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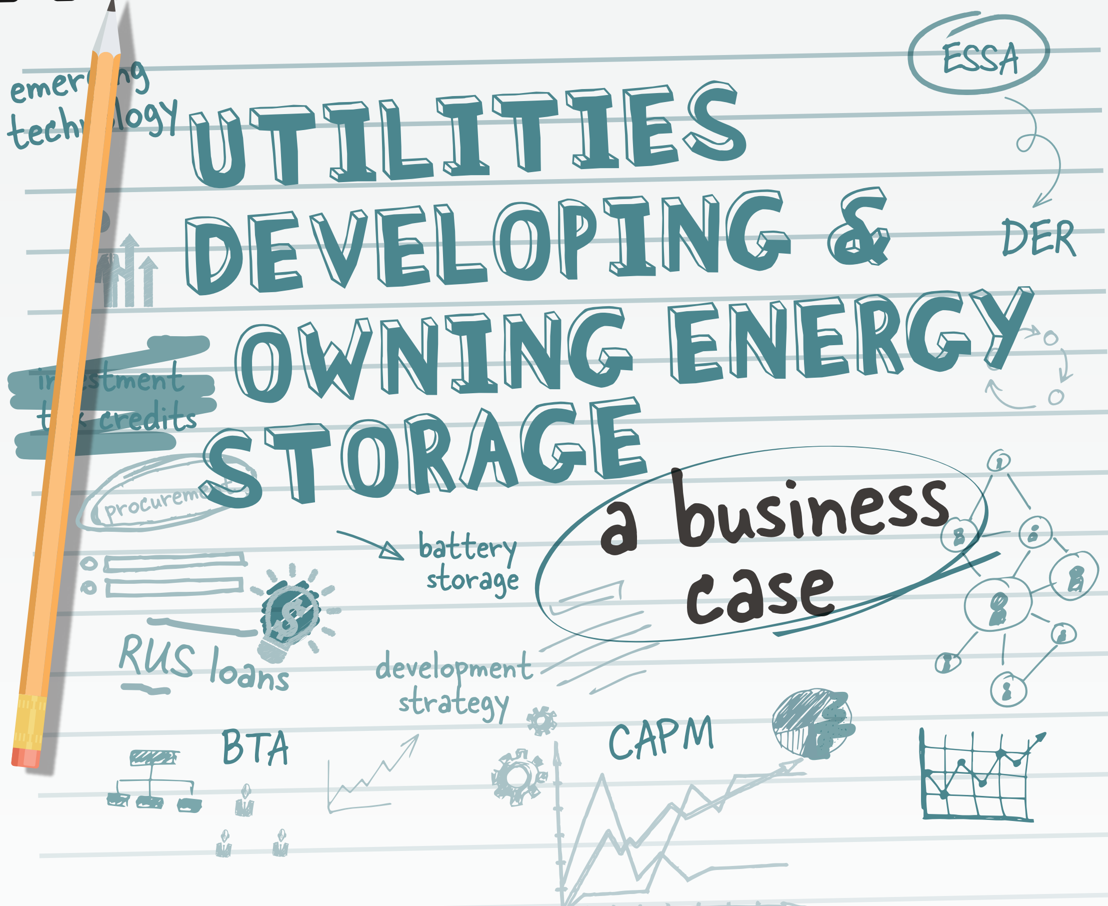
TRANSACTIONS

2025 Q1/2

UTILITIES DEVELOPING & OWNING ENERGY STORAGE

a business case



Battery Energy Storage Systems (BESS) are no longer considered an emerging technology because of the large-scale deployment of lithium-ion-based battery storage across the United States. Battery manufacturing global expansion combined with Investment Tax Credits (ITC) have created alternatives for municipalities and cooperatives to procure BESS as an economical resource in their power supply portfolio. Public Power has historically contracted with third-party owners and operators through an Energy Storage Service Agreement (ESSA), which provides utilities access to the equipment without the liability of ownership. The need for ESSA's has been driven by third-party development and operations experience along with life cycle management of expected performance and decommissioning responsibilities. Technology maturation and the ability for Public Power to capture the ITC through Elective Direct Pay has created opportunities for utilities to develop, own, and operate BESS facilities.

