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Estimation of Natural Gas Production, Import and Consumption in Brazil Based on Three Mathematical Models

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ABSTRACT

A mathematical model capable of providing a forecast of future consumption and import of natural gas is essential for the planning of the Brazilian energy matrix. The aim of this study is to compare three mathematical models, logistic model or model of Verhulst, exponential model or the model of Malthus and the model of von Bertalanffy to analyze the possibilities of these models to describe the evolution of production, import and consumption of natural gas in Brazil, from data provided by the energy balance of the Ministry of Mines and Energy (MME) from 1970 to 2009. A projection of the production and the import of natural gas up to 2017 is made with the models studied in this article and compared with the Brazilian Ten-Year Plan for Expansion of Energy (PDE). At the end of this paper a comparison with the Hubbert model for Brazilian natural gas production is made. These data were adjusted to use the differential equations which describe the models of population growth. All the computer work used in this article: graphics, resolution of differential equations, calculations of linearization and the least squares fitting was prepared in the software MatLab. The results obtained by means of graphs show that the population dynamics models (logistic, exponential and von Bertalanffy) can be applied in modeling the production, import and consumption of natural gas in Brazil.

KEYWORDS

Natural Gas; Mathematical Modeling; Logistic Model; Exponential Model; Model of Von Bertalanffy

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References

[1]   E. B. Tambourgi and S. R. Louren?o, " Gás Natural: Perspectivas e Utiliza??o," Exacta, Vol. 3, No. 1, 2005, pp. 63-70.

[2]   Energy Information Administration (EIA), " Annual Energy Outlook," 2008. http://www.eia.gov

[3]   P. H. de M. Santana, G. de M. Jannuzzi and S. V. Bajay, " Developing Competition while Building up the Infructure of Brazilian Gas Industry," Energy Policy, Vol. 37, No. 1, 2009, pp. 308-317. doi:10.1016/j.enpol.2008.09.044

[4]   N. Apergis and J. E. Payne, " Natural Gas Consumption and Economic Growth: A Panel Investigation of 67 Countries," Applied Energy, Vol. 87, No. 8, 2010, pp. 2759-2763. doi:10.1016/j.apenergy.2010.01.002

[5]   R. C. Bassanezi, " Teaching and Learning with Mathe- matical Model," Contexto, S?o Paulo City, 2006.

[6]   M. Rafikov, J. M. Balthazar and H. F. von Bremen, " Mathematical Modeling and Control of Popu-lation Systems: Applications in Biological Pest Control," Applied Mathematics and Computation, Vol. 200, No. 2, 2008, pp. 557-573. doi:10.1016/j.amc.2007.11.036

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[7]   J. Scarpim, " Modelo de von Bertalanffy Generalizado Aplicado à Curvas de Crescimento Animal," Master' s Thesis, Unicamp, Campinas, 2008.

[8]   D. G. Zill, " Differential Equations," Contexto, S?o Paulo City, 2003.

[9]   M. Forouzanfar, A. Doustmohammadi, M. B. Menhaj and S. Hasanzadeh, " Modeling and Estimation of the Natural Gas Consumption for Residential and Commercial Sectors in Iran," Applied Energy, Vol. 87, No. 1, 2010, pp. 268-274. doi:10.1016/j.apenergy.2009.07.008

[10]   A. Tsoularis and J. Wallace, " Analysis of Logistic Growth Models," Ma-thematical Biosciences, Vol. 179, No. 1, 2002, pp. 21-55. doi:10.1016/S0025-5564(02)00096-2

[11]   M. K. Hubbert, " Nuclear Energy and the Fossil Fuels," Drilling and Production Practice, Vol. 95, 1956, pp. 1-57.

[12]   J. H. Laherrère, " World Oil Supply-What Goes Up Must Come down, but When Will It Peak?" Oil & Gas Journal, Vol. 97, No. 5, 1999, pp. 57-65.

[13]   Ministry of Mines and Energy (MME), " National Energy Balance," Energy Research Company, Brasília, 2010.

[14]   Energy Research Company, " Ten-Year Plan for Expansion of Energy," Energy Research Company, Brasília, 2009.

[15]   M. R. V. Schwob, M. Henriques Jr. and A. Szklo, " Technical Potential for Developing Natural Gas Use in the Brazilian Red Ceramic Industry," Applied Energy, Vol. 86, No. 9, 2009, pp. 1524-1531. doi:10.1016/j.apenergy.2008.10.013