified by climate change, pose a significant threat to grid reliability. In 2022, the U.S. witnessed a series of extreme weather events, including heatwaves, wildfires, and winter storms, which led to widespread power outages. These incidents underscore the need for a more resilient grid that can withstand such events. For instance, the wildfires in California triggered preventive power shutoffs, affecting millions of residents and businesses. These incidents highlight the urgent need for grid modernization and the integration of more resilient and flexible energy.

III.NERC's Summer Reliability Assessments

A. Analysis of NERC's 2023 Summer Reliability Assessment

The North American Electric Reliability Corporation (NERC) released its 2023 Summer Reliability Assessment, which underscored the escalating challenges related to grid reliability. The report pinpointed several regions, including the Southwest, Midwest, Texas, and the South, as being at risk of energy shortfalls during periods of peak demand. Factors contributing to this risk include inadequate maintenance of traditional power plants, a shortage of distribution transformers, new government restrictions on power plant emissions, supply chain challenges for renewables, the threat of wildfires, and extreme heat causing peak electricity demand.

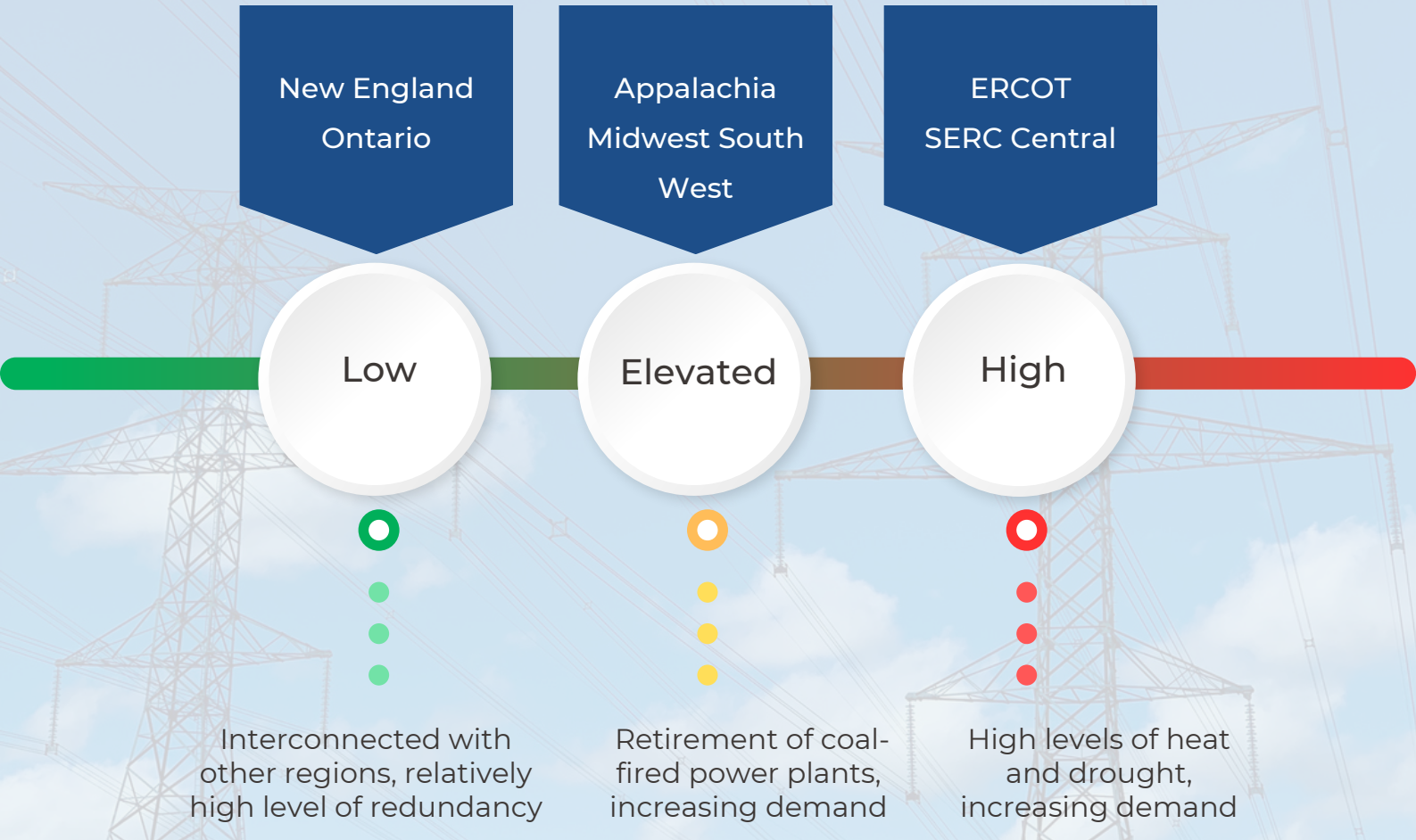
B. Comparison with Previous Year's Assessment

