

AN OUNCE OF PREVENTION...

TO MEET THE DEMANDS OF THE NEW MODEL FOR THE ELECTRIC POWER SECTOR, CEMIG HAS DECIDED TO REFINE ITS ENERGY DEMAND FORECASTS AND ADOPT A SYSTEM TO ACHIEVE PRECISION AND FLEXIBILITY **BY SOLANGE CALVO AND BIA ALVIN**

After facing rationing in 2001, the companies in the electrical power sector are confronted with the challenge of adapting to a new model for the industry that was established by that country's federal government in March 2004. One of the pillars of this design, the rules for buying energy from distributors, requires an extremely high degree of accuracy in load forecasting. In order to enhance the accuracy of its forecasts, the distribution area of Cemig (Companhia Energética de Minas Gerais) has opted to adopt a complete system for projecting demand, combined with a tool for homogenizing the information obtained from disparate databases.



New model for the electric power sector drives the adoption of technology capable of performing analyses and providing precise forecasts

To a greater or lesser degree, all Brazilian distributors have had to perfect their forecasting processes as a result of the new model for the electric power sector. Based on a strategic directive from the Board that the company should adapt as best it could to the new rules, Cemig technical teams analyzed availabilities in the world market and recommended the SAS solution, which is currently in the final phase of deployment.

According to Agostinho Faria Cardoso, superintendent of Cemig's Wholesale Energy Purchase and Sale Department, internal development was never an option. "We believe that each company has its own expertise. Ours is energy distribution. SAS has hundreds of professionals, including engineers and mathematicians, who are engaged in constructing specialist systems, which is to say that they are certainly more well informed about advances in this field and can supply the best methodology and the best system of forecasting."

SAS® enables flexibility

In preparing the forecasts of energy load in the medium and long terms, economic performance indicators are utilized, such as the

GDP (gross domestic product), population density and consumer sector sales expectations. For short- and very-short-term forecasts, aspects such as normal consumer behavior, seasonal factors and weather forecasts are taken into account, in addition to possible emergency situations.

Based on all of these variables, SAS High-Performance Forecasting develops various scenarios and then projects the respective energy needs for each one of them. In order to do so, the system combines various advanced technological resources, such as neural networks, time series models, and decision trees, among others.

According to Cemig's superintendent, one of the main advantages of SAS High-Performance Forecasting is its extreme flexibility. "The system is not a black box. We can set up various scenarios and modify them as economic or environmental conditions change, for example, and as we make the purchases," Faria Cardoso says. "In addition, it is quite user-friendly. It is easy for our analysts to organize the data, alter it or consult it; in short, interacting with the system is very simple."

Faria Cardoso also applauded the SAS consultants who contributed to the project. "Over the eight months of the project, SAS specialists worked together with our employees. The result is a system that is fully parameterized for forecasting energy loads and also customized for the type of files used by Cemig," he explains. At the same time, the distribution team was undergoing training in order to exploit all the potential of SAS High-Performance Forecasting.

SUSTAINABLE DEVELOPMENT

Cemig is one of only two Brazilian companies (the other is the Itaú holding company) to be listed on the exclusive Dow Jones Sustainability Index/World, or DJSI World, ever since the list was created in 1999. The DJSI World recognizes companies based on the principles of sustainable development, i.e. their capacity to create value for shareholders, make the most of opportunities and manage the risks associated with economic, environmental and social factors.

The DJSI 2004/2005, published in September 2005, cites 318 companies worldwide, selected from a survey of 2,500 companies in 60 industrial fields in 34 countries. The selection takes into account financial performance and, especially, the quality and continuing improvement of business management, which must include environmental and social actions as a form of long-term sustainability.

Security and credibility

To feed the forecasting system, Cemig uses different databases, both internal and external, such as that of the Electrical Energy Chamber of Commerce, the institution responsible for mediating the purchase of energy among generators and distributors. To ensure that the data is as up to date as possible and to avoid conflicting information, Cemig uses SAS Enterprise Miner.

“SAS Enterprise Miner transforms the data in different languages and from various databases into reliable information that can be handled securely,” says the superintendent. “It would be useless to have an excellent forecasting system if it were based on incorrect data.”

According to Faria Cardoso, access by Cemig’s technical personnel to the SAS test base and to clients who already use the systems was crucial in the process of choosing a program. The superintendent also noted the fact that SAS has been continually mentioned over the years as one of the best companies to

work with was a contributing factor in the decision.

