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ENERBIZ II: Strategy and Risk Management in Electricity Trading

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ABSTRACT

The electricity market in Colombia has been immersed in a competitive environment in which trading is a high-risk activity involving a large number of agents. Those agents should have specialised knowledge on the market to develop strategies and manage the risk.

ISA, the Colombian Grid Company, and the National University of Colombia developed a workshop for energy trading in Colombia supported by a microworld named ENERBIZ. In the first version of the microworld, the user assumes the role of a trader under different hydrology scenarios and learns about the market before confronting his task under real-life situations.

The second stage of this workshop, named ENERBIZ II, is intended to the learning of strategy and risk management tools. The strategy approach seeks to develop competitive advantage skills. With the risk management module, the user learns the more important concepts of risk, efficient portfolio and measure of the risk associated to electricity trade.

Presentation

The Colombian electricity agents are facing several problems derived from their poor knowledge of the market rules and the decision making process. Small utilities and generators are mainly affected by the lack of analysis tools in this environment. ENERBIZ I was intended to provide tools for dealing with the market uncertainty and dynamism.

Trading means buying electricity for sale to both final users and/or other market agents. Purchases and sales can be performed in two different ways: using bilateral contracts, and in the electricity pool. ENERBIZ I was made for trading because it involves almost all agents in the market and has a high potential number of users.

The activity of trading has the same problems of several organizations: individuals and groups need adequate training in topics related to both risk analysis and corporate strategy, in order to take advantage of market opportunities in a competitive environment. ENERBIZ I is a helpful analysis tool to support training programs. It has been used in several workshops with traders, regulators, generators, etc. of the Colombian Electricity

Market to explain the dynamics associated and the role of a trader buying and selling electricity, using different types of contract.

Among other microworlds that inspired the creation of ENERBIZ I, are: *The Beer Game* [1], *People Express* [1], *Oil Producers* [1] and *Beefeater Restaurants* [2], see Langley and Larsen [3] for a brief description of most of them.

ENERBIZ I was the first approach to the learning of the basis of strategy and risk management. There is a need for tools to take advance of the market, and ENERBIZ II is focused on strategy concepts in electricity trading and risk analysis and management. This paper present ENERBIZ II, as a microworld built to support the training of traders in the Colombian electricity market, but focusing on strategy and risk management. In the following sections we briefly present the system dynamics model, some of its most important features, the added modules, and the application of new concepts.

Model

ENERBIZ II is a new version of the microworld and is supported in a system dynamics model. The general structure of ENERBIZ I remains unchanged, but some new concepts and modules were added. The general system representation of the trading business is shown in Figure 1.

In Figure 1, energy traders have to take into account the pool price, contract market, and regulation. Both pool market and contract market are constrained by regulation policies. Moreover, energy availability has an effect on pool and contract prices. Finally, we have to include in the model two customer markets: large users with free-market access and small, regulated users. The microworld includes the trading business, competitors and final users in order to represent the Colombian electricity market.

