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The new imperative for grid operators

Advanced-analytic models and solutions can help transmission and distribution companies boost operational performance to withstand mounting economic and regulatory pressure.

by Diego Hernandez Diaz, Jesús Rodriguez Gonzalez, Gonçalo Pinheiro, and Alexander Weiss

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The distribution of electricity was once a stable, seemingly risk-free business—but not anymore. Amid rapidly evolving technological, environmental, and regulatory trends, operators around the world need to make fundamental changes to their operations to stay competitive.

Pressures are mounting on multiple fronts. On top of the burden of an aging asset base, grids need to be adapted to new power flows as the energy transition progresses. At the same time, low interest rates and political pressure to keep public services affordable are driving regulators to reduce remuneration for grid operators while maintaining or raising standards for service quality. As a result, the capital remuneration allowed by regulators (in terms of weighted average cost of capital, or WACC) has shown a sharp decline in countries from Europe to the United States to Australia (Exhibit 1).

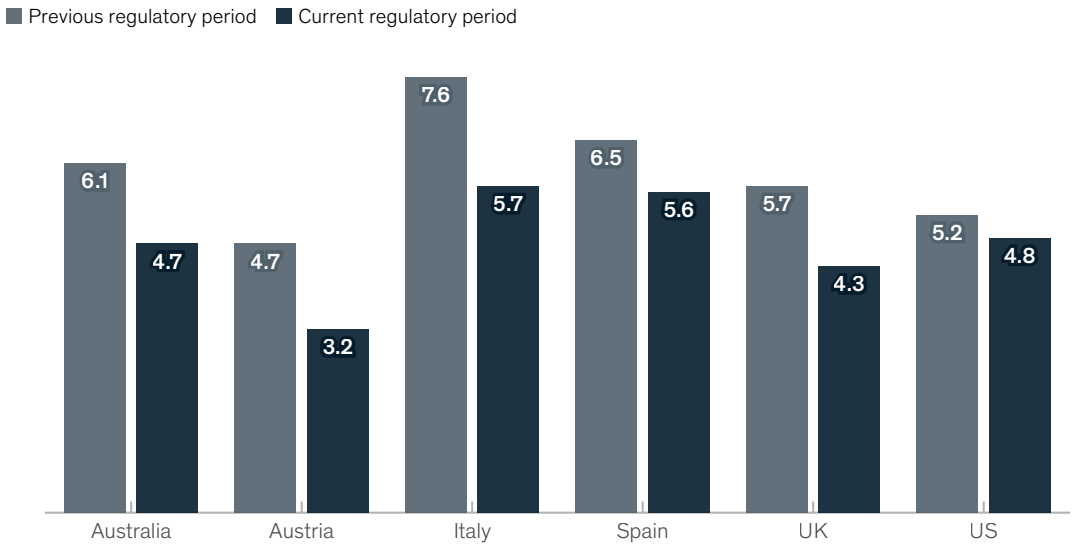
Grid operators will also share in the economic repercussions accompanying the humanitarian crisis of the global COVID-19 pandemic. In the short term, the regulated revenues of operators offer a degree of financial protection, although those in some countries may experience temporary revenue deficits. In the medium to long term, grid fees could be lowered by regulators seeking to reduce costs for customers.

The convergence of these factors is prompting the sector to renew its focus on operational performance. Benchmarking and our global industry experience show that top performers can achieve

Exhibit 1

Weighted average cost of capital has fallen sharply in many countries.

Pre-tax regulatory weighted average cost of capital (WACC), %



Note: Australian average is measured as nominal vanilla WACC for 3 Australian grid operators (Ergon, Energex, SA Power Networks). US average is measured as WACC for 3 US grid operators (Duke Energy, American Electric Power Company, PPL Corporation).
Source: AEEG; AER; ARERA; E-Control; Ofgem

impressive improvements from efforts to optimize their operational expenditure, regardless of the evolution of their regulatory asset base (Exhibit 2). For other operators wishing to follow suit, we have identified three key insights that can help them target their efforts, along with three ways to use advanced analytics to unlock their potential (see sidebar, "Extracting insights from benchmarking").