Direct-Purchase and Build-Transfer Agreements (BTA) are becoming a viable option for utility owned and operated BESS facilities. The challenges of owning and operating Distributed Energy Resources (DER) are not trivial and most municipal and cooperative utilities may not be immediately equipped to integrate a technology in which they have no experience. The responsibilities of asset ownership involves many things, including financing alternatives, qualified support services, capturing incentives, developing internal organizational capability, and managing performance over the project's life.

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Myrtle Beach, SC

AUG 17-19
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BESS Applications for Electric Utilities

JUL 8
Engineering Economics for Utility Projects

BASIC ELECTRIC DISTRIBUTION SYSTEMS

JUN 10
Safety

JUL
System Reliability & Resiliency

Note *All webinars are recorded & available for viewing post-presentation*

An organization seeking to obtain the benefits of BESS ownership while overcoming the challenges should be aware of the challenges and benefits:

CHALLENGES

- Installation Costs: Dependent on ability to finance and manage credit impacts
- Engineering and Construction: Contracting qualified construction firms and managing projects
- Operations Staffing: Develop local expertise to execute operations and maintenance
- Asset Management: Attain effective asset management and warranty issues
- Reliability Events: Manage reliability including catastrophic events or equipment failures
- Capturing Incentives: Navigate ITC's Prevailing Wage and Domestic Content Requirements
- Supply Chain: Achieve price certainty in the age of tariffs and Developer consolidation

BENEFITS

- Economic Margins: Control the procurement process while offsetting Developer margins
- Cost of Capital: Leverage lower cost of capital versus Developers
- Strategic Benefits: Develop organizational staff capability and project engagement
- Mature Industry: Peripheral services available such as liability insurance and warranty support
- Utility Procurement: Create strategic relationships with supply chain and project partners
- Flexibility of Operations: Economic opportunities may shift over the 20+ year useful life

HOW DOES IT GET DONE?

Project execution steps vary on a case-by-case basis but always involves the hurdles of: (1) early-stage development, (2) obtaining project capital / financing, (3) selecting project partners, and (4) assuring Operation and Maintenance (O&M) throughout the life of the equipment. Many utilities are familiar with aspects developing, owning, and operating power resources such as distribution systems and substations, but are less familiar with the aspects of BESS due to the relatively new entrance of this technology into utilities DER portfolios. An electric utility's organizational capabilities and project partners determine the ability to support the various aspects ***(Figure 1)*** of BESS asset ownership.

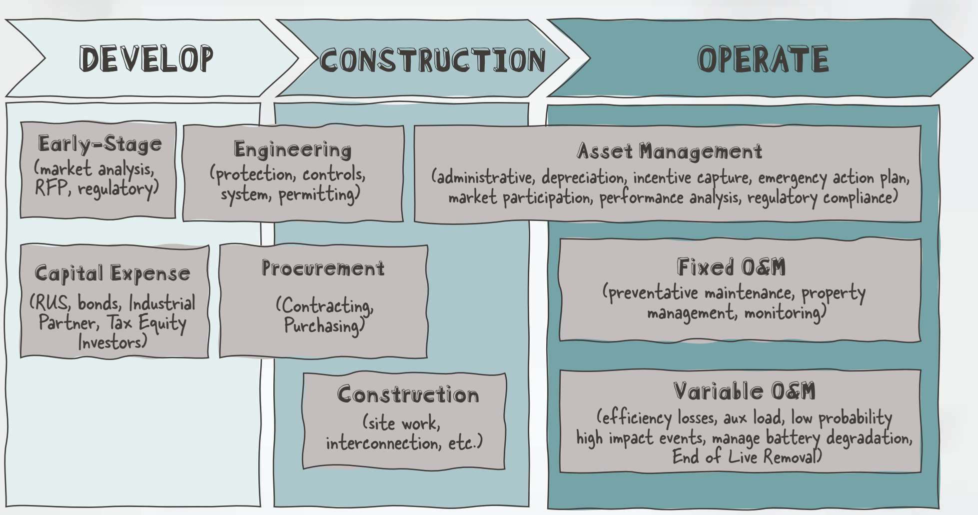

Figure 1. ***An Electric Utility's Organizational Capabilities & Project Partners Determine the Ability to Support BESS Asset Ownership***

