


Managing Risks

Strategies to reduce the impact of weather volatility

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Once an emerging industry, alternative energy has now become an international business, expanding all over the world and involving major local and global players from different classes of investors such as independent developers, large traditional utilities, private equity firms, and pension funds. Wind, hydro and solar power projects, including individual and company-specific portfolios, are becoming larger in scale and will continue to grow in the future as well.

As the wind, hydro and solar industries continue to mature, stakeholders are becoming conscious about the risks and rewards inherent to these markets as they invest greater amounts of capital than ever before. Energy production, particularly renewable energy production, is highly weather sensitive. As the renewable energy business requires large capital investments and high financial leverages, it is essential to limit the losses in revenues and profits caused by unfavourable conditions and therefore guarantee the stream of cash flows required to support the economics of each project. This applies to wind, hydropower and solar projects.

Impact of climate change

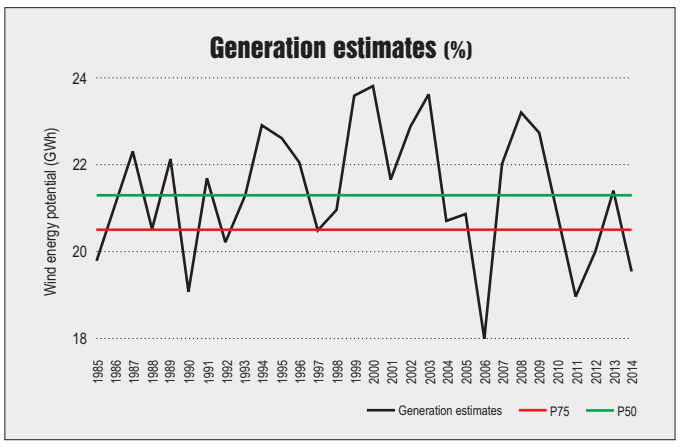
There is scientific evidence, notably from the World Meteorological Organization, that climate change is aggravating naturally occurring climate variability. The frequency and intensity of weather anomalies are increasing and companies in various sectors have started to experience more significant weather-related financial losses. Increasing unseasonal weather patterns are impacting business revenues and increasing costs.

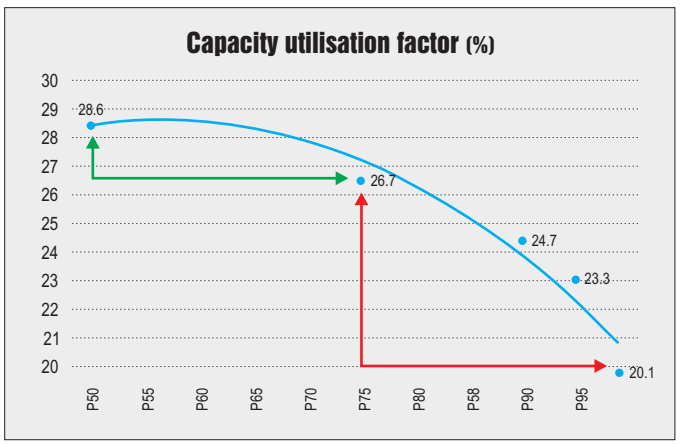
Take wind power. Wind flows, which are essentially caused by temperature and pressure gradients, are impacted by various dynamic atmospheric conditions, including multi-year climate cycles such as El Niño. These variations cause wind power generation to vary significantly from year to year. Since wind power output is determined by wind speed, the resultant wind generation and revenue generation are greatly impacted by climate variations. In shorter periods, intra-annual climate variability, such as strong heat waves and droughts, is also increasing. It is noteworthy that climate change is bringing about more intense, more frequent and longer-lasting heat waves across the world.

Financial consequences

A major issue in renewable energy projects is their costliness in the early stages. The projects are often capital intensive and highly leveraged, with 70-80 per cent financed through debt. As companies seek to scale up investments, overcoming financial risks is one of the biggest challenges. These risks increase further as projects grow in scale and complexity. Climate variability over the lifetime of a renewable project and its impact on energy yields are key to assessing the investment potential of a new project.

Weather risk management is thus essential to the renewable energy industry. It proactively manages weather-related volumetric risk by covering the industry against the adverse financial impact of weather anomalies. Index-based weather insurance is triggered when the index exceeds a predefined value. The index can be a temperature threshold, rainfall levels, sunshine duration, wind speed, or any other weather variable or combination of variables that represent the weather risk





the business is exposed to. The insurance cover is designed to compensate fully or partially for the losses incurred due to adverse weather conditions.