Change in profile

Of course, forecasting energy loads was never anything new to Cemig. The electric power sector has always worked with two major forecasting horizons: the long term, required to support the construction planning for power generating plants, and the very-short-term, which depends upon variables that are impossible to control, such as sudden changes in temperature.

At the distributors, forecasts can go to the extreme of being formulated daily and even hourly. These are very-short-term forecasts, a classic example of how these are used in Brazil are those for the days on which World Cup football is televised. As Cemig’s superintendent explains, during game time consumption is low, basically only from TV sets that are turned on. As soon as the game ends, there is an exceptional – and simultaneous – increase in demand, the so-called “ramp-up” effect.

If forecasting is nothing new, what has changed? The new model for the electric power sector has created a more competitive environment, in which load forecasting has become an absolutely critical factor for distributors. This environment has emerged since energy purchases are now done exclusively by means of auction sessions, based on the criterion of lowest price.

Before each auction session is held, the distributors have to send the Ministry of Mines and Energy its load forecasts for three scenarios: startup of supply after five years of the contracting, after three, and after one. The adjustments in demand and in consumption of energy are made in the very-short-term auction sessions, where prices are higher than in the normal auction sessions.

Load forecasting five years in advance has as its objective to allow the government to plan for bid tenders on new power generating plants. These enterprises require a quite long planning horizon, which can extend for up to 20 years.

Good for both shareholders and consumers

The precision of the forecasting is vital, because the law provides that a distributor must use 100 percent of the energy contracted for, and the margins of variation permitted are very small. At the annual rendering of accounts to ANEEL (Agência Nacional de Energia Elétrica/ the National Electrical Energy Agency), if the company has purchased under 100 percent than the energy distributed, it may be subject to fines. The objective of the government in this regard was to establish rules to ensure there is no shortage of energy.

On the opposite end, if the distributor buys too much energy, it may only pass this cost along to energy rates if the margin of error is up to 3 percent or less.

Cemig's FARIA CARDOSO:
adoption of a parameter-
ized system for forecasting
energy loads



“The more often we get it right, the greater the chance of having cheaper energy, and the smaller the chance of an energy shortage.” AGOSTINHO FARIA CARDOSO, SUPERINTENDENT, CEMIG



If it has acquired energy at a higher rate, the distributor will be subject to price risk (contract versus spot) without passing this portion along to the consumer. With this rule, the government was aiming at guaranteeing the lowest rates possible.

While the new model for the Brazilian power industry permits some alternatives “to place” the distribution load inside those narrow limits (from 100 to 103 percent), purchasing more or less power than is required based on poor forecasts creates challenges when administrating the load, which may lead to losses. For this reason, although the

previous system was working satisfactorily, with a low level of error, Cemig felt it ought to increase even further the quality and accuracy of its forecasting even further.

Nowadays, says Faria Cardoso, Cemig has a system with an excellent cost/benefit ratio. “The more often we get it right, and the earlier we do so, the greater the chance of having cheaper energy and the smaller the chance of an energy shortage,” he says. “That is essential for Cemig, which bases its operations on respect for both its shareholder and consumers.” ■

PROFITABILITY AND INVESTMENTS

Cemig manages the largest electrical power distribution network in Latin America and one of the four largest in the world, measuring over 359 thousand square kilometers in size. It serves approximately 96 percent of the state of Minas Gerais, which encompasses an area of 560 thousand square kilometers. Its client base exceeds 17 million individuals in 774 cities. The distributor has 46 power generating plants, five of them under a partnership system with other business groups, most of them hydro-electric energy companies.

Founded on May 22, 1952, Cemig operates in the generation, transmission and distribution of electrical energy to the second-largest consumer market in Brazil, in which are located some of the largest Brazilian companies in the steel-making, mining, automobile manufacturing and metallurgical industries, such as Usiminas, Belgo Mineira, Fiat Automóveis, Mercedes Benz, Companhia Vale do Rio Doce, and Açominas, among others.

In 2004, Cemig’s gross invoicing was R\$8.5 billion, which represents an increase of 19.3 percent as compared to the previous year. Profit in 2004 was R\$1.385 billion. Cemig’s investments last year totaled R\$1.051 billion, 16 percent higher than in 2003. The bulk of investments was allocated to the areas of generation, with R\$687 million, and distribution of electrical energy, with R\$222 million.