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Setting the problem of energy production forecasting for small hydropower plants in the Target Model era

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The highly-competitive electricity market over EU and the challenges induced by the so-called “Target Model”, introduce significant uncertainties to day-ahead trades involving renewable energy, since most of these sources are driven by non-controllable weather processes (wind, solar, hydro). Here, we explore the case of small hydropower plants that have negligible storage capacity, and thus their production is just a nonlinear transformation of inflows. We discuss different forecasting approaches, which take advantage of alternative sources of information, depending on data availability. Among others, we investigate whether is it preferable to employ day-ahead predictions based on past energy production data per se, or use these data in order to retrieve past inflows, which allows for introducing hydrological knowledge within predictions. Overall objective is to move beyond the standard, yet risky, point forecasting methods, providing a single expected value of hydropower production, thus quantifying the overall uncertainty of each forecasting method. Power forecasts are evaluated in terms of economic efficiency, accounting for the impacts of over- and under-estimations in the real-world electricity market.