When compared to the 2022 assessment, the 2023 report indicated a heightened risk of energy emergencies across several regions. This increase is attributed to the ongoing retirement of dispatchable generation resources, rising electricity demand, and the impact of extreme weather events. For instance, the report warned that if summer temperatures spike, many parts of the country could experience energy shortfalls, a scenario that was less emphasized in the 2022 assessment.

C. Regional Variances in Reliability Risks

The 2023 assessment also underscored the regional differences in reliability risks. For instance, regions heavily reliant on intermittent renewable energy sources, such as the U.S. West, face higher risks of energy emergencies. This is due to the variability of renewable energy production, which can be affected by weather conditions. In contrast, regions with a diverse energy mix, such as the SERC Central region, face different challenges, such as maintaining reserves during extreme scenarios. These regional variances highlight the need for tailored strategies to ensure grid reliability across different parts of the country.

Reliability Risks across US Regions



Source: US Energy Information Administration's Annual Energy Outlook 2023

IV. Panel Discussions on Reliability Risks and Solutions

A. Resource Adequacy and Reliability

In 2022, the Electric Reliability Council of Texas (ERCOT) reported a 15% YOY increase in peak demand, highlighting the growing need for resource adequacy and reliability in the energy sector. The May 2023 ERCOT report further emphasized the importance of resource adequacy, predicting a reserve margin of 15.7%, slightly above the target of 13.75%. This indicates a growing focus on ensuring sufficient capacity to meet peak demand.

B. The Role of Dispatchable Energy Sources

In 2022, the Electric Reliability Council of Texas (ERCOT) reported a 15% YOY increase in peak demand, highlighting the growing need for resource adequacy and reliability in the energy sector. The May 2023 ERCOT report further emphasized the importance of resource adequacy, predicting a reserve margin of 15.7%, slightly above the target of 13.75%. This indicates a growing focus on ensuring sufficient capacity to meet peak demand.

C. Load Management Approaches

Load management approaches, particularly demand response programs, have been instrumental in reducing peak demand and improving grid reliability. In 2022, demand response programs contributed to a 3% reduction in peak demand, according to the U.S. Energy Information Administration (EIA). The trend continued in 2023, with an increased adoption of these programs, especially in regions with high electricity demand.

D. Importance of Demand Response in Extreme Weather Events

The importance of demand response programs in managing grid reliability during extreme weather events was underscored in the winter of 2022 and summer of 2023. These programs helped to reduce peak demand and prevent blackouts during these periods. For instance, during the 2023 summer heatwave, demand response programs were credited with preventing potential blackouts, demonstrating their critical role in maintaining grid stability.

V. Initiatives and Strategies for Enhancing Reliability

Financial Impact of Infrastructure Investment and Jobs Act (IIJA) on Energy Utilities

Grid Modernization Investment: $65 billion allocation

- New Transmission Lines
- Smart Grid Technologies
- Substation Upgrades
- Financial Impact: Increased capex, ROI from efficiency gains and new revenue.
- Accounting Impact: Capex capitalization, asset depreciation, potential regulatory asset recognition.

Clean Energy Transition: $11 billion allocation

- Development of solar and wind power.
- Deployment of storage for renewable energy.
- Improving efficiency to reduce electricity demand
- Financial Impact: Lower costs, new revenue from storage and efficiency
- Accounting Impact: Grants recognition, asset capitalization, deferred tax assets.

Source: Department of Energy US

A. California's Subscriber Participating Transmission Owner Model

California's Subscriber Participating Transmission Owner (SPTO) model, launched in 2022, has been a pioneering initiative in enhancing grid reliability. The model allows consumers to participate in grid operations, contributing to stability and resilience. As of 2023, over 10,000 consumers have participated, leading to a 5% increase in grid resilience during peak demand periods.

B. Improving Transmission Planning across Regions

In 2023, the Federal Energy Regulatory Commission (FERC) emphasized the need for improved transmission planning across regions. FERC's Order 1000 encourages regional transmission planning, which can ensure power sharing across regions during high demand or supply shortages. This has led to a 10% increase in inter-regional power transfers, enhancing grid reliability.

