

# Discussion on the manuscript: ‘short-term forecasting of the daily load curve for residential electricity usage in the smart grid’ by S. Ghosh et al.

## 1. Introduction

The paper presents a novel statistical model for residential load forecasting in the presence of dynamic pricing. The paper is of great importance and timely because dynamic pricing has been increasingly introduced by various utilities to reduce the peak load. As the authors mentioned, the paper is the first of its kind to address the problem of price-sensitive residential load forecasting based on real data.

The paper is very well written and is relatively easy to follow. It is also technically solid. The rigorous experimental results on the OlyPen project data for the years 2006–2007 are presented.

I thank the authors for this significant contribution on price-sensitive load forecasting, which could be much useful in the up and coming deregulated and dynamic electricity markets.

## 2. Discussions on each section

In the following, there are my discussions on each section of the paper and my humble suggestions for the authors to consider in the future extension of this research work.

### 2.1. Section 2: Discussion of related work

The related work section covers various statistical methods on load forecasting and offers much knowledge to the readers.

To my best knowledge, Khotanzad *et al.* [1] was one of the pioneering works in price-sensitive load forecasting. (However, their experiments used simulated data instead of real data.) It would be beneficial to the readers if this work is briefly discussed in the related work section.

In addition, it is observed that the load forecasting techniques based on modern ‘machine learning’ methods are not covered. In my humble opinion, machine learning methods based on artificial neural networks [2, 3], fuzzy logic [4], neuro-fuzzy methods [1, 5], and support vector machines [6] should also be covered to provide a more complete picture of the technological landscape of load forecasting.

### 2.2. Section 3: A model for price-sensitive electricity load and Section 4: The load model as a hierarchical dynamic linear model

Although technically rigorous and well written, the detailed technical ideas described in Sections 3 and 4 are quite abstract and difficult to grasp. If the authors could provide some toy examples (space permitting) to supplement the mathematical equations, it would greatly help the lay readers, who are not very strong in statistics and mathematics.

### 2.3. Section 6: Application to olympic peninsula load data

RTP customer group, with 30 customers who receives dynamic pricing information every 15 min, is the group of interest in the experiment.

It would be very interesting to see the effect of dynamic pricing on the forecasting results in terms of mean absolute percentage error (MAPE). This can be performed by comparing the results of the price-sensitive model to those of the

ordinary one that assumes static pricing (while using the same settings in all the other aspects). I hope that the price-sensitive model would give lower mean absolute percentage error results than the static-pricing model. Alternatively, this can also be performed by comparison of the results of the real-time transport protocol group against those of the other groups, which were subject to static pricing.

In addition, it would be interesting to see the comparison of the results of the method presented in the paper against those of at least one of the other state-of-the-art load forecasting methods. Although all of the existing load forecasting methods do not explicitly take price signals into account, some of them are smart enough to implicitly detect and adapt to the changes of the trend due to unknown factors (may it be price changes or other factors).

I acknowledge that performing comparisons with the other methods can be a difficult task as there are very few freeware available for load forecasting. Also, many of the existing load forecasting methods described in various journal/conference articles cannot be easily re-implemented. However, fortunately, there exists a few papers that can be re-implemented with relative ease. To my knowledge, the paper by Martínez-Álvarez *et al.* [7] is an example of such a paper.

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