Techno-Economic Solution for Semi-Dispatchable Solar

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Solar power generation is subject to the natural unpredictability of local weather conditions, particularly intermittency of cloud cover. If solar generation is directly coupled to the grid, system control would have little control of power to the system. Therefore, a significant solar capacity installed can have a negative potentially impact. The paper presents the use of an energy storage device, coupled with a forecasting mechanism, to convert solar into a more predictable, semi-dispatchable input. The stochastic nature of the solar output is characterized and fed into the power system in half-hourly profiles obtained utilizing weather forecast data and past trends. The random deviations that would not be categorized by the prediction are mitigated using the energy storage device which assists in adhering to the pre-scheduled infeed, dependent on predicted weather attributes. The forecasting mechanism comprises of solar irradiation, recent energy trends and five weather attributes: humidity, cloud cover, precipitation, visibility and gusts. Results show that an accuracy of 88% could be achieved for the half-hourly predictions. The use of a battery of 15% allows the predicted hourly energy to be quite accurately fed during the day, giving around 93% for the daily energy prediction.

Keywords: Solar Intermittency, Battery Storage, Semi-Dispatchable, Forecasting