1. Early-stage development: Owning BESS involves the typical steps of evaluating the value proposition through market and regulatory analyses. The early-stage development process establishes site control, begins the long-term planning process, and determines how the capital expenditure will be financed or otherwise funded.
2. Capital/ Financing: Determining how the project's capital cost will be funded is specific to a utility's access to cash through municipal bond financing, Rural Utility Service (RUS) loans, traditional loans, or even having cash on hand. A distinct advantage for municipalities and electric cooperatives is the lower cost of capital relative to Developers, combined with their ability to partner with local industrial or investment entities on upfront capital requirements. Local partners such as data centers, manufacturing facilities, or even community energy programs all have potential to help a utility financially justify the expenditure through electric rate structures or other alternative project structures.
3. Engineering: Development of the selected site will facilitate decisions on various best practices to achieve technical specifications for a construction firm to complete civil design scope. This process results in a specification for contractors to implement designs based upon physical constraints, equipment specifications, substation integration analysis, system impact studies, operation and maintenance planning,

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integration with utility operations, applicable codes and standards, community and environmental impacts, site access, and utility preferences.

4. *Procurement:* Most electric utilities have robust procurement processes in place that are suitable for BESS equipment procurement. To be eligible for the ITC Elective Pay, current Internal Revenue Service guidance requires the project meet Domestic Content thresholds in addition to Prevailing Wages. The accounting of these parameters can be complex and will require tax and accounting skills to advise and manage the process.
5. *Construction:* A general contractor experienced with utility work is typically capable of turning development specifications into detailed design documents outlining the requirements for materials, workmanship, and methods, which ensures consistency and quality. Appropriate staff, including third-party engineers, can advise construction planning and select local companies to execute necessary geotechnical site studies and construction work.
6. *Operations:* BESS facilities are not trivial to manage and require 24/7 monitoring, bi-annual preventative maintenance, and an event response plan. Operations planning translates equipment technical requirements into scheduled maintenance, monitoring strategy, and event response action planning. Utilities can develop best practices to manage operation agreements with third-party O&M provider(s).
7. *Asset Management:* Assuring the economic success of the project comes down to rigorous asset management throughout the life of the project, including construction, operations, and end of life removal. Electric utilities are already familiar with many aspects of managing BESS facilities, such as: regulatory compliance, developing emergency action plans, depreciation, managing contractors, product performance analysis, and ensuring employee and public safety. Combining a utility's existing know-how with an experienced third-party vendor will produce an effective asset management team.

SHOULD A PUBLIC POWER UTLITY OWN AND OPERATE A BESS?

The decision to incorporate energy storage also has long term implications whether the asset is owned by the utility or a developer. Every utility has their own challenges that determine the most economical and comprehensive solution. Some entities may be experienced in owning and operating generation assets while other utilities have experiences limited to the electric distribution system. **Although BESS is far less complex than an aeroderivative turbine and other utility managed assets, each entity will need to carefully evaluate the ability to support the project throughout its lifecycle.** Dilligence should be completed with respect to obtaining capital financing, reviewing internal capabilities, and seeking out third-party services that allow them to successfully execute the project plan.

Inspect What You Expect: A project proforma can demonstrate required levels of capital financing, asset management profile, need for third-party services, and the qualitative and quantitative benefits of the project. Sensitivity analyses will help evaluate low-probability-high-impact events or unexpected issues over the life of the system, both of which allow a utility to determine appropriate risk management or mitigation tools, including potential third-party vendor support.

