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Boosting capital project efficiency to meet rising electricity demand

Utilities can use a three-step approach to enhance capital projects efficiency—pick the right projects, choose the right delivery models, and execute properly.

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US electricity demand is growing faster than it has in decades: Grid planners have nearly doubled forecasts of demand growth over the next five years. In response, utility companies are rapidly increasing the size and scale of their capital expenditure (CAPEX) projects. Aggregate utility investments (electric, gas, and water) are projected to hit new highs of $202 billion in 2025, $206 billion in 2026, and $211 billion in 2027.[1]

Given the historic pace and scale of the current energy infrastructure buildout, utility companies need to rethink their entire approach to managing their capital portfolios. Companies today routinely move forward with projects they should delay or cancel—and often move too slowly on critical or strategic projects. A time of rapidly increasing risks, with volatility in tariffs, regulatory uncertainty, and increasing supply chain disruptions, further raise the stakes for CAPEX investments.

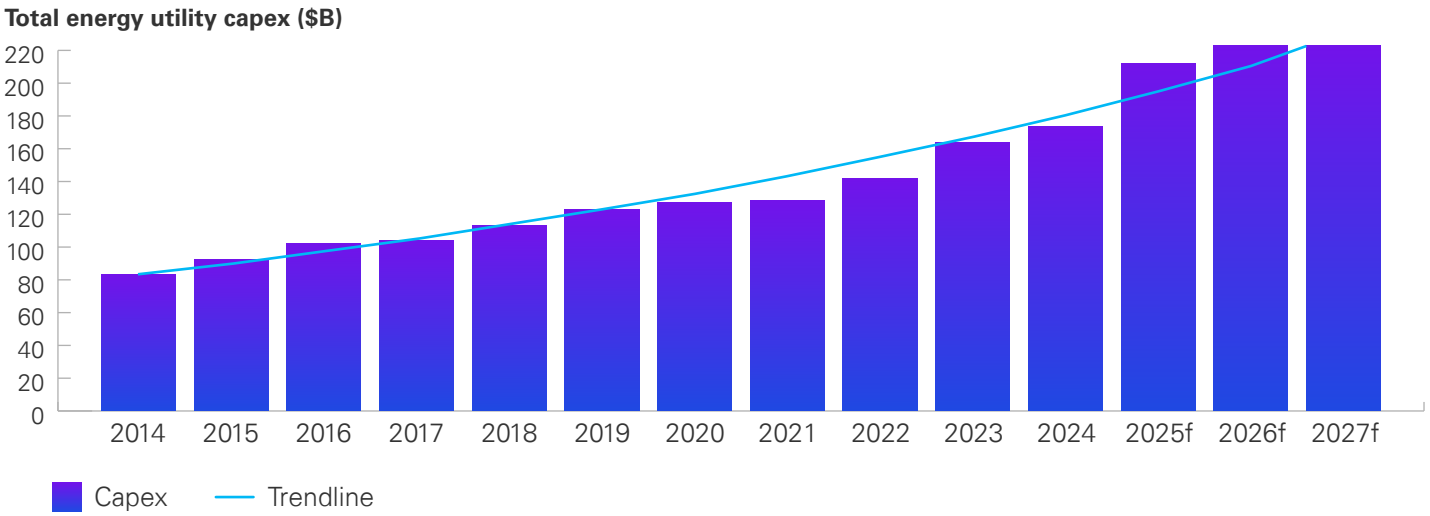
Using a three-step approach, utility companies can improve capital efficiency, speed up projects, and achieve other objectives such as lowering operational and maintenance costs and increasing power supply security. First, pick the right projects. Second, choose the right delivery model based on project-specific characteristics. And third, execute projects properly. From developing an integrated project evaluation model that helps prioritize the right projects to continually benchmarking performance of in-flight projects, this approach helps utilities realize their ambitious CAPEX plans and fuel economic growth.