Insight 1: Quality doesn't have to be expensive

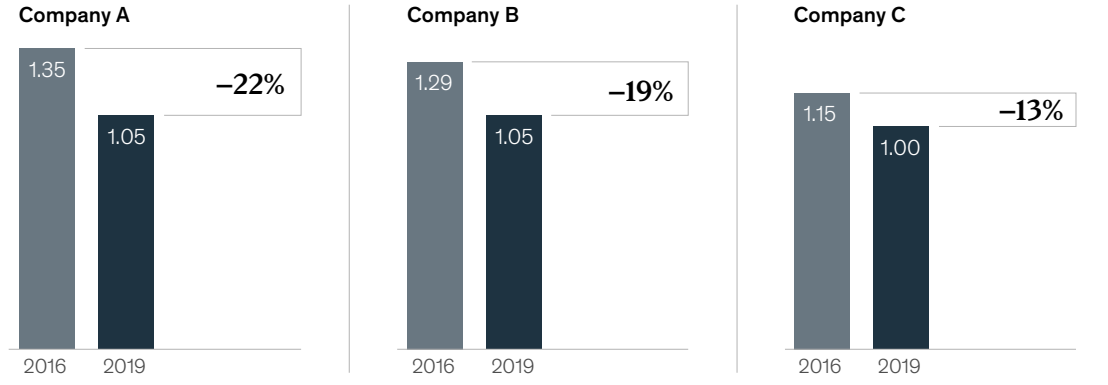
For years, operators' constant refrain has been "we need to spend to maintain quality." But while it's true that quality has a price, it needn't be costly. When we examined the relationship between two key operational drivers, totex (total expenditure: operational plus capital) and SAIDI (System Average Interruption Duration Index, a measure of supply quality), we found that top performers are able to optimize their totex while keeping their SAIDI score below that of peers with higher spending.

This insight is borne out by differences between countries and regions in the cost and quality of supply. While the East Asian operators in our sample prioritized quality over cost, for instance, their Latin American peers took the opposite approach, opting for efficiencies in spending at the expense of supply quality. However, top-performing European operators followed neither of these strategies, achieving better service *and* lower costs than their Australian counterparts did (Exhibit 3).

Exhibit 2

Top performers reduced their operating expenditure significantly in three years, regardless of the evolution of their regulated asset base.

Operating expenditure per customer, indexed,[1] % change



[1]All values are normalized to Company C's 2019 operating expenditures.
Source: McKinsey T&D Benchmark

Extracting insights from benchmarking

To act as a source of insight for operators looking to reduce operational costs while maintaining or improving service quality, McKinsey developed a benchmark for electricity transmission and distribution.

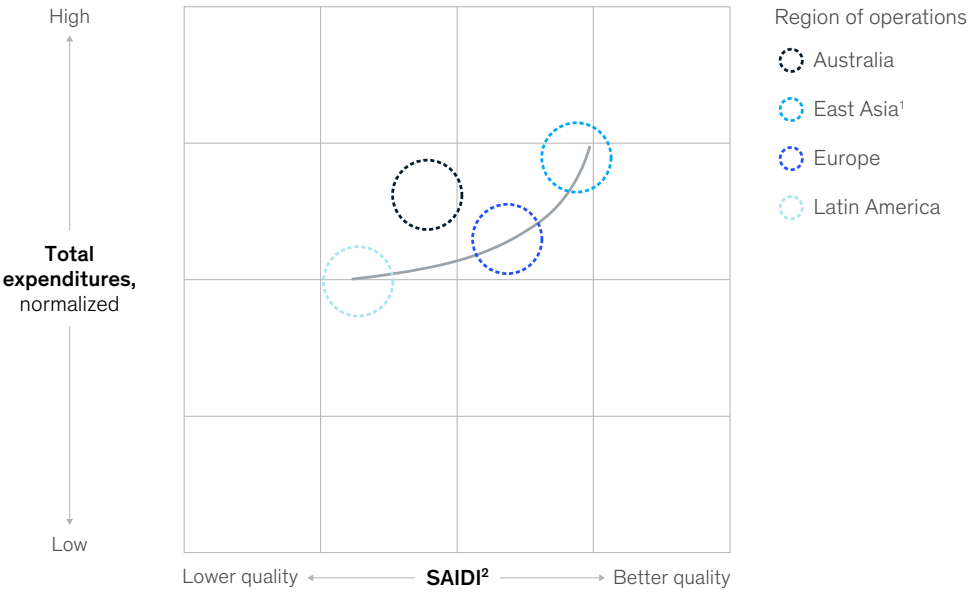
The McKinsey T&D Benchmark recognizes that operations differ widely among companies and that the sector presents a large set of variables—network length, density, and so on—that need to be corrected for. The benchmark uses advanced-analytic methods to normalize across grids and provide apples-to-apples comparisons against relevant peer sets from our database. It draws on experience as well as statistical evidence to ensure that these peer sets are genuinely comparable:

- discarding operators with structural characteristics and outliers that disqualify them as comparable peers
- normalizing at the macro level across currencies, labor rates, and inflation
- normalizing the cost base by developing "should cost"—a fair and reasonable cost determined through regression analysis

Over the past ten years, more than 110 grid operators globally have applied the benchmark to help identify areas of opportunity in operational performance, and several have gone on to initiate wholesale transformations to capture these opportunities.