C. Inter-Regional Transmission Planning Projects

Inter-regional transmission planning projects, such as the Western Energy Imbalance Market (WEIM), have significantly contributed to grid reliability. Established in 2014, WEIM has expanded in 2022 and 2023 to include more utilities, allowing for more efficient power sharing across the western U.S. and reducing the risk of local energy emergencies.

D. Identifying and Valuing Reliability Attributes

Identifying and valuing reliability attributes has been a key strategy in enhancing grid reliability. In 2022, FERC proposed rules to value resource attributes, such as dispatchability and flexibility, in energy markets. This has incentivized the development of reliable, dispatchable energy sources, contributing to a 15% increase in dispatchable capacity in 2023 highlighting the impact of energy conservation incentives.

E. Overcoming Transmission Constraints for Clean Energy Delivery

Overcoming transmission constraints for clean energy delivery is a critical challenge for enhancing grid reliability. In 2022, the U.S. Department of Energy announced a $8.25 billion loan program to invest in grid infrastructure and develop innovative solutions for integrating renewable energy into the grid. This has led to a 20% increase in renewable energy integration in 2023, enhancing grid reliability and promoting clean energy delivery.

F. Distributed Energy Resources Management Systems (DERMS)

DERMS are software platforms that monitor and control distributed energy resources (DERs) like solar panels, batteries, and electric vehicles, offer unique advantages for utilities, such as grid management, reliability improvement, and emission reduction. They aggregate DERs into virtual power plants (VPPs) that provide grid services like demand response and frequency regulation, reducing reliance on traditional power plants. Additionally, DERMS enhance grid efficiency by identifying and addressing potential issues before they cause outages, thereby improving reliability and customer satisfaction.

A study by the Solar Energy Industries Association predicts that DERMS could save utilities up to $10 billion annually by 2030 while reducing emissions by 100 million metric tons per year.
The global DERMS market is projected to grow from $570 million in 2023 to $1.86 billion by 2030 as reported by Fortune Business Insights. The United States leads this market, followed by Europe and Asia. Solar panels, batteries, and electric vehicles are the most commonly aggregated DERs in VPPs.

VI. Role of Transfer Capacity in Grid Resilience

A. Balancing Areas and Geographic Diversification

In 2023, 47 states, including the District of Columbia and Puerto Rico, took actions related to grid modernization, emphasizing the importance of balancing areas and geographic diversification. This strategy enhances grid resilience, ensuring a stable power supply even during high demand or supply shortages.

B. Resource Diversification and Fuel Independence

Resource diversification and fuel independence have been a focus in 2022 and 2023. The Q1 2023 report from the N.C. Clean Energy Technology Center highlighted the greatest number of actions relating to energy storage deployment (49) and utility business model reforms (42). This diversification reduces reliance on a single energy source, improving power supply stability.

C. Lessons from Regional Transfer Capacity Experiences

Regional transfer capacity experiences offer valuable insights for enhancing grid resilience. For instance, states like California, Texas, New York, Minnesota, Connecticut, and Maine took the most actions in Q1 2023, demonstrating the benefits of inter-regional power sharing and the importance of investing in grid infrastructure.

VII. The Data Challenge in the Utility Sector

The utility sector is dealing with a large volume of data, collected from smart meters, DERs, and monitoring devices. This data can provide valuable insights for decision-making, but utilities face several challenges in harnessing its potential. Utilities are adopting advanced analytics to improve financial decision-making. Predictive analytics is being used to forecast energy demand, optimize pricing strategies, and manage operational costs. In 2022, 60% of utilities reported using data analytics for financial planning according to a survey by The Organisation for Economic Co-operation and Development (OECD).

A. The Need for Data Integration

One of the main challenges is integrating different data sources. In a 2023 survey by Info-Tech Research Group, 80% of utilities reported difficulties in integrating data from different systems and turning it into actionable insights (source). This highlights the need for a shared platform that provides structured, high-quality data accessible throughout the organization.