With respect to wind energy, wind speed variations are the main factor influencing power production. Variations in the availability of renewable energy resources account for the majority of the overall production risks. They can account for as much as 90 per cent of overall production risk, for a 20 per cent financial impact in certain regions. As data sets grow, it becomes clear that anomalous wind volume levels (solar irradiance in the case of a solar project) can persist for several years, and rainfall and periodic wind "droughts" can also be expected. This has consequences for the predictability of a project's debt repayment capacity and the expected return on investment for equity investors. Renewable energy businesses consequently have lower credit ratings as compared to other energy-related investments.

Risk diversification

Sometimes geographic diversification can reduce the overall cash flow uncertainties of the business. For example, a wind power producer may build wind farms across different states in India or a European operator may build a wind farm portfolio spread across countries. While this helps reduce volatility to a certain extent, it still leaves them exposed to the risk of inter-annual variability in regional weather systems.

Hedging weather risks

Weather risks were traditionally not managed due to limitations regarding the ability to model complex risks in a fast and cost-efficient manner with low basis risk. However, with increased weather volatility creating a market for weather risk management, and advances in technology to model them, these risks are being managed proactively. With the use of advanced modern statistical techniques, data assimilation, interpretation and post-processing model outputs, the insurance industry is now in a position to offer hedge solutions for managing weather risks. Innovative insurance-led risk management solutions are increasingly being used globally to reduce the risk and cash flow uncertainties of diverse renewable energy and related businesses. Innovative weather risk transactions are now being configured in the US, Latin America, Europe, China and Australia, around significant exposures arising from hydrology, wind and solar irradiation exposures.

A proactive approach in managing weather risk in renewable energy businesses helps project developers seek better credit ratings, leading to better lending terms from financial institutions and financial markets. This is essentially achieved through a risk re-review and repricing of term borrowing as projects move from the project development or construction risk stage to the steady operations phase. These benefits can flow by way of renegotiation, refinance or access to the corporate or green bond market.

Advantage of insurance contracts

By entering into an insurance contract for protection against low wind, the risk of low revenues can be addressed. The insurance cover acts as a loss of revenue or loss of profit policy, which is not linked to asset impairments but to a drop in revenue generation based on weak resource availability during a given period.

This helps the project cash flows and economics in two ways. The insurance cover provides for the shortfall in revenue generation based on risk modelling done by specialist insurance broker and insurance companies that offer such products. This improves the minimum debt service coverage ratio (DSCRs), a very important parameter in the business plan. By improving the DSCRs, projects are able to secure better loan pricing.

Besides, renewable energy developers need to replenish their capital to keep developing new projects. Better risk management opens up avenues to realign debt repayment to the long life cycle of renewable energy projects by broadening the access to long-term capital such as refinancing with longer repayment schedules, or by enabling access to bond markets backed by enhanced credit ratings.

For equity investors, the possibility of internal rate of return (IRR) downside is curtailed since the minimum gross cash flows from operations together with insurance cash flows now have a higher threshold. ■

Hedging wind variability risks

Wind farms can face high uncertainty in wind resource availability, which can have high variability from year to year. Empirical studies show that climate changes have increased the volatility of wind resource availability, which, in turn, adversely impacts annual cash flow variability. Poor wind years, particularly during the initial stages of a project, can significantly derail free cash flow generation (after debt principal and interest servicing). This can severely curtail the reinvestment capacity of project developers and in a worst-case scenario cause them to default on the timely servicing of debt repayment and interest dues.

A wind farm's generation is estimated in terms of its exceedance probability. This is determined by simulating wind power generation over a long period (typically 30-year historical wind data). A P50 estimate refers to the 50 per cent probability that generation will be above or below this estimate. Similarly, P75 refers to 75 per cent probability that there is 25 per cent probability that generation will be below this estimate. A drop in generation estimates is much steeper from P75 to P99 as compared to P50 to P75. As is evident from the accompanying charts, during low wind years, when generation is below P75, the drop in generation is much steeper.

If such low wind years occur during a project's initial stages, when it still has significant debt repayment obligations, it impacts project economics in two ways. First, debt servicing can get stressed during these low wind years. Second, free cash flows during the initial years are attenuated, thereby adversely impacting the equity IRR.