Access Organizational Capabilities: **Not every utility is equipped to explore all aspects of owning and operating BESS, but there may be some key areas that allow the utility to create opportunities from within and grow.** For example, the electric utility typically has a detailed understating of its electric distribution system and substations to integrate the BESS into their system with the correct protection and controls. Once an evaluation of organizational capabilities is complete the utility can seek out support services from known project partners and other third-parties to assure project success.

Not every utility is equipped to explore all aspects of owning and operating BESS, but there may be some key areas that allow the utility to create opportunities from within and grow.

Third-Party Services: Third-party services are widely available to help assure project success while utilities eventually scale up operations during construction and over the life of the project. Some of these services include outside assistance for legal and regulatory compliance, market analysis and integration, communication and data management, financial consulting, technical consulting, information technology, operational and maintenance, and general asset management support.

Until recently, the idea of owning energy storage was out of reach for many electric utilities, particularly cooperatives and municipal utilities, due to a lack of familiarity with the technology and rapidly emerging energy storage industry. But as is often the case with emerging technologies, familiarity increases with the technology, ownership cost structure, and use cases over time and today's BESS industry has matured in such a way that electric utilities now have options as to whether they want to assume more ownership responsibilities and benefits versus outsource those responsibilities to BESS developers. ■

For more information or to comment on this article, please contact:

MATT SMITH, SENIOR ENGINEER
GDS Associates, Inc. - Marietta, GA
770.799.2478 or
matt.smith@gdsassociates.com

EXAMINATION OF UTILITY BETAS

an update

Utility betas increased sharply as part of the Covid-19 related market volatility experienced in the early 2020s and have only now, five years later, dropped back to much lower levels, albeit not back down to the level of earlier beta estimates. It has been an incredible turn of events, one not seen since the financial crisis of 2008.[1] This matters because the beta estimate[2] is a core part of the Capital Asset Pricing Model ("CAPM"), an analytical model relied upon by many regulatory commissions to inform the allowed return on equity ("ROE"), which utilities earn on their investment in utility plant, i.e., rate base. This change will likely put significant downward pressure on the ROEs authorized by regulatory commissions.

For the purposes of this article, ***we use a computational approach accepted by FERC, where the beta for an individual stock is measured using the S&P 500 as the market return index over a five-year period based on weekly realized return data and is Blume-adjusted.*** We also use the S&P 500 Utility sector as a proxy for individual utility stocks.

Evolution of Utility Betas

As described in a **previous article**, utility betas generally trended downwards towards 0.55 for several years leading up to the Covid-19 market volatility and then shot up to around 0.85-0.90 in a matter of a few short weeks in early 2020.[3] The utility betas have only now declined significantly to 0.70. Similar to the sharp increase, this drop happened quickly, in about a two-month period. The catalyst for this change is that the rolling five-year beta study period no longer captures the extreme Covid-19 related financial data. This is consistent with the trend seen with shorter-term betas and how those betas similarly declined following the removal of the early 2020 financial market data from the computation, e.g., betas computed using two years of financial data.[4] ***Figure 2*** below depicts rolling five-year betas for the S&P 500 Utility sector using market data since 2000.