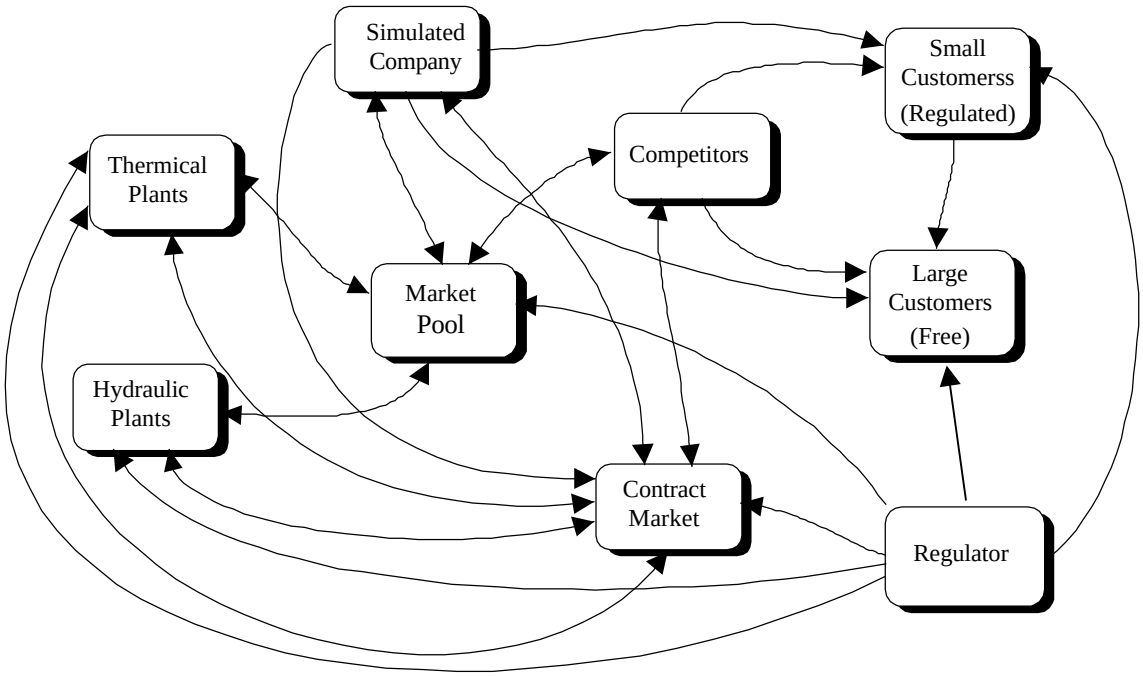

Figure 1. General Structure of the System: model to support the Microworld

The interface of ENERBIZ permits several options to make decisions and to see a lot of graphic and tabular reports (Dyner 2000). The interface tries to give a pleasing and modern environment where the trainee can develop skills on contract electricity. The figure 2 shows the decision- window in ENERBIZ I, while figure 3 shows some standard reports.

Figure 2. Windows decision of ENERBIZ I

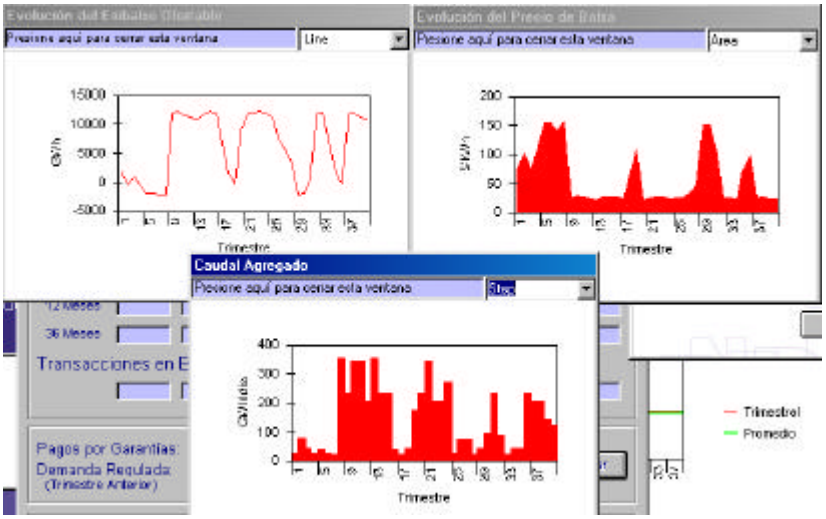

Figure 3. Graphics report of ENERBIZ I.

ENERBIZ II is intended to teach basic concepts about corporate strategy and risk management applied to electricity market. Some theoretical issues are explained and practised through workshops that make use of the microworld.

The new version of the model has a deeper representation of the company, and the trainee can make many more decisions than in ENERBIZ I. The model is now more detailed in the representation of the market, in aspects such as investments and contracting options. ENERBIZ II allows energy risk management by using portfolio theory and value and risk. The new concepts developed in ENERBIZ II are explained below.

Strategy

ENERBIZ II can be used as support to business-strategy teaching. ENERBIZ II also intends to ease the practice and learning of tough concepts through the interaction with its Microworld. In ENERBIZ, a company achieves sustainable competitive advantage through a good resource management, using three different kinds of investment decisions: Innovation and Technology, Human Resources, and Marketing and Customer Service.

An adequate share of investment on the items mentioned before is essential to achieve both a sustainable growth of the company, and the goals of the managers. If a company invests all the capital in innovation and technology, without investing in human resources or customer service, will probably get no benefit.

When you invest only in human resources you can get a short-run growth because the market changes quickly and the company becomes obsolete. The same situation happens if you only invest in marketing and customer service.

Risk – trade electricity

Trade of electricity faces new risks and offers opportunities. Thus, management and valuation of risk have become important for power markets. In Colombia, hydrology plays an important role in the volatility of electricity prices. Because of this, the management and valuing of risk are necessary tools for trading electricity in Colombia.

ENERBIZ II intends to teach some concepts about management and valuing risk through double-loop learning (Argirys, 1977). The main concepts explained in the microworld are portfolio theory to manage risk and value at risk, both in the electricity markets.

Portfolio theory was initially developed for Markowitz in 1952; now it is a standard tool applied to manage risk in financial markets. Portfolio theory intends to take advantage of different features of assets in the market for minimising the inversion risk with a given return (Elton and Gruber, 1995). The main concept used in portfolio theory is diversification, which is to choose a group of assets that do not have similar return by balancing assets, with high and low risks and returns (Brealey and Meyers, 1996).