Exhibit 3

Costs and supply quality vary considerably among regions.



[1]Excluding China.
[2]The System Average Interruption Duration Index (SAIDI) is a reliability indicator used to measure quality of service.
Source: McKinsey T&D Benchmark, using a peer set of 37 grid operators

Since regulators not only often track operators' performance in SAIDI and totex but also subject it to penalties and incentives, finding the optimal trade-off between quality of supply and operational and capital expenditure is a strategic imperative as well as a financial one. It can have a fundamental effect on an operator's cash flow, and ultimately on its credit rating.

Insight 2: Not all preventive maintenance is created equal

Preventive maintenance often reduces costs, but not always; our benchmarking indicates that too much of it can have the opposite effect. Whereas corrective maintenance denotes efforts to recover normal grid status after a fault or asset failure, preventive maintenance is concerned with determining or improving an asset's condition in the absence of any such event.

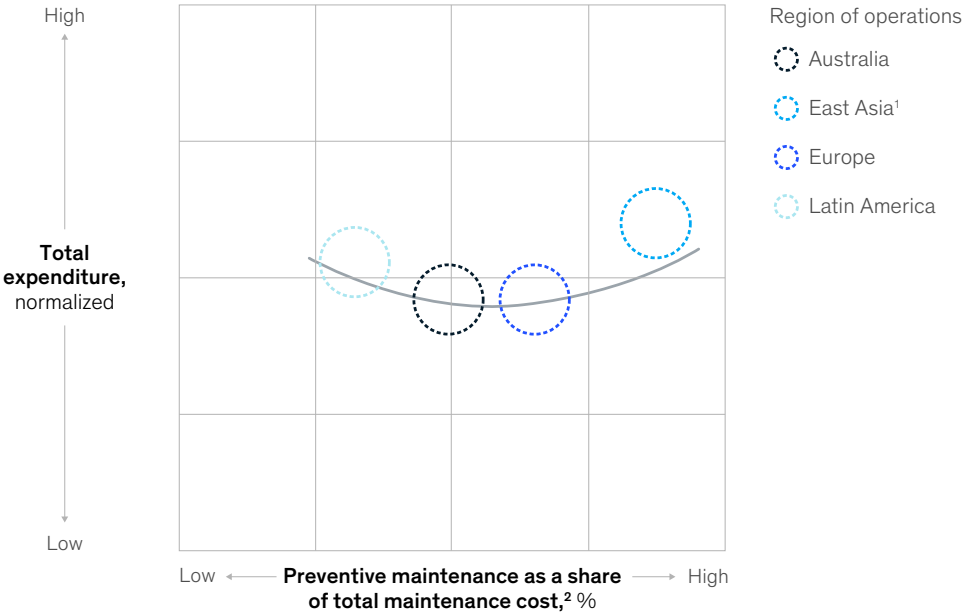
Our analysis of benchmarking data shows that achieving cost efficiency involves striking the right balance between corrective and preventive maintenance. Again, there are marked differences in maintenance strategies from one region to another. The emphasis on preventive maintenance among the East Asian operators in our sample leads to world-class supply quality, but at a higher cost. Conversely, Latin American operators' reliance on corrective maintenance harms their quality of supply (Exhibit 4).

Insight 3: Outsourcing remains effective in cutting the cost of corporate functions

Analysis of our benchmarking data reveals that top performers minimize the costs of HR, accounting, finance, and other corporate functions, and that an operator's cost optimization is highly correlated with its level of outsourcing (Exhibit 5). Some of the

