USING DATA VISUALIZATION TECHNIQUES TO UNDERSTAND AND COMPARE ALTERNATIVE RATES IN A COMPETITIVE MARKET

Michael Becker, RLW Analytics, Inc.

Jedd Parker, RLW Analytics, Inc.

James A. McCray, RLW Analytics, Inc.

ABSTRACT

With the approaching competition in the electric utility industry, large commercial and industrial energy customers must be able to quickly evaluate their energy costs, both electric and gas, under a wide variety of alternative rate schedules. The large energy customer will have the ability to "shop around" for the energy provider and rate which best suits the customer's current and anticipated energy consumption patterns. RLW Analytics, Inc. has developed the proof of concept for a visually based tool for the comparison of hourly energy costs under different pricing scenarios. The Visualize-IT™ Rate Analysis Tool will utilize high resolution hourly or 15 minute interval demand data along with various proposed rate schedules to aid in determining the best rate for a customer's particular energy usage pattern. Tools for comparisons, i.e. "What if" scenarios, are also possible and could be used to assess the effect of shifting load off-peak, adding new load due to new processes or reducing load due to removing processes. Verification of historical billing will be an additional function of the program. Data visualization techniques are used to better understand the differences between pricing proposals and intelligently plan energy cost reductions.

INTRODUCTION

As markets open in the new competitive electric utility industry, large commercial and industrial energy customers or entities representing aggregated groups of customers must be able to quickly and easily evaluate their energy costs, both electric and gas, under a wide variety of alternative rate schedules. The large energy customer will have the ability to "shop around" for the energy provider and rate which best suits the customer's current and anticipated energy consumption patterns. Understanding energy consumption patterns, both on a daily basis and over extended periods of times (seasons) will be paramount in obtaining the most economical energy costs for such customers. A set of tools for the analysis of rate offerings and their cost benefits is required for such understanding.

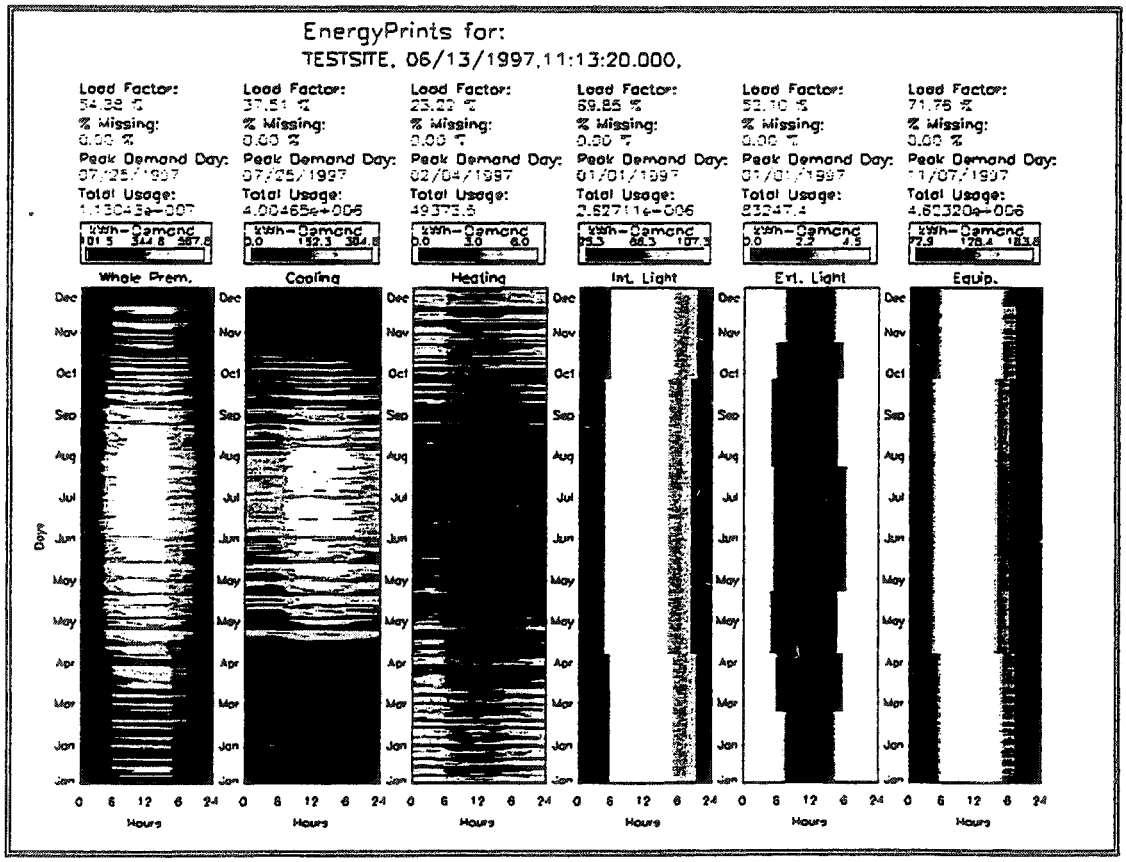
In order to evaluate options effectively, customers must have the data (electric or gas consumption and rate schedules) and, more importantly, a tool which can turn that data into useful information. Along with the bottom line total energy cost, the incremental cost of hourly (or finer) usage patterns would allow customers to have a fuller understanding of their particular energy costs. RLW Analytics, Inc. has developed the proof of

concept for a visually based tool to be used in the evaluation of hourly energy costs under different pricing scenarios. The Visualize-IT™ Rate Analysis Tool utilizes high resolution hourly or 15 minute interval electric or gas demand (CCF or kW) data to aid in determining the best rate for a customer's unique energy usage pattern. This paper details a proof of concept for the continued development of the software and process.