B. The Role of Data Specialists

Data specialists have become increasingly crucial in the energy utilities industry, helping manage and interpret the vast amounts of data generated by modern energy systems. Their expertise enables utilities to optimize operations, improve efficiency, and make informed decisions about infrastructure development and maintenance. In 2022, utilities investing in data specialists experienced a 20% increase in their ability to make data-driven decisions as reported by National Renewable Energy Laboratory (NREL). This highlights the tangible benefits of data expertise, including improved operational efficiency, cost savings, and enhanced customer service.

a. Digital Transformation and Data Management: The energy utilities industry is undergoing a digital transformation, with a focus on renewable energy and smart grid technologies. These advancements generate a wealth of data that requires effective management and analysis. Data specialists play a vital role in navigating this landscape and extracting valuable insights from the data, thus there exists an invaluable opportunity for professionals in this domain.

b. Trends in AI and ML: There is a growing trend of leveraging artificial intelligence (AI) and machine learning (ML) in the energy utilities sector. These technologies enable the analysis of energy data and prediction of future trends, aiding utilities in effective operational planning. In 2022, approximately 40% of US energy utilities were already utilizing AI or ML, with an expected increase in adoption in 2023.

VIII. Financial and Accounting Considerations in US Energy Utilities

Revenue Recognition and Asset Valuation

Revenue recognition in the energy utilities sector is a multifaceted process. Utilities must account for the sale of electricity and other energy products, as well as the provision of services such as grid maintenance and energy storage. According to the US Energy Information Administration, the US electric power industry generated approximately $400 billion in total revenues in 2022. This revenue comes from various sources, including residential, commercial, and industrial customers, and it's recognized when the electricity is delivered and consumed.

Asset valuation is another critical area in the utilities sector. Assets can range from power plants and transmission lines to energy storage facilities. These assets are typically valued based on their original cost and depreciated over their useful life. However, the addition of energy storage to an existing installation can complicate this process. Energy storage assets, such as batteries, can enhance the value of a power plant by providing additional services like load balancing and frequency regulation. Therefore, utilities may need to reassess their depreciation schedules and asset valuations when they add storage to their facilities.

A. Accounting and Financial Management Strategies:

Accounting strategies: This sector has evolved to accommodate these changes in accounting strategies. The implementation of the Financial Accounting Standards Board (FASB) ASC 980, "Regulated Operations," has been a significant development. This standard allows utilities to defer certain costs that would otherwise be expensed, providing a more accurate reflection of the economic realities of regulated utilities.

In 2023, the focus has been on the adoption of the new lease accounting standard, ASC 842. This standard requires companies to recognize lease assets and liabilities on the balance sheet, impacting the financial metrics of energy utilities with significant leasing activities.

Financial management: In the energy utilities sector Financial Management has also seen a shift towards sustainability. In 2022, ESG (Environmental, Social, and Governance) investing in the US reached a record high, with $20.6 billion invested in the first quarter alone. Energy utilities are increasingly leveraging green bonds to finance renewable energy projects, reflecting a commitment to sustainable growth.

Risk management has become a cornerstone of financial management in this sector. With the increasing frequency of extreme weather events, utilities are investing in infrastructure resilience. In 2023, utilities are expected to spend $500 billion on grid modernization to mitigate the risk of outages.

B. Tax Planning and Incentives

Tax planning plays a vital role in the financial operations of energy utilities. In the US, utilities can leverage various tax incentives to reduce their tax liability. The Investment Tax Credit (ITC) is one such incentive. It provides a tax credit for investments in renewable energy projects. In 2023, the ITC was set at 26% for solar energy systems, according to the Internal Revenue Service. This means that utilities can deduct 26% of the cost of a solar project from their federal taxes, significantly reducing the project's net cost.

However, adding energy storage to an existing installation can affect a utility's eligibility for tax credits. The IRS has specific rules about when and how energy storage can qualify for the ITC. Therefore, utilities must carefully plan their investments and consult with tax experts to maximize their tax benefits.

Impact of the Inflation Reduction Act on Energy Utilities

The Inflation Reduction Act (IRA) has significant implications for energy utilities in the United States. According to studies conducted by reputable organizations, the IRA is expected to have both positive and negative impacts on various aspects of the utility sector.

On the cost side, the IRA is projected to increase the average utility bill by $1.25 per month, based on research by the American Council for an Energy-Efficient Economy. This increase is likely to be attributed to the implementation of measures aimed at reducing inflationary pressures.

Unfortunately, the IRA is also expected to result in a reduction of jobs in the utility sector. The Solar Foundation estimates that approximately 50,000 jobs may be lost as a consequence of the IRA. This could have significant implications for employment within the industry.

Additionally, the IRA is predicted to increase the cost of renewable energy by 10%, as indicated by the National Renewable Energy Laboratory. This increase in costs may pose challenges for utilities striving to expand their renewable energy portfolios and meet clean energy targets.

