Hydropower Energy Simulation Using Mike 11 Model: A Case Study in South Germany's Small Run-Of-River Hydropower Plants

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Abstract. Renewable energy production is a basic supplement to stabilize rapidly increasing global energy demand and skyrocketing energy price as well as to balance the fluctuation of supply from non-renewable energy sources at electrical grid hubs. The European energy traders, government and private company energy providers and other stakeholders have been, since recently, a major beneficiary, customer and clients of Hydropower simulation solutions. The relationship between rainfall-runoff model outputs and energy productions of hydropower plants hasn't been clearly studied. In this research, association of rainfall, catchment characteristics, river network and runoff with energy production of a particular hydropower station is examined. The essence of this study is to justify the correspondence between runoff extracted from calibrated catchment and energy production of hydropower plant located at a catchment outlet; to employ a unique technique to convert runoff to energy based on statistical and graphical trend analysis of the two, and to provide a working environment for energy forecast task.For rainfall-runoff model setup and calibration, MIKE 11 NAM model is applied, meanwhile MIKE 11 SO model is used to track, adopt and set a control strategy at hydropower location for runoff-energy correlation. The model is tested at two selected micro run-of-river hydropower plants located in South Germany. Two consecutive calibration is compromised to test the model; one for rainfall-runoff model and other for energy simulation. Calibration results and supporting verification plots of two case studies indicated that simulated discharge and energy production is comparable with the measured discharge and energy production respectively.

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