[1] Dan Lowrey, Jason Lehmann, Brian Collins, and Heike Doerr, "Energy utility capex projected to eclipse $790B from 2025 through 2028," S&P Global, January 9, 2025

Utility companies are under the spotlight

For decades, utility companies were often described as "sleepy," "stable," and "boring." Now, they are thrust into the spotlight as critical catalysts of US economic growth. Electricity demand is surging with grid planners rapidly increasing the size and scale of their 5-to-10-year CAPEX plans. In 2025, 2026, and 2027, aggregate utility investments are expected to reach new records of $192 billion, $196.5 billion, and $197 billion, respectively.[2] According to a report by Grid Strategies, the five-year load growth forecast has surged by 456 percent, projecting an increase of 128 gigawatts (GW) by 2029.[3]

US energy utility CAPEX, 2014-2027



[2] Regulatory Research Associates, October 2024

[3] National Load Growth Report 2024, Grid Strategies LLC

This surging demand comes at a time when utility executives already face pressure from stakeholders to modernize grid infrastructure. The majority of transmission and distribution infrastructure is reaching the end of its useful life. After an extended period of declining investment in transmission infrastructure, annual spending by major utilities on electricity transmission systems nearly tripled from 2003 to 2023, reaching $27.7 billion.[4] Investment imperatives are driven by various factors:

Investor and shareholders' financial concerns:

Smart capital planning and execution enables utilities to stabilize returns, increase their return on capital investment, and help reduce operating costs over the long term.

Customer issues:

Affordability, reliability, and safety are perennial concerns for customers (and regulators) while business demand for mobility and data centers to fuel artificial intelligence (AI) is ascendant.

Power supply security:

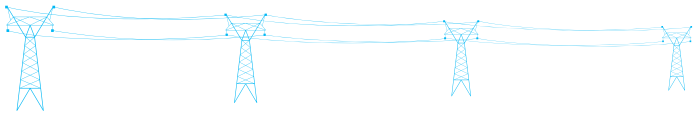
Cyberattackers have repeatedly targeted the utilities sector, disabling wind-farm remote controls, disrupting prepaid meters, and causing widespread data breaches that expose client personal information. Critical utility infrastructure is among the primary targets of malicious cyber activity.

Vendor and supplier relations:

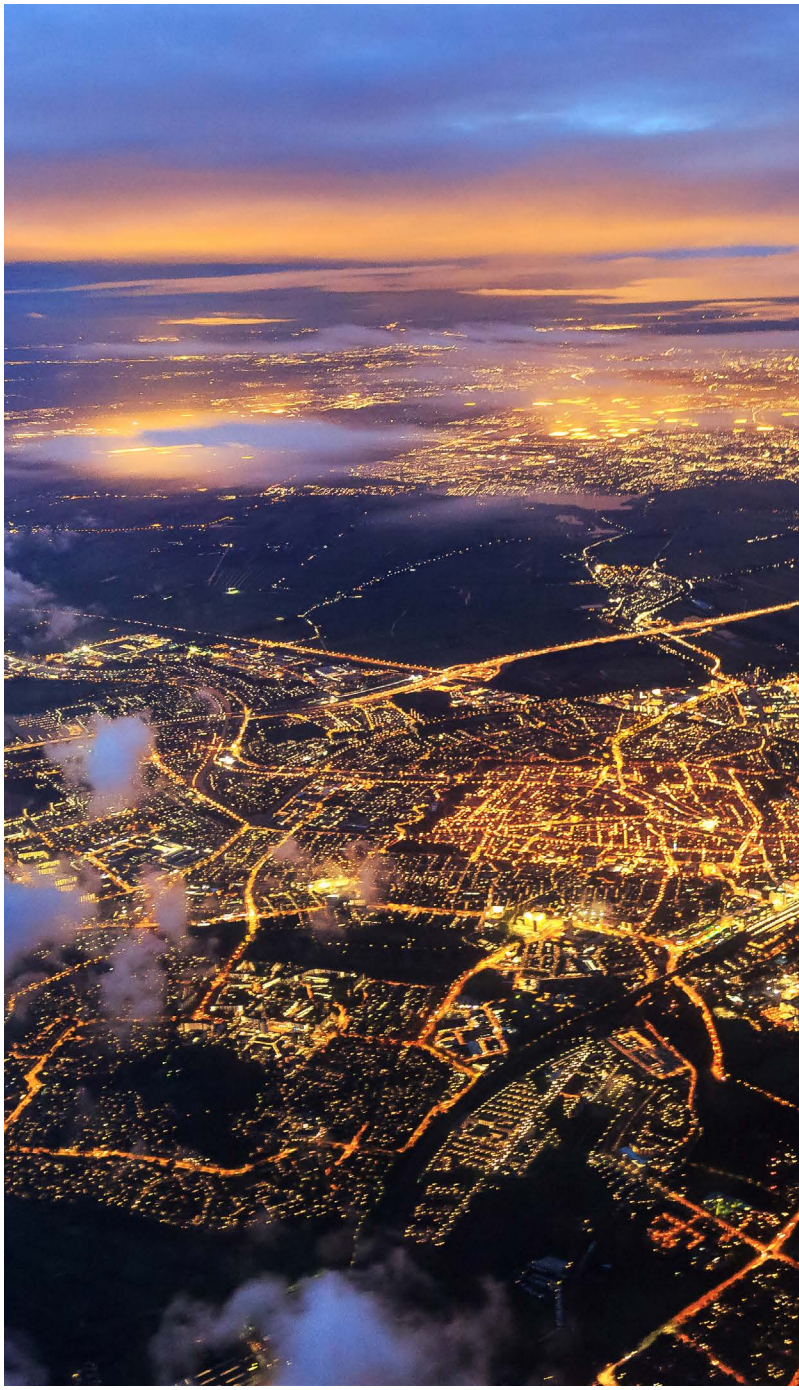
Vendors and suppliers have a lower risk tolerance and prefer stability and predictability in their operations and financial dealings. The efficiency of the projects they supply can significantly reduce uncertainties and risks for them. Moreover, global factors like trade policies and tariffs are magnifying existing challenges with supply chain disruptions and rising equipment and labor rates.

Climate risk:

Climate change is posing significant threats to infrastructure. As examples, 87 percent of US utilities are exposed to heat stress and 22 percent are exposed to floods.[5] Both risks are likely to worsen over the next decade or two, demanding investments in resiliency.



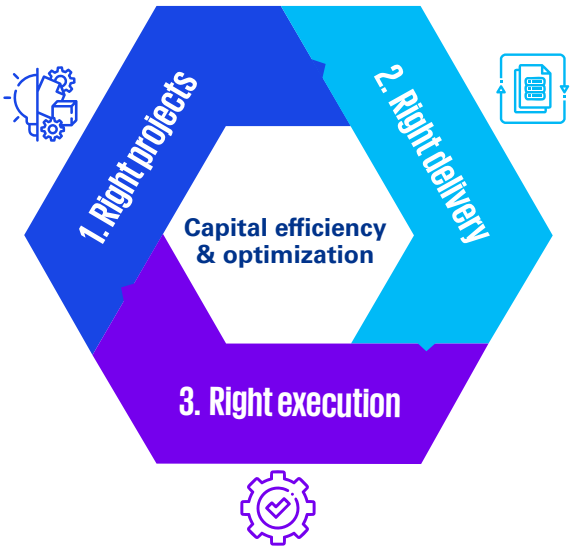
This confluence of factors underscores the urgency for utility companies to adopt a more strategic and efficient approach to their capital projects.



[4] US Energy Information Administration, "Grid infrastructure investments drive increase in utility spending over last two decades," Today in Energy, November 18, 2024

[5] Herman K. Trabish, "As extreme weather spurs billions in utility resilience spending, regulators struggle to value investments," Utility Dive, April 25, 2020

A three-step plan to improve capital efficiency



The utilities industry has a distinct set of cultural, industry, and regulatory complexities that capital planners ignore at their peril. Additionally, as in other asset-intensive organizations, utilities frequently lack insight into the true drivers of capital efficiency, so they are not set up for success. Cross-functional accountability throughout the process—including engineering, finance and planning, project management, and operations—is critical for success. With these dynamics in mind, our three-step approach can help utilities achieve real capital efficiency.

