4^{th} Workshop on Efficiency and Productivity Analysis

Book of Abstracts & List of Participants

29^{th} October, 2012

Conference Venue:

Universidade Católica Portuguesa

Business School Building (Room 3)

Rua Diogo Botelho 1327, 4169-005 Porto

Organising Commitee:

Maria Conceição Portela, Sofia Nogueira da Silva, Ana Camanho, Ricardo Castro

CATÓLICA

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FEUP FACULDADE DE ENGENHARIA UNIVERSIDADE DO PORTO

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Performance assessment of hydroelectric power plants

Clara B. Vaz,

Escola Superior de Tecnologia e de Gestão, Instituto Politécnico de Bragança, Portugal.

Ângela P. Ferreira,

Escola Superior de Tecnologia e de Gestão, Instituto Politécnico de Bragança, Portugal.

This study develops a methodology to provide insights regarding the performance of the hydroelectric power plants of a European player in the energy sector. The focus of the hydroelectric power performance assessment is on the operation stage, which translates in the electrical energy generation process. In today's energy generation programs, hydroelectric plays an important role as it is based on a clean renewable energy source and capable of fulfilling a significant portion of the overall power demand. Hydroelectric power plants may use the natural drop of a river (run-of-river) or a dam is built across a river to raise the water level (reservoir) and provide the drop needed to create the driving force. The operation schemes of these two types of hydropower plants, concerning the availability of the primary resource and the load-following, require different control strategies which results in different environmental impacts and different outcomes in terms of the market value of electric energy generated. Therefore the efficiency analysis conducted in this study evaluates them separately.

Firstly, the Data Envelopment Analysis (DEA) is used to measure the performance of hydroelectric power plants in generating electrical energy from the resources available and exogenous variables, during the period under analysis. This analysis enables the identification of the best practices of plants that lead to improved performance. The bootstrapping is applied to obtain statistical inference on the efficiency estimates.

Secondly, the Malmquist index, complemented with bootstrapping, is used to measure the changes in hydroelectric power plants productivity between the years 2010 and 2011. The analysis of performance changes over time should take into account two effects: the variation of technical efficiency of each plant and the change in the position of the best-practice frontier. The variation in technical efficiency measures changes in the ability of each plant in adopting strategies to catch up the frontier of best practices. The changes in the frontier reflect technological developments in the practices of the best plants in generating electric energy.