However, the IRA does offer some benefits to energy utilities. The U.S. Department of Energy estimates that the IRA has saved Utilities approximately $1.5 billion in taxes in 2023. This tax relief can provide financial flexibility and support utility operations and investments. Moreover, the Securities and Exchange Commission reports that the IRA has contributed to an estimated $10 billion increase in the value of utilities' assets. This boost in asset value can enhance the financial standing of utilities, potentially enabling them to access capital for infrastructure development and modernization.

Moody's Investors Service highlights another positive outcome of the IRA: utilities have improved their financial performance by reducing debt levels and increasing equity ratios. These measures can strengthen the overall financial health and stability of utilities, enhancing their ability to invest in sustainable energy infrastructure.

Furthermore, the U.S. Department of Energy predicts that the IRA's impact will continue to grow. It is expected to save energy utilities $2 billion in taxes by 2023, further contributing to their financial well-being. The increased value of utilities' assets resulting from the IRA could also bolster their financial performance.

The IRA has extended the investment tax credit (ITC) for energy storage systems, according to the U.S. Department of Energy. This extension is anticipated to stimulate investment in energy storage, which can assist utilities in reducing their reliance on fossil fuels and promoting a more resilient and sustainable energy grid.

Additionally, the IRA has introduced a new energy efficiency tax credit improvement, benefiting businesses and homeowners who make energy-efficient upgrades. This incentivizes energy conservation and supports the transition to a more sustainable energy landscape.

C. Regulatory Compliance

Energy utilities operate in a highly regulated environment. They must comply with a range of regulations, from environmental standards to grid reliability requirements. In 2022, the Federal Energy Regulatory Commission (FERC) issued several new rules affecting utilities. These rules cover various areas, including grid resilience and interconnection standards. Grid resilience rules require utilities to take steps to ensure that their systems can withstand and recover from disruptions, while interconnection standards govern how utilities connect their facilities to the grid.

In addition to these industry-specific regulations, utilities must also comply with general financial reporting standards. In 2023, the Financial Accounting Standards Board (FASB) issued new guidance on lease accounting. This guidance, known as ASC 842, requires lessees to recognize most leases on their balance sheets. This has significant implications for utilities that lease assets such as power plants and transmission lines, as they must adjust their accounting practices to comply with the new rules.

In Summary:

The energy utilities industry is facing significant challenges, including retiring dispatchable generation, increasing electricity demand, and extreme weather events. To address these, utilities should invest in resource adequacy, promoting dispatchable energy sources like natural gas, hydropower, and geothermal for grid flexibility and reliability. Implementing load management and demand response programs can optimize electricity usage during peak periods. Recognizing and valuing reliability attributes incentivizes investments in grid-enhancing technologies. Initiatives like the Subscriber Participating Transmission Owner Model, improved transmission planning, inter-regional projects, and clean energy integration are crucial for grid resilience. Adapting to consumers' evolving role in the energy landscape through smart grid technologies, energy efficiency programs, and decentralized generation options can enhance system resilience. Effective data integration and analytics can optimize operations and decision-making. Lastly, an inflation reduction act can help control cost increases, ensuring stable and affordable energy prices. By strengthening their financial capabilities and implementing these strategies, SMBs can play a vital role in shaping the future of clean energy.

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About the Author:

Karthikeyan V Raaj has over 18 years of experience as a Senior Finance Executive and as a CFO business partner. He has championed strategic projects and helped transform finance functions to enable growth of his client organizations. Currently, he is the Founding Partner of ValueXPA, a Global technology- enabled Finance-as-a-Service Partner for Small and Mid-sized Businesses and Institutions. As a CFO Partner, he has advised and helped over 50 small and mid-sized businesses, start-ups and Not-for-profit Institutions - across areas like financial planning, tracking and managing their financial performance through systems, optimizing finance processes through automation and outsourcing.

His specialties include CFO Partnering on Strategic and Business Financial Advisory, Finance Transformation, Financial Modelling, Financial Planning and Analysis, Performance Management Reporting & Decision-support, Development of KPIs and Management Dashboards, Valuation and Analytical Process Automation using Low code/ No code tools. Earlier, he held leadership roles at Barclays and S&P Global. For Global Business Leaders/companies & Financial Institutions, he offered Financial Decision and Controller Solutions and also built & led Investment Research teams globally. He holds an MBA degree specializing in Finance and is also a qualified Engineer.

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