

Short term PV Power Forecasting for Demand Response and Storage Control in Smart Grid Energy Management

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The large scale penetration of photovoltaic power into sub-transmission and distribution grids can have a significant impact on a power system's operation and stability because of inherently variable generation and weather dependent energy resources. It is well known that a sudden change in sunlight can initiate a rapid disconnection or reduction in a PV generating capacity. As the penetration of PV increases, this can lead to a problem of voltage variation and transient voltage instability in the case of a weak coupling with the grid. The large-scale penetration of PV units also has an impact on the short-term voltage and transient stability of a system, which is not only restricted to the distribution network but also influences the whole system. Solar photovoltaic forecasting can be used to mitigate these problems and provides the appropriate storage control and reduces the requirements of additional generating stations.

In this work, fuzzy logic based one hour ahead short term forecasting of solar photovoltaic (PV) power using meteorological parameters is developed and presented. The solar photovoltaic power is forecasted using solar irradiance, ambient temperature, wind speed, humidity and type of the day or sky conditions as input parameters. The real data of PV plant has been used for the training, testing and validation purpose. The obtained results are evaluated on the basis of statistical indicators including RMSE, ARE etc. The results of the proposed models are found better as compared to the existing models for different climatic zones. Further, the obtained results have been used for the demand response, storage control applications in the smart grid energy environment.

Biography

Dr. M. Rizwan received the Ph.D. degree in power engineering from Jamia Millia Islamia, New Delhi, India in 2011. He is presently associated with Delhi Technological University, Delhi, as Assistant Professor in the Department of Electrical Engineering. He has published/presented more than 60 research papers in reputed international and national journals and conference proceedings. Dr. Rizwan has been awarded three research projects in the area of renewable energy systems and power quality. He is the recipient of UGC research award for the period of 2014-2016. Also he has been awarded Raman Fellowship for Post-Doctoral Research for Indian Scholars in USA for the Year 2016-17. At present he is pursuing his post-doctoral research at Virginia Polytechnic Institute and State University, USA. His area of interest includes power system engineering, renewable energy systems particularly solar photovoltaic, building energy management, smart grid and soft computing applications in power systems. He is Sr. Member IEEE, Life Member, ISTE, Life Member SSI and many other reputed societies. He is also associated with many journals including IEEE Transactions, International Journal of Elec-trical Power and Energy Systems, Renewable and Sustainable Energy Reviews (Elsevier), International Journal of Sustainable Energy (Taylor and Francis) in different capacities.

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