Solar energy capital

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The world is building more solar-power plants because they are getting cheaper. Since 2009, the total installed costs of solar have fallen by as much as 70 percent around the world. New power-purchase agreements frequently fall below $100 per megawatt-hour, with some reaching less than $30.4 4."Follow the sun," Economist, April 16, 2016, economist . That price puts solar at or below the cost of a new natural-gas plant.

Regulatory measures, such as the Investment Tax Credit in the United States, further support the economics of solar. In many instances, solar is often "in the money"--that is, less costly than the next cheapest alternative. A number of leading multinationals are signing solar deals not only to gain green credentials but also to lower their energy costs and diversify their sources of supply.

Given these trends, we believe that 2,000 to 3,000 GW of solar capacity--or almost half of total electric-power capacity in the world today--will be economic by 2025. Of course, solar can"t fully meet the need for electricity on its own because (among other reasons) the sun doesn"t always shine, so not all of this will be built. But a significant portion will. And that growth will transform energy markets around the world.5 5 pared with nuclear or fossil-fuel plants, solar has a much lower capacity factor--the ratio of actual to potential output--of 15 to 34 percent. Solar therefore generates fewer units of energy for every unit of capacity.

Although the future is bright, many solar companies are struggling. Downstream providers--the developers and builders of solar-power plants--have pursued growth and market share but struggled to deliver profits. In the United States, valuations of some companies fell drastically in 2015 and 2016, and there have been a number of high-profile restructurings and bankruptcies, possibly with more to come.

Macro factors also play a role. Low oil and gas prices have tested solar"s competitive position. The threat--though perhaps now more distant--of higher interest rates is another negative factor because the economics of solar projects are sensitive to the cost of capital.

In spite of these issues, we believe opportunities for growth and profit exist throughout the solar value chain. To survive the current market conditions and prosper in the longer term, downstream businesses in particular need to overcome two major challenges.6 6.We recognize that there also are challenges related to integrating solar with the electric-power grid in a cost-effective, fair, and technically efficient way. These topics are outside the scope of this article.

As more companies enter the market for solar projects, competition intensifies--and profits narrow. The solar industry is relatively young, so construction costs vary widely, with some firms experiencing severe overruns. To maintain attractive margins, the best players will drive down the cost of building a plant faster than the industry average, allowing them to grow and take market share. To do so, they must address system design and construction execution.

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System design. Systems for solar are typically designed from the bottom up. Each power plant or roof gets the perfect answer, a process that translates into high costs for labor and production. It doesn"t help that the solar supply chain is immature, and the technology itself is still evolving rapidly. Many of the sector"s engineering, procurement, and construction (EPC) companies are small, with limited solar-specific capabilities.

As the industry scales up, players should develop systems based on prefabricated components that are a very good, but not perfect, fit for a wide range of sites and that will integrate easily in the field--an approach known as "design for constructability." In addition, automation and aerial site assessments can speed up design prototyping and help firms make more accurate estimates before they put boots on the ground (or the roof).

In the case of large utility-scale projects, better up-front assessments of ground conditions can minimize rework for pile driving or trenching. Developers could prefabricate off-the-shelf units, making it possible to install them in hours rather than days for rooftops, or in weeks instead of months for large ground-mounted systems. To achieve this goal, firms will have to overhaul their supply chains to ensure that components can work with one another and should collaborate closely with EPC companies to create and deploy cost-saving ideas. The automotive industry, which uses standard designs over and over for different models, is a helpful analogy. Similarly, big-box retailers often use a handful of standard designs for their stores.

Construction execution. Traditionally, construction performance has taken a back seat to project development. But from now on, as the industry scales up and the number of projects grows, solar companies must pay more attention to execution.

Many of them struggle to finish projects on time and on budget; the resulting delays and cost overruns damage profitability and capital management. Ultimately, projects are at risk if they miss deadlines for operations and for connections to the power grid.