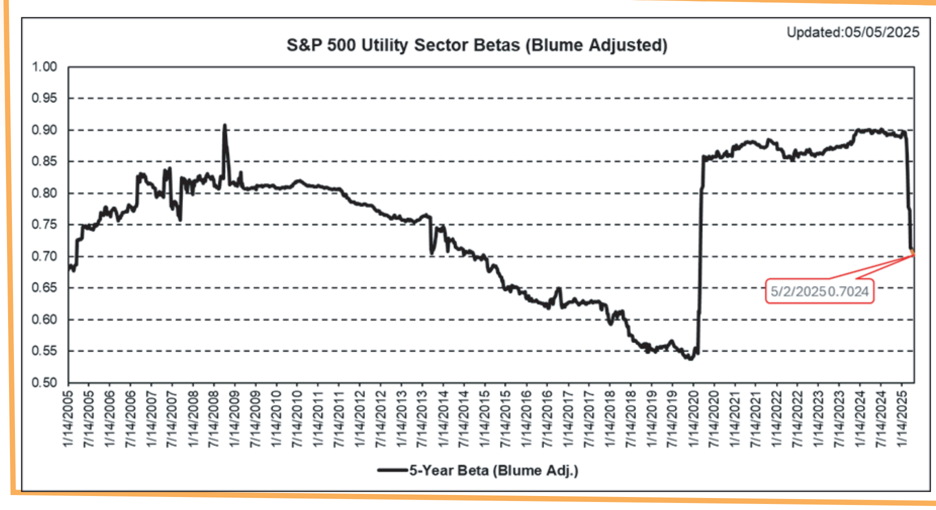

Figure 2. ***S&P 500 Utility Sector Five-Yr. Betas***

Beta Estimates – Behind The Scenes

It's beneficial to a take a look at the different calculation components behind the beta estimate to better understand how the beta has evolved. For reference, the beta can be determined using the following mathematical expression:[5]

$$\beta = \text{Correlation }(R_i, R_m) \times \sigma_i / \sigma_m$$

Where β = beta, R_i = the return on the individual stock, R_m = the return on the market, σ_i = standard deviation of the return on the individual stock, and σ_m = the standard deviation of the return on the market. This produces a "raw" beta. Regulators commonly accept the use of Blume adjusted betas, which adjusts a stock's raw beta towards 1.0 based on the premise that the beta for all stocks trend towards 1.0. Therefore, *the three key components of a beta are: (1) correlation between the individual stock and the market index; (2) the standard deviation in returns of the individual stock as a factor of the standard deviation of the market index; and (3) the Blume adjustment.*[6]

In reviewing the changes in these key components, we identify several aspects that bear mentioning regarding the change in five-year utility betas:

01 The standard deviation factor experienced swings of approximately 20%, with the factor changing from 1.03 at the end of 2019 to 1.21 by the end of April 2020. It dipped to 1.15 during part of the interval period, and is now back down to 1.03 at the end of May 2025. This indicates that the utility sector's standard deviation of weekly returns increased (decreased) at a quicker rate than the S&P 500 Index's standard deviation.

02 The correlation of returns between the utility sector and S&P 500 Index saw an even more dramatic rate of change. The correlation between the two was 0.30 at the end of 2019, increased noticeably to 0.65 by the end of April 2020, went to around 0.70 in the interval period, and now declined to 0.54. It appears this is the main reason why betas have not drawn back to the pre-early 2020 estimates.

03 A unique feature of the impact on betas from the early 2020 period is that both the standard deviation and correlation moved in lock-step, i.e., both increased at the same time. In previous years the two components generally moved in different directions.

04 The Blume adjustment's impact of increasing utility betas was considerably less since early 2020 to present, given that the underlying raw beta was much closer to 1.0 than before.

