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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Application of solar radiation forecast for the management of a mixed PV-biomass power plant: a preliminary evaluation.

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The increased contribution of renewable sources in the frame of national electric energy production - strongly driven by the 20-20-20 targets dictated by EU - is leading to criticalities on the transmission grid. The main issue is associated to the high variability – and thus to the high forecasting uncertainty - of the renewable energy production. The troublesome effect of such a condition consists in the resulting unbalance between power demand and power bid which may arise within the grid in case of an unforeseen production of wind or photovoltaic power. These kinds of energy sources are in fact characterized by priority dispatch with respect to the other ones (apart from possible critical scenarios in which the network safety may be compromised), and they cannot be modulated in other ways than either a drastic reduction of the power supply or, in worst cases, a power plant shedding.
The capability of an early forecast of the future production of plants that are spread all over the Italian territory allows the Transmission System Operator (TSO) to enhance the planning and management of the energy reserve, which leads, as an example, to the avoidance of a forced shedding of power supply from renewable energy plants, with a corresponding saving of energy reserve correlated costs.
This is one of the issues which drove the emanation of a Governmental Rule that introduce the concept of “system with predictable input energy profile”. According to this definition, the RE producer should supply an hourly power prediction for the next day within an imposed limit to the forecast error. For the solar source, the radiation forecast, at the state-of-art, is not enough to provide a reliable prediction of the energy profile. In order to get over the problem, a solution could be a mixed solar-biomass power system, where a programmable source (biomass) could compensate the effects of meteorological forecast uncertainty.
A technical-economical model has been developed to simulate the capability of compensating the effects of meteorological forecast uncertainty when a photovoltaic plant is coupled with a programmable production one (e.g. a biomass plant). The simulation has been based on the radiation forecasts provided by a numerical prediction model coupled with a diagnostic radiative transfer model for a whole year. The performance of the solar radiation forecast has been evaluated with the measurements on two Italian sites: Milan and Catania.
The paper demonstrates that such a coupling strategy leads to the achievement of desired performances in terms of forecasting errors in accordance with the Rule. However this solution generates an economical loss associated to the income reduction caused by the modulation of biomass production.