International Journal of Innovative
Computing, Information and Control
Volume **6**, Number **9**, September **2010**

 ISSN 1349-4198
pp. **4203–4218**

LOCALLY LINEAR NEURO-FUZZY (LLNF) ELECTRICITY PRICE FORECASTING IN DEREGULATED POWER MARKETS

Majid Abdollahzade[1], Mohammad J. Mahjoob[1], Reza Zarringhalam[2] and Arash Miranian[3]

[1]School of Mechanical Engineering
[3]School of Electrical Engineering
University of Tehran
Tehran, Iran
m.abdollahzade@gmail.com; mmahjoob@ut.ac.ir; ar_miranian@yahoo.com

[2]School of Mechanical Engineering
Sharif University of Technology
Tehran, Iran
r_zarringhalam@mech.sharif.edu

Received March 2009; revised October 2009

Abstract. *The disguise of traditional monopolistic electricity markets into deregulated competitive ones has made 'price forecasting' a crucial strategy for both producers and consumers: for the producers, to maximize their profit and hedge against price volatilities and for the consumers to manage their utility. Electricity price forecasting has thus emerged as a progressive field of study and numerous researches have been conducted to improve and optimize the price forecast methods. This paper proposes a precise and computationally efficient method to perform price forecasting in deregulated power markets. A locally linear neuro-fuzzy model is developed for price forecasting. The model is trained by a locally linear model tree (LOLIMOT) learning algorithm. An appropriate input selection based on correlation analysis is considered to develop the model. In order to investigate the performance of the proposed model, three major power markets almost serving as global benchmarks for price forecasting studies are tested and the results are verified using real observed data for various forecasting scenarios. Furthermore, the performance of the suggested model is comprehensively compared to the most recent studies available in the literature using various assessment criteria. Comparisons demonstrate the superiority of the proposed model, in terms of its performance and accuracy, for application in real world forecasting problems.*
Keywords: Electricity markets, Electricity price forecasting, Locally linear model tree algorithm, Locally linear neuro-fuzzy model

1. **Introduction.** Starting from Chile in 1982, transition from monopolistic vertically integrated power systems to competitive electricity markets has already swept many countries around the world. Such reconfiguration incorporated competition into deregulated power markets, aiming at reducing energy prices.

A restructured power system is mainly comprised of generation, transmission and distribution companies as market participants, and an independent system operator (ISO) which runs and supervises the market. In a traditional setting, all of these were jointly managed by a single, usually state-owned utility.

Due to the rise of competition in power industry, electricity has turned into a commodity which can be traded at market prices. In this context, electricity prices are determined by a variety of market mechanisms, rather than cost-based engineering calculations. The pool and bilateral contracts are two types of dominant trading strategies in the deregulated