Identifying the right projects

Most organizations already use sophisticated planning tools and advanced financial models to identify, screen, prioritize, select, and budget for projects; however, capital planners tend to focus heavily on financial metrics such as return on investment or cost efficiency, without fully considering the broader value a project could bring to the organization. More progressive companies are moving toward evaluating each project based on a broader set of strategic criteria, including:

Readiness for the future:

Early investment in proof-of-concept initiatives for certain types of complex projects—for example, transitioning to battery storage, or to hydrogen or small modular reactors—can increase readiness and decrease the likelihood of complications and costs associated with a hurried transition later on.

Alternative funding sources:

Utilities can develop internal capabilities to secure and manage government grants and loans. For example, the Inflation Reduction Act and the Infrastructure Investment and Jobs Act provide attractive alternative funding sources that benefit the utility, investors, and customers.

Shovel-ready projects:

For utilities in high-growth areas, prioritizing readiness for execution ("shovel-ready" projects) could be paramount. Delaying these projects could result in missed opportunities to meet rising demand, often driven by population or economic growth in the region.

Aging infrastructure:

For utilities in areas with stable growth, a significant share of the projects could be about replacing or upgrading aging infrastructure. In this scenario, the priority might shift more towards cost and affordability considerations as these older elements are gradually updated.

Environmental considerations:

In states where environmental considerations and climate change are treated with high importance (for instance, in coastal states like California), projects focused on environmental factors would take precedence in such regions due to the high demand from customers and regulatory agencies. Conversely, in states where environmental regulations are less stringent (such as Texas or Oklahoma), gas projects might be prioritized more than those focused on sustainability.

A more holistic project evaluation approach—taking into account strategic alignment with the company's future goals, technical risks, readiness, regulatory and customer demands, as well as potential risks—includes:

Integrating strategic, financial and technical criteria into a balanced scorecard informs project priorities

1. Evaluation criteria

Strategic fit:

- Long-term growth alignment
- Customer demand/commitment
- Competitive differentiator—Grid resilience
- Competitive differentiator—Sustainability
- Regulatory alignment

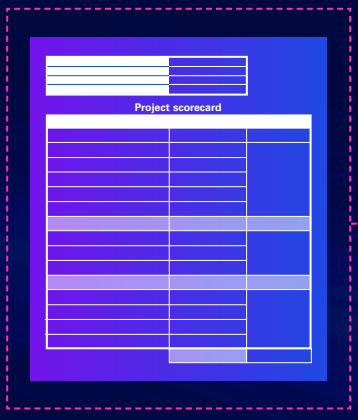
Financial fit:

- Payback
- IRR
- NPV
- Affordability
- $/watt

Technical fit:

- Reliability
- Project readiness
- Potential risk factors
- Safety

2. Balanced scorecard



3. Prioritized projects list

#	Project name	Additional capacity [kt]	Required CapEx [M$]	Value based score
1	Project A	40	$50M	4.1
2	Project B	75	$100M	3.8
3	Project C	18	$15M	3.7
4	New processing line	25	$30M	3.5
5	Project D	120	$150M	3.4
…			…	…
29	Project E	140	$200M	2.7
30	Project F	65	$80M	2.6

An integrated evaluation model:

Potential projects are evaluated against a set of in-depth strategic, financial, and technical key performance indicators (KPIs) using a balanced scorecard approach (Exhibit 1). Objective scoring enables planners to make fact-based decisions, prioritizing projects based on the additional capacity they can deliver, and their required CAPEX.

Quantitative cost and schedule risk analytics:

Advanced risk analysis helps owners understand the overall risk profile of each project. Using digital and AI tools combined with risk analytics modules in project management software, project planners perform a cost- and schedule-based risk analysis to calculate whether a project's cost estimate falls within an acceptable range of accuracy for the type of project.[6] They also benchmark a project schedule against an industry index of schedule ratings.[7] Using these tools, they can generate probability curves for achieving cost and schedule objectives, even during the initial phases of the project lifecycle.

