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Abstract (677 Kb)

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Electricity Price Forecasting by Linear Regression and SVM

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***Abstract*— Power system has appeared as a complex interconnected network due to competitive business environment. Power producers and consumers obligate for a precise price forecasting, as this information is an important part of decision making process. Decisions, regarding optimal scheduling of generators, bidding tactics and demand side organizations are based on price forecast. In recent years, development of new approaches for short term price forecasting has attracted the interest of the researchers. Electricity as a commodity consists of some distinct features that, firstly it can't be stock piled & secondly the volatile nature of the electricity price. With these two issues, forecasting of electricity price becomes an intimidating task for system planners and designers. This paper presents a hybrid approach based on linear regression and Support Vector Machine (SVM) to forecast short term electricity price. Linear Regression patterns are developed with the help of different factors of historical data of the electricity price. Two philosophies are developed with the combination of different factors. It is observed that method of similar days is effective. Further forecasted results of the regression models are given to SVM based supervised learning model which have tuned by Particle Swarm Optimization (PSO) technique. It is observed that proposed hybrid approach shows better accuracy as compared with others.**

Keywords—Historical electrcity price data, linear regression, SVM.

I. INTRODUCTION

Price forecasting has become an important issue in competitive electricity markets because of the trading of the electricity as a commodity. Price of the electricity is volatile in nature because it cannot be stored economically and due to transmission line congestion. Transmission line congestion prevents free exchange of electricity price amongst the control areas. Price forecasting is essential for every Generating company (Genco) in restructured electricity market as it indicates market situations. Electricity price forecast is important for two market players; first one is Independent System Operator (ISO) and second is Genco. However, the objectives of these two players for forecasting are different. ISO determines Market Clearing Price (MCP) through forecasting. The process for ISO is much simpler as price can be numerically computed through bids. Hence, the forecasting accuracy for ISO had not much important. On the other hand, the Genco needs information of MCP, Zonal Market Clearing Price (ZMCP) and Location Marginal Price (LMP) for submission of bids. A Genco has very limited knowledge about other Gencos and would only rely on the historical information of MCPs and load patterns. Hence, the forecasting accuracy plays a crucial role in the determination of bidding strategies and for set up bilateral contracts. A bid closer to MCP would results in profit. Gonzalez et al. [1] have proposed a logistic smoothed transition regression, which showed a regime- switching for periods of structural change. Martinez-Alvarez et al. [2] have presented a model using a clustering technique where the groups and labels of the samples from data collection were set. In this approach the pattern sequence of the data was extracted first. Then, by averaging of all the sequential samples from the historical data, prediction was calculated. A two stage multiple SVM based midterm forecasting hybrid model of the electricity (MCP) was proposed in [3]. A hybrid methodology based on set of Relevance Vector Machine (RVMs) was adopted for individual ahead-of-time electricity price prediction by Alamaniotis et al. [4]. In [5], authors proposed a recurrent neural model for day ahead deregulated electricity market price forecasting. This method was realized by using Elman network which has a single compact and robust architecture. Wan et al. [6] proposed a hybrid approach to construct forecast intervals of MCPs of two stage formulation in which Extreme Learning Machine (ELM) was taken into habit to estimate point forecasts MCPs and noise variance were estimated by the maximum likelihood methods. A novel method based on a two-stage hybrid network of SOM and SVM was proposed by Fan et al. [7].

Authors in [8] presented a novel hybrid intelligent algorithm employing a data filtering technique based on WT, firefly algorithm and a soft computing model based on fuzzy ARTMAP (FA) network in order to forecast day-ahead electricity prices. Yan-Gao *et.al.* [9] have trained the SVM by Genetic Algorithm for electric price forecasting. Sarikpruecket.al. [10] proposed a hybrid method for very short term market price forecasting to enhance forecast accuracy on both non-spike and spike wholesale market prices. Four

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