On the other hand, Value at risk is an important measure to which a given portfolio is subject to different kinds of risk present in financial markets. Considerable amount of research has been dedicated in recent years to the development of acceptable methods for evaluation of this risk measure (Fusaro, 1995). Value at Risk (VAR) is an important measure of exposure of a given portfolio of assets to different kinds of risk inherent in financial environment. By now, it has become a tool for risk management and part of industrial regulatory mechanisms.

Portfolio's VAR is the minimum expected lost in a period of time with a given confidence level which is expressed in reference currency (Blanco and Garman, 1999). For example if the VAR for a day of a portfolio is 10 millions of pesos with 95% of confidence level, there is a probability of 5% for losing 10 millions of pesos in the next 24 hours.

The microworld is intended to give the concepts that allow the trainees to learn basic concepts about portfolio theory to manage risk in volatile markets and Value at Risk to quantify this risk. This knowledge allows them to improve their performance in the electricity market in Colombia.

For learning to manage and value risk by using the microworld there are six steps, which are shown in the Figure 3, and explained below.

- Market analysis: It pretends to analyse the available assets (risk and return) and trainee risk position (Value at Risk).
- Stating scenarios: According to market analysis, the trainee defines some scenarios that he wants to test by using the microworld.

- Stating strategies and objectives: The trainee defines his objectives and strategies, based on the chosen scenario, and his mental models about the risk in the market.
- Making decisions: By using the microworld, the trainee makes decisions. According to his defined strategies, he creates a portfolio and has decides to take a risk, which is valued by VAR.
- Performance analysis: The simulated market shows the trainee performance, which must be analysed by comparing the stated and achieved objectives.
- Feedback and development of strategies and objectives: By asking and answering questions about the performance, and under the guidance of experts, the trainee reinforces or restructures the mental models about management and valuing risk. Then the trainee may state a new scenario and repeat the double-loop learning shown in Figure 1.

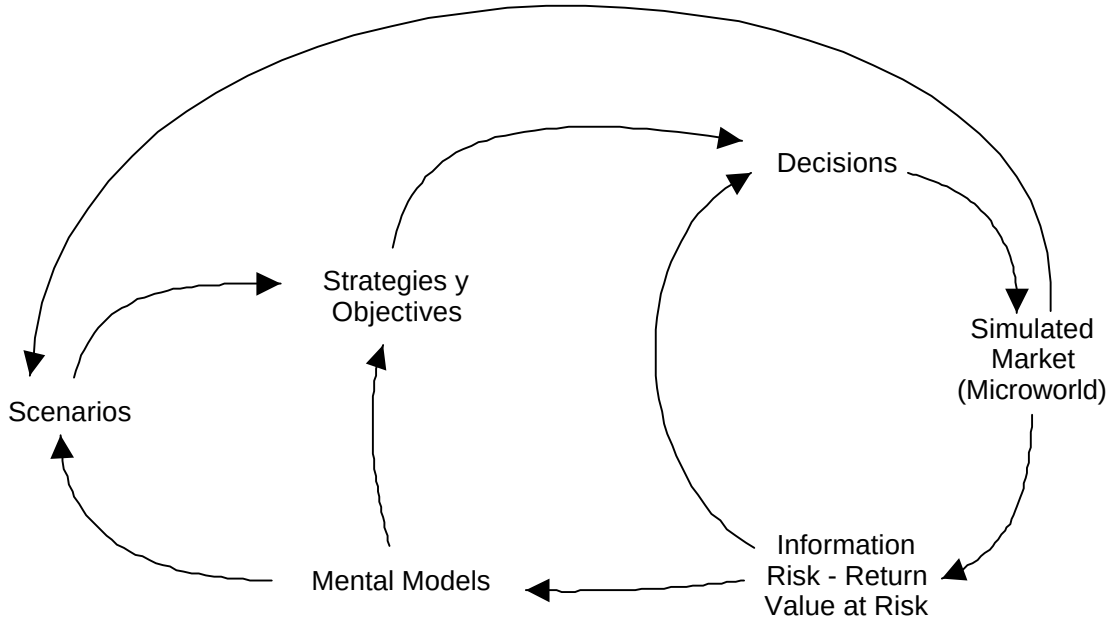

Figure 3. Management and valuing of risk at the Microworld.

Final comments

ENERBIZ II has been applied in a workshop where the concepts of trading, strategy and risk management for the Colombian electricity market are included. Its risk-management module allows not only that the user understands the market structure and dynamics, but also that he acquires the specific skills to manage uncertainty and risk in the energy market.

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