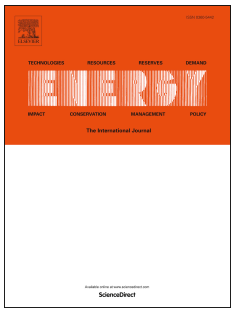
Accepted Manuscript



Investment in the energy sector: An optimization model that contemplates several uncertain parameters

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PII: S0360-5442(17)31281-1

DOI: 10.1016/j.energy.2017.07.103

Reference: EGY 11291

To appear in: *Energy*

Received Date: 11 November 2016

Revised Date: 7 July 2017

Accepted Date: 14 July 2017

Please cite this article as: Cunico ML, Flores JR, Vecchietti A, Investment in the energy sector: An optimization model that contemplates several uncertain parameters, *Energy* (2017), doi: 10.1016/j.energy.2017.07.103.

Investment in the energy sector: an optimization model that contemplates several uncertain parameters

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Abstract:

Investments in the energy sector on the medium/long term are risky due to the uncertainties having in this sector: price volatility, unclear demands and indeterminate fossil reserve volumes, among others. Decision making tools plays an important role in order to attenuate the effect of uncertainties in the investment by including this aspect in the models. In this sense, mathematical programming models provide analytical tools to improve the decision making process. This paper presents a multi-period mathematical model for planning investments in the energy sector in a medium time horizon. The model considers several imprecise information of the energy market: uncertainty in the price of fossil resources, the trend in the growing demand and the variation in the availability of fossil reserves.

The main objective of this work is to formulate a decision making model in planning investments in the energy sector which can provide a unique strategic plan, robust enough to cover pessimistic and optimistic scenarios of the uncertainties. In particular, a fuzzy approach is used to formulate the problem, and is combined with sets of possibilistic techniques to transform the problem into a form that can be solved. In order to show the capabilities of the model, it is applied and solved for the Argentina's energy sector.

1. Introduction.

Fossil fuels are currently the main source of energy to produce goods and services to cover the needs of human life. In the last decades, these resources have been strongly questioned for environmental and sustainability reasons; for those motives many renewable sources (wind, biomass, solar, etc.) has become alternatives to produce energy. Nevertheless, substituting fossils by renewables is not, in principle, economically viable, it requires new and efficient technologies, well oriented politics, and economic incentives to compete at the same level. With this situation in mind, an investment plan to produce energy is a complex task that requires a model for helping the decision making. It involves making choices in the medium and long terms about what to do with the financial assets. The length of time horizon implies dealing with imprecise information about future behavior of market conditions that can affect negatively the expected benefits. That is the case of the energy sector where it was a large fluctuation in the oil and gas prices, imprecision in the projected demand, and also vagueness in the availability of nonrenewable resources, all parameters that affect the profitability of investments. In this context, the model to make decisions for investment in the energy sector must include the uncertainties that can influence the selection of alternatives.