

THERMAL AND HYDRO INTEGRATION AND RISK MANAGEMENT IN THE BRAZILIAN ELECTRICITY SUPPLY INDUSTRY.

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Overview

Market-oriented reforms in the electricity supply industry worldwide have changed the decision investment context. Risks, such as the real need for new capacity and the return on investment, which were formerly borne by consumers or by taxpayers, now have to be faced by investors. However, even when scarcity prices efficiently reflect the tightness of supply in electricity markets, the reliability of the electric service may be jeopardized by uncertainties affecting revenue and investment perspectives. This paper uses the Brazilian experience to discuss the main issues which have to be addressed by investors and policy makers in order to improve reliability through better thermal and hydro integration as well as the specificities of thermal generation and electricity trade in Brazil and the most recent solutions adopted for its development. Section 1 summarizes the main features of the Brazilian Electricity Supply Industry, examining perspectives for investments in thermal power plants; Section 2 discusses the opportunities that have emerged from the recent changes in the NG industry and trade; Section 3 presents and discusses the electricity contracting in Brazil; Section 4 analyses the economic implications of greater flexibility in the NG market in the Brazilian electricity industry based on a stochastic dual dynamic programming model to determine the expected operational cost of a thermal power plant in the next 10 years; finally, Section 5 concludes, with a brief assessment of the remaining issues, that important barriers to investments in flexible NG power plants have been removed. Despite the many peculiarities of the Brazilian Electricity Supply Industry, the approach addressed to the investment adequacy problem for thermal power plants may be used to draw parallels elsewhere.

Methods

To establish whether bigger flexibility in thermoelectric generation is or not desirable, this paper presents a comparative study using Dual Stochastic Dynamic Programming – DSDP in a hydrothermal scheduling problem with the Brazilian power system features. The comparison is made by a simulation using 2000 synthetic series for the inflows of the hydroelectric system in the next 10 years, and the analysis of the average operational cost of the whole system and of the minimum electricity price which should be required by a thermal producer to earn a given return rate. The problem out-put offers the expected total operational cost of the electrical system and the marginal cost at each stage and at each hydro inflows scenario. Hence, it is possible to estimate a generation rate to a given power plant and the expected cost of the electricity bought from a thermo power plant with an availability contract.

Results

The results obtained in this study lead us to conclude that there is a relevant window of opportunity for Brazil to enter in the Atlantic LGN market which could make it feasible for full flexible thermal generation in Brazil. The papers results show the expected gain from a fully flexible natural gas generation in Brazil, thanks to the complementariness with the hydroelectric system, should allow an affordable electricity generation, compatible to a hydro system.

Conclusions

Investments in fully flexible thermal power plants in Brazil are quite feasible. Energy exchange framework improvement has made possible cross-commodities risk management between fuel and electricity prices. These contracts emulate options contracts and work as financial price insurance and serve as a risk-sharing mechanism which enables thermo power producers to reduce their exposure to fuel and electricity price volatility, dispatch uncertainties and to confer predictability to the cash-flows of thermoelectric plants which have signed long term contracts. New availability contracts play an important role in establishing price signals, providing price discovery, facilitating effective risk management, inducing capacity investments in generation, and enabling capital formation. However, the exiting legal and financial instruments may be not sufficient to make a relevant LNG trade between Brazil, USA, UE and other LNG markets possible. The Petrobras signalized investment to supply Brazilian NG power plants up to 20 million m³/day does not include storage capacity. It means that Brazilian LNG market will have a delivery time gap because of the travel time needed to ship LNG from foreign markets.

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