

## **Pricing flexible natural gas supply contracts under uncertainty in hydrothermal markets**

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**Abstract—** The worldwide development of the natural gas industry resulted in an integration process between electrical and gas sectors in several countries. In Brazil, this process has been taking place in a consistent manner, especially on account of the increase in gas consumption for industrial use and of the installation of thermoelectric plants. Due to the predominance of hydro plants in electric power generation, thermoelectric energy production is basically dependent on hydrology and, as a result, presents a wide annual variability. Consequently, the investment applied to gas production and transportation infrastructure may become under-utilized during a large part of the time; thus, it is important to find mechanisms apt to improve its utilization. In this respect, the present work investigates the creation of a flexible market for gas, where contracts for flexible gas supply would be offered to industrial users, who would receive the gas assigned to thermal power plants when the latter are not dispatched, and would resort to an alternate fuel when these plants are dispatched. The attractiveness of such a contract would depend, of course, on its price. The purpose of this work is to develop a stochastic model for pricing flexible gas supply contracts, taking into account the uncertainty associated to the supply - dependent on the dispatch of the thermal power plants, which have the priority of use of the gas - and the risk profile of potential consumers.

**Index Terms—** Electricity-gas integration, natural gas, power system economics, risk management.

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