Exhibit 4

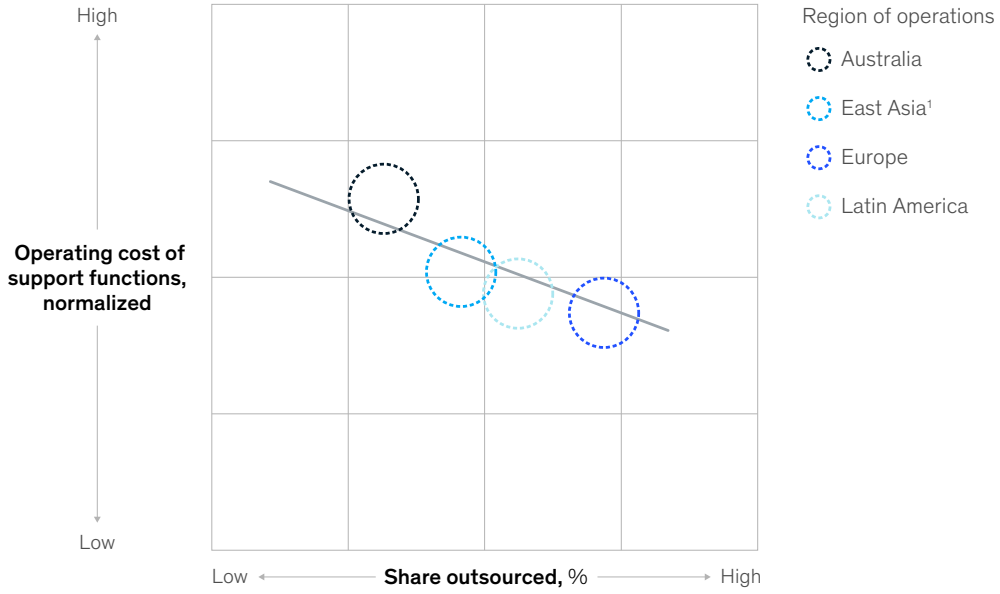
Operators need to strike the right balance between corrective and preventive maintenance.



[1]Excluding China.
[2]Total maintenance cost = preventive and corrective maintenance.
Source: McKinsey T&D Benchmark, using a peer set of 37 grid operators

Exhibit 5

Outsourcing is still effective in reducing the cost of corporate functions.



[1]Excluding China.
Source: McKinsey T&D Benchmark, using a peer set of 37 grid operators

most optimized operators have outsourcing levels in excess of 70 percent. The functions outsourced vary from one country and operator to another, depending on factors such as the local regulatory environment, labor market, and the operator's digital maturity.

However, to be effective, outsourcing must be implemented appropriately, usually as part of a broader transformation strategy. This helps grid operators capture value holistically and avoid pursuing efficiency at the expense of becoming unduly dependent on increasingly powerful suppliers for critical capabilities.[1] Without proper governance in place, operators run the risk of expending a great deal of human and financial capital on outsourcing that delivers limited returns on investment and increases business risk.

Evidence from some of the top performers in the benchmark indicates that automation is accelerating in the industry. Over the next few years, we can expect to see grid operators increasingly adopt technologies such as natural-language processing to streamline repetitive tasks and optimize support functions.

Using advanced analytics to unlock operators' potential

Our analysis of grid operators' operational and capital expenditure showed that top performers are adopting digital and advanced analytics to optimize costs, improve operations, and advance their evolution into the utility of the future. In particular, they are taking advantage of data and advanced analytics:

Inform long-term investment planning. One European operator developed a model that takes into account more than 10,000 variables, including all grid assets, current and projected generation

[1] See Calin Buia, Christiaan Heyning, and Fiona Lander, "The risks and rewards of outsourcing," August 10, 2018, McKinsey.com.

capacities and their profiles, expected load distributions and their profiles, and import and export capacities. The model can simulate the impact of external events, such as an acceleration in the adoption of renewable energy sources; calculate the effect of decarbonization and energy demand at the level of individual assets; and clarify the risks of possible grid failures, the value at stake, and possible solutions. Using the model to inform investment decisions has enabled the operator to reduce its capex by between 10 and 30 percent across a range of asset classes.

Rethink asset-management strategy. By drawing on data and technology infrastructure already available in their organizations, operators can build machine-learning algorithms that help them rethink their asset strategies, reduce opex and capex, and maintain or improve reliability. These algorithms can predict failure points in the grid to help operators direct maintenance spending to the areas that need it most. Following a benchmarking exercise to identify opportunities for improvement, one Asian operator transformed its asset management, capturing savings of 20 percent in maintenance opex and replacement capex while maintaining superior supply quality.

Provide employees with best-in-class digital tools. Network operators can improve performance and productivity in both field operations and corporate functions by equipping their workforce with advanced digital tools. In field operations, using technology to optimize high-value activities such as smart scheduling, live dispatching, and remote support can deliver considerable operational improvements. One European operator, which adopted remote-support devices and required contractors to use a mobile app that provided for remote supervision, managed to improve its success rate for critical interventions by up to 30 percent.

Grid operators can learn useful lessons by comparing their performance with that of peers and rethinking their assumptions about quality versus cost, maintenance, and corporate functions. Some leading operators are then building on these insights to drive a holistic transformation to optimize their operations. Advanced analytics and digital solutions will be key enablers in the journey to become the utility of the future.

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