UNDERSTANDING ENERGY USAGE PATTERNS

Understanding energy usage patterns will become increasingly important as customers evaluate different rate offerings or real time pricing. Current electric rate schedules for large customers are often based on both the total energy consumed as well as the peak demand during various time periods. Future rate schedules and real time pricing may demand hour by hour price variation and require a more thorough understanding of the corresponding hour by hour energy consumption at a site or group of sites. RLW's Visualize-IT software currently provides an EnergyPrint™ which is developed using interval consumption (kW or CCF) data collected on 5, 15, 30 or 60 minute intervals and allows for a quick qualitative evaluation of energy usage patterns. A more quantitative analysis of energy usage patterns is also available. Figure 1 shows EnergyPrints for the whole premise and several end uses for a simulated site. In the EnergyPrint, the days of the analysis period (usually 365 days) are on the vertical axis, the hour of the day is on the horizontal axis, and the interval demand is color coded based on its level with lighter colors representing higher energy consumption for the interval. Each end use has its own legend indicating the range of demands for that end use. By examining the EnergyPrint the analyst can become familiar with the energy usage patterns of the facility in question. By associating costs with the hourly interval data, a "CostPrint" can be developed which shows the energy cost patterns for the site.

Figure 1: EnergyPrint Showing Hourly Energy Consumption



ANALYSIS OF RATES

As stated above, both demand data and rate schedules will be required to develop a full analysis of the benefits of particular rate offerings from energy providers. "Cost patterns" which combine the energy consumption and the rate schedules will be the basis for evaluating offered rate schedules. The envisioned tool will enable an analyst to access existing rates, as well as add new rate offerings, and create side by side qualitative and quantitative comparisons of the various rate schedules as they relate to the analyst's unique site or sites. A "bottom line" energy cost for each rate under analysis would be provided. Analysis tools for further quantitative analyses would give a more complete understanding of energy cost by enabling the analyst to see how hour by hour energy consumption at a site relates to the total energy cost. With the appropriate process or end use level data, the analyst could evaluate the energy costs allocated to the various processes at the site as well. An additional potential use of the program would be to verify current billings based on actual consumption and current rate schedules.

"WHAT IF?" SCENARIO EVALUATION

The next step in the analysis of the energy consumption of a site is to examine "What If?" scenarios of adding or deleting new processes and loads or the shifting of processes or loads to alternate time periods based on the rate schedules under scrutiny. The evaluation of energy costs would be an integral part of the overall analysis of the economic benefits or costs of shifting a particular part of an operation from a "peak" to an "off peak" time period or vice versa. In addition, the energy cost savings associated with upgrading to more efficient equipment could also be performed, thus improving the accuracy of the cost justification of such upgrades. These energy cost analyses could be based on current and alternate rates.

EXTENSION FROM PROOF OF CONCEPT

The current software is based on simple rate structures and requires enhancement. Rate schedules such as time of use and consumption plus demand charges are currently included in the program, but more complicated rates currently exist in the market place and could be incorporated into the toolset. In addition, the development of the "What-If?" scenario tool is not complete. Other additions to the software are seen as either necessary or preferable. Several steps would be required to move the current proof of concept software to a complete and robust software package. These steps include:

- Interfacing with Existing Rate Databases
- Development of a "Rate Wizard" for entering new rate schedules for use in analysis
- Completion of the "What If?" scenario tool
- Expansion of toolset based on individual customers' needs

Each of these steps are discussed below.

Interfacing with Existing Rate Databases

In order to provide the most extensive selection of rate schedules, the toolset will draw on already existing rate schedule databases. Such data bases are available from Electric Power Software, Utility Marketing Services, Energy Interactive, and Mykytyn Consulting Group, Inc. An alternate approach may be the incorporation the CostPrint and related functions into existing software offered by these companies.

Development of a "Rate Wizard" for New Rate Schedules

As the competitive utility industry continues to evolve, new rate schedules will become available. The toolset will be able to perform analyses using these new rate schedules through the "Rate Wizard". This tool will enable the inputting of new rate schedules for use in analysis. The rates could allow for a 8,760 hour rate schedule, schedules based by time period, season, or many other groupings currently used in the industry.

Completion of the "What-If?" Scenario Tool

The "What-If?" scenario tool currently does not have all the capabilities that are envisioned for a fully functional tool. Further development is required for the load shifting and other functions. These functions will be supplemented using existing concepts as well as those from potential users of the package.

Customization of the Toolset

Ongoing development of the toolset will be possible by implementing ideas and input from users and potential users. Customization of the toolset improves the overall functionality and completeness of the process of the rate analysis.

CONCLUSIONS

The Visualize-IT Rate Analysis Toolset will enable better understanding of the merits of the various rate schedules that will become available in a competitive market. The tool will enable:

- A more complete understanding of the energy usage patterns of a customer's site or group of sites and the cost ramifications of those usage patterns,
- Ability to analyze the benefits of available rate schedules can be performed,
- Exploration cost benefits of load shifting using existing or proposed rate schedules, and
- Cost savings information for justification of upgrading the efficiency of equipment