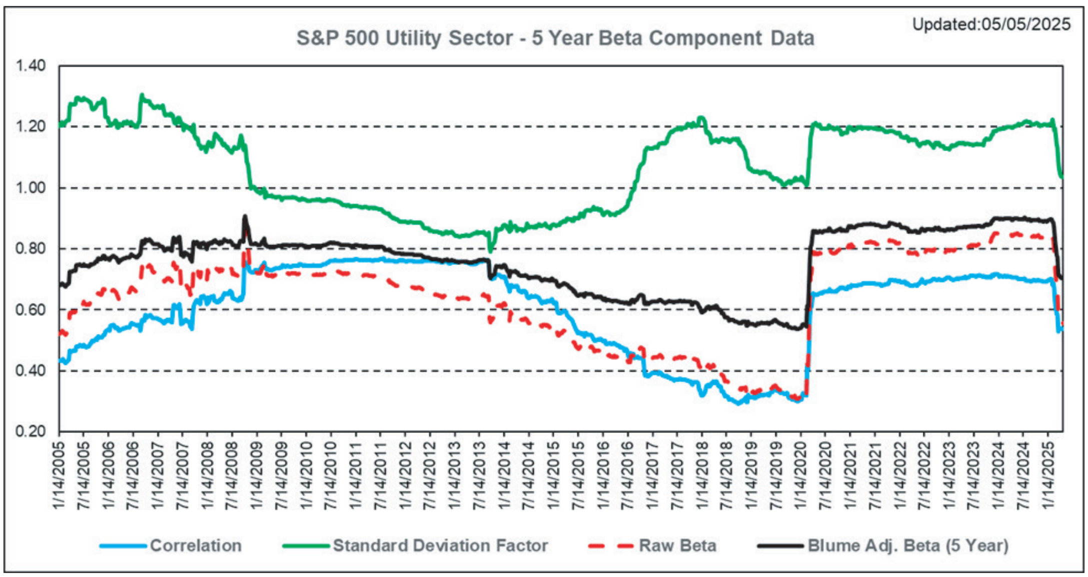

Figure 3. ***S&P 500 Utility Sector Beta Calculation Components***

Impact to CAPM ROE Results

It is expected that the decline seen in betas will put downward pressure on the return on equity results measured using the CAPM model, all else being equal. The CAPM measures the systematic risk of a company and its expected return. The beta measures the systematic risk of the company.[7] To illustrate the impact on CAPM ROE results, we developed an illustrative example using a risk-free rate of 4.60% and market risk premium of 7.50%, together with two beta scenarios of 0.89 to represent the five-year utility beta calculation that includes the early 2020 period and 0.70 to represent the now-lower utility betas. As shown in ***Figure 4*** below, the CAPM ROE result falls from 11.28% to 9.85%, a decline of 143 basis points.

It will be of significant interest to observe how a change of this magnitude in CAPM results will impact authorized ROEs for regulated utilities. In many instances, a regulator decision is informed by additional analytical models, over and above the CAPM, together with its judgement to determine the appropriate ROE. Therefore, the full decline in CAPM results may be negated somewhat but will nevertheless be expected to be impactful. ■

For more information or to comment on this article, please contact:

BREANDAN MAC MATHUNA, PRINCIPAL
GDS Associates, Inc. - Marietta, GA
770.799.2391 or
breandan.macmathuna@gdsassociates.com

Description	Risk-Free Rate	Market Risk Premium	Beta	CAPM K_e
Covid-19 Impacted Beta	4.60%	7.50%	0.89	11.28%
Current Beta	4.60%	7.50%	0.70	9.85%
Reduction			**0.19**	**1.43%**

Figure 4. ***Beta Impact on Utility CAPM ROEs***[8]

References

1. Moreover, the previous spike seen in utility sector betas was short-lived in nature.
2. The "beta" term measures the volatility of a company's stock return relative to the market return. The price of a stock that has a beta value greater than 1.0 is assumed to be more responsive to a change in the market returns than a stock that has a beta value of less than 1.0.
3. See Examination of Utility Betas, GDS Associates, August 30, 2023, available at https://blog.gdsassociates.com/examination-of-utility-betas.
4. See id., at Figure 2: S&P 500 Utility Sector Betas At Different Study Periods.
5. Another common approach of expressing the beta formula is Covariance (Ri, Rm) / Variance (Rm).
6. As a general guide, please note that holding all else equal, if the correlation increases, the beta estimate increases; if the standard deviation factor increases, the beta estimate increases; and the farther away the raw beta is from 1.0, the larger the impact will be from the Blume adjustment to bring the beta closer to 1.0.
7. The CAPM methodology is mathematically expressed as: ERi = Rf + βi (ERm – Rf), where: ERi = expected return on investment, Rf = risk-free rate, βi = beta, ERm = expected return of market, (ERm – Rf) = market risk premium.
8. The illustrative assumptions used in this example are generally representative of estimates computed at the time of writing using FERC's preferred methodological approaches.

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