BCG

Weekly Brief

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Why the Energy Transition Hinges on the Grid

In March 1900, 125 years ago, Nikola Tesla received a patent for wirelessly transmitting large amounts of power over vast distances. Sadly, his invention never proved practical, and we remain dependent on wires for power transmission.

Whether for electric vehicles, heating, the data centers that power AI, or increased air conditioning needs, electricity consumption is expected to double by 2050, according to the International Energy Agency. But generating more power is only part of the challenge—we also need a modernized, expanded grid to deliver it.

By some estimates, we'll need $25 trillion in grid investments by 2050 to enable long-term economic prosperity. As *The Economist* phrased it in 2023, we need to "hug pylons, not trees." But that's easier said than done when we can't agree on where to build out these grids and how to fund and permit them.

In the article Delivering the Energy Transition Will Come Down to the Wires, my colleagues in BCG's Energy practice explore what this means for energy and power companies and how they can tackle the scale and complexity. But the impact extends far beyond the energy sector:

- **Tough Tradeoffs for Heavy Industry.** Companies committed to reducing emissions must weigh reliability and costs. When the full expense of grid upgrades is factored in, renewable electricity may not be as cheap as once

anticipated. And rising grid fees and new pricing models based on electricity transport costs will influence decisions on where to invest in energy-intensive facilities.

- **The Economic Power of Demand Flexibility.** Companies that improve their electricity demand flexibility—adjusting usage based on variations in power availability and cost—can both improve their own economics and help ease grid congestion.
- **Big Questions for the Public Sector.** First, there's the question of prioritization. Which sectors should be at the front of the grid connection queue? Should governments prioritize speed or cost in decarbonizing energy? Second, how will we fund these critical grid investments—through higher electricity bills or taxes, or by absorbing some costs through subsidies or an extended period of cost recovery? And finally, will governments enable faster permitting to build at the needed speed and scale?

Investment Opportunities in a Grid Boom

Investors should focus on how and where capital can play a part in grid expansion to generate attractive returns. Three areas come to mind:

- **Grid Equipment and Construction.** The stock prices of some listed grid equipment companies have more than doubled in the past two years. Niche solutions that enable faster or more cost-effective grid expansion will likely be in high demand.
- **Grid Management Solutions.** As renewable energy plays a bigger role in power generation, maintaining grid stability will become both more challenging and more expensive. Curtailment and capacity solutions that help manage grid congestion could prove highly valuable. Rapidly growing companies such as Octopus Energy, Voltus, and Plexigrid are at the front edge of this long-term trend.
- **Grid Assets and Financing Models.** The sheer scale of grid investment needs will force countries to explore new financing, ownership, and commercialization models—similar to what we're already seeing with the interconnectors

that link electricity grids. Investors that understand how and where to deploy capital will benefit.

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These kinds of critical inflection points have happened before in the development of electricity transmission infrastructure. This time, the challenge is to deliver clean, secure, and affordable energy through a modern, expanded grid. It's a massive endeavor full of complexity, bringing critical questions and opportunities to businesses, governments, and investors everywhere.

Until next time,

Rich Lesser
Global Chair

Further Insights

Delivering the Energy Transition Will Come Down to the Wires

Electricity grid companies are embarking on a once-in-a-generation task to build the infrastructure needed to provide society with clean, secure, and affordable energy.

POWER THE ENERGY TRANSITION

After Global Elections, What's Next for the Energy Transition?

Although the energy transition will continue worldwide, the past year's election results around the globe have prompted many government leaders to devote more attention to energy affordability and energy security.

NEW POLICIES, NEW ENERGY

Policy Tradeoffs in the Pursuit of Green Growth

Transitioning to green energy creates a healthier planet while providing countries with job growth and greater energy security. However, governments will have to make many policy tradeoffs.

A GREENER ECONOMY

Boston Consulting Group
200 Pier Four Boulevard
Boston, Massachusetts 02210, USA