Portfolio-wide prioritization:

This step entails prioritizing and advancing projects that demonstrate higher confidence and greater maturity (based on their internal rate of return percentage and payback years), thus ensuring a more effective allocation of resources and maximal returns.

Rolling multiyear analysis:

Continually updating the analysis helps owners ensure the "right" projects are still right on a portfolio-wide basis over time. Adopting rolling capital plans allows organizations to assess and incorporate potential investments throughout the year. The plan becomes a living document within certain parameters (e.g., total budget), moving companies away from long, resource-intensive annual planning exercises that become static once finalized. If done well, this can drive accountability for performance and enable better project-level planning and predictability.

[6] Based on the Association for the Advancement of Cost Engineering International cost estimate classifications for the industrial and manufacturing industry

[7] Deltek Acumen Fuse Schedule Index ratings for industrial and manufacturing schedules

Choosing the right delivery model

Although energy companies invest billions of dollars in capital programs, they rarely allocate sufficient time to selecting the appropriate delivery model. Considerations include:

Key project characteristics:

The process of choosing the right delivery model starts with identifying and investigating the specific characteristics of a project (Exhibit X). Analyzing project characteristics to inform the delivery model choice (based on past successful outcomes) helps to eliminate bias and preconceived notions, and objectively validates the final decision. And making the best choice helps leaders efficiently allocate resources, mitigate risk, and ensure sound financial performance.

Investigating project characteristics helps to inform delivery model decisions

Accountability	Control	Owner wishes to assign single source accountability for overall project delivery
Specifications	Scope	Performance-based specifications will be provided for the project
Scope Clarity/Resolution	Scope	Degree to which facility and/or process performance requirements are or will be defined prior to commencing
Scope/Project Complexity	Scope	The facility and/or process requirements on the project are difficult and/or complex
Cost Control	Cost	It is critical/possible to establish project costs early in the project delivery process
Cost Growth	Cost	Certainty of completion to a pre-determined budget is critical. (Business obligations require on time B.O.D.)
Schedule Speed	Schedule	Schedule demands a short project delivery period (design and/or construction schedule is aggressive for this project)
Change Control	Control	The likelihood of numerous Owner required changes is anticipated on the project
Owner Involvement	Control	Degree to which Owner qualified staff are or will be committed to the project

Choosing the right model entails assessing trade-offs based on the key characteristics noted above. For example, choosing a delivery model that places a premium on speed could reduce cost control. Likewise, it requires project owners to have a clear understanding of their own capabilities. For example, if a project owner has limited resources and experience, selecting a delivery model requiring high levels of owner involvement and oversight could lead to difficulties. Further exploration might entail looking at market conditions, contractor experience, or other characteristics, and devising a specific strategy based on the findings. These tools aim to ensure consistency in the approach used for choosing delivery strategies, thus continuously improving outcomes.

Contract model options:

Equally important to selecting the best model for a given project are the characteristics of different models. Utility planners typically select one of four models to deliver projects:

- Direct delivery (DD): Also referred to as owner as a general contractor, in this model, the utility company (owner) retains full control over the project, taking responsibility for planning, design, procurement, and construction management. The owner often contracts with various service providers, such as designers, engineers, and contractors, but maintains overall project coordination and management.

- Construction manager at risk: Construction manager assumes contractual liability for project construction in addition to overseeing all phases of the project including schedule, cost, constructability, project management, and so on.
- Construction manager not at risk: Construction manager acts as an advisor to the owner, but does not assume contractual liability for project construction.
- Design-Bid-Build (DBB): Traditionally, this is a widely used project delivery method where engineers or architects fully design the project first, then put it out for bid, and it is typically constructed by the lowest responsible bidder. The utility holds separate contracts for design and construction, which can sometimes lead to less integration and potential miscommunications between the design and construction phases.
- Design-Build (DB): Under this model, a single entity is contracted to handle both the design and construction of the project. This approach aims to streamline communication and improve project efficiency by integrating design and construction responsibilities. The design-build contractor assumes most of the risk and guarantees cost and schedule performance. Note: This is sometimes called the engineering, procurement, construction model.

