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Forecasting Natural Gas Demand for Electric Power Generation

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PROJECT TITLE: Forecasting Natural Gas Demand for Electric Power Generation
FACULTY NAMES: Ronald Brown, George Corliss, and Richard Povinelli, Department of Electrical and Computer Engineering
STUDENT NAME: Paul Kaefer, Computational Sciences Master's Student

INTRODUCTION

Forecasting energy demand allows energy utilities to predict the load on their systems in the near future. This enables utilities to better plan their operations. Implications arise for plans that forecast lower or higher expected demand than the actual energy demand. For natural gas forecasting, these implications include the need to shut off customers when the forecast was too low to meet actual demand, or pay high storage costs, when the forecasted demand was higher than the actual. As a result, energy utilities have a high incentive to make accurate forecasts.

Historically, the most common use of natural gas has been heating[1]. This behavior has patterns that help in the development of forecasting models. Natural gas is increasingly being used to generate electricity, and is expected to continue to do so in the future[2]. As a result, natural gas utilities need to adapt their forecasting techniques to reflect the behavior of customers that use natural gas in power generation, since their use of natural gas is very different from the behavior of other users.

SIGNIFICANCE

Marquette University's GasDay Project works with about 30 natural gas distribution companies and delivers a software package that uses forecasting models to help these utilities predict natural gas demand. Utilities have several different types of customers with different behaviors that add to the complexity of the forecasting problem. Power generation customers are a class that behaves in different ways than other residential, commercial, or industrial customers.

FORWARD THINKING/INNOVATION

This research is innovative because forecasting how much natural gas will be used to generate electricity is a difficult problem that has not been widely studied. Since many energy utilities work in both the natural gas and electric power markets, this research could help expand the GasDay product offerings. GasDay supports a number of graduate and undergraduate students, and research like this enables the project to grow and continue to support students.

STUDENT INVOLVEMENT

Paul Kaefer, Graduate Research Assistant at Marquette University's GasDay lab, will take the lead on this project with the support of Drs. Brown, Corliss, and Povinelli, professors on the GasDay Project. Mr. Kaefer will review the current literature to gain a better understanding of all the factors involved in this problem. Mr. Kaefer will then develop models, with the collaboration of the aforementioned professors.

REFERENCES

1. Brown, R.H.; Kharouf, P.; Feng, Xin; Piessens, L.P.; Nestor, D., "Development of Feed-Forward Network Models to Predict Gas Consumption." Neural Networks, 1994. IEEE World Congress on Computational Intelligence., 1994 IEEE International Conference on, Vol. 2, pp. 802-805, 27 Jun-2 Jul 1994.
2. U.S. Energy Information Administration, Annual Energy Outlook 2013, http://www.eia.gov/forecasts/aeo/index.cfm. Accessed November 1, 2013.