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MODELING ENVIRONMENTAL, SOCIAL, POLITICAL, TECHNICAL ECONOMIC AND MARKET VARIABLES TO IMPROVEMENT OF ENERGY RESOURCES PORTFOLIOS

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OVERVIEW

This article presents an analytical model based on linear programming and classic Markovitz theory for the construction of energy resources portfolios within the Integrated Energy Resources Planning (IRP). The model seeks to maximize the ranking of energy resources, formed by the use of the Decision Lens software through pre-established criteria, and maximizing investment return in energy resources portfolios as a function of the Net Price of Differences, applied in the Brazilian energy market. Environmental, social, political and technical-economical variables are included in the model.

Environmental restrictions are related to emissions due to electricity production, such as particulate matter, CO2, CH4, among others. Social restrictions variables are related to the improvement of social conditions of the population in surrounding energy ventures included in the portfolio. In the model, variables like human development index, health impacts, degree of influence in local development, among other attributes are considered. Political restrictions variables are related to various policy decisions that can influence the implementation of long-term energy resources, such as generation and transportation incentives, billing and taxation policies, among others. Variables of technical-economic constraints are related to the technical characteristics of technologies used for the exploitation of each energy resource that comprise the portfolios. The market variables included in the template are variable costs, fixed costs and investment volumes.

METHODS

The model initially makes the integration of energy resources through the combination of both Deterministic and Holistic Full Costs Accounting of each resource into a general ranking, and the subsequent simulation of portfolios on the basis of constructed scenarios using the Monte Carlo method.

RESULTS

The results produced in the model present the composition of resources in the portfolio, the volumes of investments, the expected return, area occupation of energy projects, variation of human development index through the implementation of energy resources, employment increase, level of emissions due to the production of energy, volume and cost of energy generated by each portfolio.

The energy generated by the portfolio must meet the predicted demand throughout the energy planning horizon at the lowest possible cost and lower level of acceptable risk, one of the basic assumptions in the model.

CONCLUSIONS

Abbreviations and acronyms when they are used the first time in the text should be defined. Do not use abbreviations in the title of the paper unless they are unavoidable.

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