A project owner that wants to understand and limit its risk by taking the project "one step at a time" might select a more traditional DBB approach. A project owner that actively participates and transparently shares project risks may prefer a DD model. And a project owner working in an organization with stable needs that is looking for a solution that transfers project risks in the short term and in the long term may choose a partnership delivery model for medium-sized projects and DB model for major projects. By carefully aligning alliance contract strategies with specific projects, planners can effectively transfer risk, ensure flexibility, establish the support structure, ensure healthy stakeholder relationships, and properly align contractor compensation and incentives to desired outcomes.

After determining the delivery model, an owner will analyze and select the most efficient contract strategy for the work. Delivery strategy and contract compensation structure are often conflated but keeping them separate is most effective. The first step in choosing the right contract structure is to decide how much emphasis to place on competitive pricing. If speed is a priority, then direct awards may be better than competitive bidding. The choice of compensation method—for example, time and materials, cost plus, or lump sum—depends on (1) the need for cost transparency, (2) the necessity of a fixed project cost ceiling, and (3) market conditions and contractors' willingness to assume performance risks, disclose costs, and manage ongoing cost details.

Alignment with scale: Finally, the delivery model must be tailored to the project's scale—whether it's a mega project, a major project, or a medium-sized project:

Tier 1: Mega projects are strategic to business, require a very experienced team and extensive resources and governance, have a complex structure, are often the first of a kind, and may reflect high geopolitical risk.

Tier 2: Major projects are core to the business, require an experienced team and sizable resources, include moderate risks, and are similar to other current or past projects.

Tier 3: Medium projects typically extend the life of an asset, have limited risks, and demand limited resources.

Having completed this work, owners can make informed decisions about the most suitable delivery strategy (or combination of strategies) for capital projects to enhance project success and align with organizational goals.

Once the delivery method is chosen, it is just as important to determine what internal project governance model will be used to execute the project. While establishing a bespoke governance model is not cost effective, using a one-sized-fits-all approach frequently leads to cost inefficiencies and exacerbates risks. Establishing a tiered governance model with increasing requirements for larger, more complex, and high-risk projects strikes the optimal balance.

Executing projects right

There is no single perfect tool that guarantees project performance excellence. Achieving project excellence requires a robust yet flexible project execution model. This model enables owners to continuously benchmark the performance of ongoing projects, assess the maturity of governance and project controls, and evaluate the readiness of projects to advance to the next stage. By implementing a continuous performance improvement plan that includes self-assessments, stakeholder feedback, and KPI tracking, organizations can drive excellence in project execution. Required elements include:

An effective project management framework:

An effective project management framework is used to assess a project at any stage and compare relevant benchmarks to industry peers. It offers specific performance improvement actions tailored to the project's phase and details. The framework also evaluates nontechnical soft controls, such as leadership, tone, culture, accountability for outcomes, team skills, and processes for addressing disagreements and raising concerns.

Benchmarking and performance analysis:

Objectively evaluating and measuring execution performance for ongoing projects is a complex task that requires a combination of qualitative and quantitative criteria. KPMG LLP uses "Project IQ" to analyze project metrics and data; benchmark performance; and assess the health, readiness, and predictability of project success. If a tool like Project IQ is not available, starting with a limited set of defined criteria from the project stage gate and project management processes and controls can be beneficial.

Accountability:

One of the biggest challenges to project efficiency and performance, especially as projects become more complex, is ensuring accountability. Exception-based performance management drives accountability for outcomes and improves efficiency. The basic concept entails first defining the right KPIs with thresholds for each to determine when intervention is needed. Dashboards can be used for reporting to senior leaders with a clear escalation process. By aligning processes, stage gates, and reporting systems to the KPIs, project leaders can eliminate any processes, reviews, and approvals that do not contribute to the KPIs or are holding up projects.

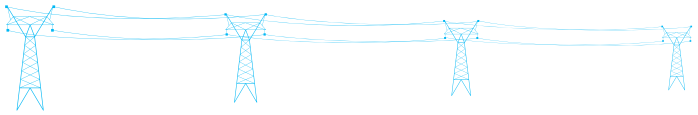
Key steps for exception-based project oversight

Focus area	Activity
KPIs and thresholds	Standardize KPIs and set KPI thresholds (Green, Yellow, Red)
Reporting and decision-making	Establish board- and C-level dashboards including a unified project and portfolio view, and identify escalation process
Exception-based triage	Evaluate projects at stage-gates (checkpoints throughout the project lifecycle) and address issues between gates through defined triage and intervention processes
Process rationalization	Evaluate process maturity and link to performance and governance, stress test established constraints and process gates, and target improvement metrics (>25% improvement feedback)
Continuous improvement	Establish peer-to-peer self-assessments and feedback, and conduct a lunch-and-learn training program monthly or quarterly

Continuous improvement and stakeholder engagement:

Reliance on the use of static, outdated, and inconsistent processes that are often ignored or bypassed can plague capital projects. By continuously tracking and monitoring project status, KPIs, and process maturity, utility companies can establish a solid baseline for measuring performance. This helps in prioritizing actions and allocating resources more effectively. New advances in analytic tools and AI are boosting the capability, effectiveness, and efficiency of continuous monitoring by automating processes, rapidly analyzing large data sets, and offering deeper insights into project trends to optimize performance.

Engaging stakeholders through self-assessments and feedback surveys provides a continuous feedback loop that helps in setting and adjusting goals. When project managers conduct self-assessments, it can lead to significant improvements and foster a culture of collaboration and ongoing improvement.



The transformative potential of adopting a strategic and efficient approach to capital projects is immense. By embracing this approach, utility companies can not only meet the unprecedented surge in electricity demand but also stabilize returns, boost reliability and safety, and ensure long-term sustainability.

How KPMG can help

The KPMG Utility Advisory practice assists clients with a broad range of complex challenges to help improve performance, mitigate risks, enable technology, and optimize their resources. Capital efficiency and performance optimization services include capital portfolio and program transformations, CAPEX efficiency and performance benchmarking, capital planning, allocation and portfolio prioritization, major project risk and readiness assessments, strategic PMO support, project and program governance, scaling project capabilities, and portfolio and project technology support.

Additionally, over the past several decades KPMG has been developing and enhancing Project IQ, a patent-pending, proprietary, cloud-based tool. Project IQ enables project leaders to evaluate a project at any point in its lifecycle, use targeted benchmarks to compare to industry peer groups, and identify performance improvement actions specific to the project phase and technical project details. The combination of quantitative and qualitative performance evaluation criteria and analytics offers an industry-leading predictive view of project performance at any stage in the project lifecycle. Project IQ also evaluates the human element of project performance by assessing non-technical soft controls such as leadership, tone, culture, accountability for outcomes, team skills, and processes for raising concerns and resolving disagreements.

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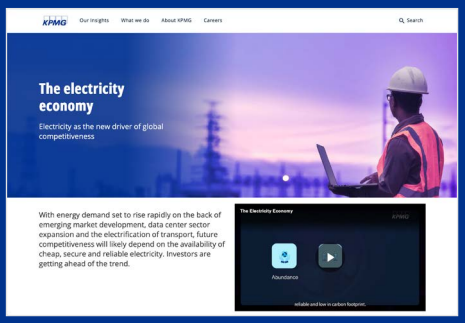
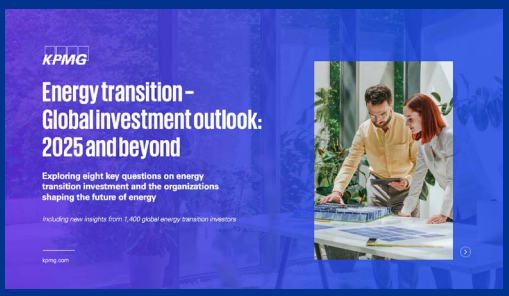


The electricity economy



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