REAL COST COMPARATIVE ECONOMIC ANALYSIS OF NATURAL GAS-FIRED AND HYDRO-ELECTRIC POWER PLANTS IN NIGERIA

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ABSTRACT

In this study, a comparative economic-analysis of a natural-gas fired and a hydro-electric power-plants in Nigeria was done based on the real electricity cost model. This was done using levelised electricity costs and cost of pollution for each plant. Plant technical and financial parameters for each power-plant were then inputted into Excel models in other to generate net present values for each combination of plant capacity and electricity price. The profitability indices for each plant was also calculated. Plots of net present values were generated for each power-plant at different plant capacities and electricity prices. This was done in other to understand sensitivity of NPV of each plant to plant capacity and electricity price. From these plots, the break even electricity price and plant capacity for power-plant were ascertained. Results obtained reveal that the economics of both gas-fired and hydropower generating plants in Nigeria are highly dependent on electricity price and plant capacity. Precisely, for a CCGT gas-fired power-plant in Nigeria of plant capacities 200,400 and 600 MW, the break even prices are $186.06, $120.78, and $101.19 respectively. And for reservoir type hydropower plant in Nigeria of plant capacities 200,400 and 600 MW, the break even prices are $249.71, $124.04 and $86.50 respectively. In addition, at $65.28, $114.25 and $163.21 per MWh (corresponding to 20, 35 and 50 Naira per kWh respectively) electricity prices, the break even plant capacities for a CCGT gas-fired power-plant in Nigeria are 625, 450, and 245 MW respectively. Also, at the same electricity prices, the break even plant capacities for a reservoir hydropower plant in Nigeria are 800, 450, 320 MW respectively. It was also deduced that natural gas-fired plants are economically-viable at lower plant capacities and electricity prices, while hydropower plants are economically-viable at higher plant capacities and electricity prices.

Keywords: Natural gas, hydropower, power plant, real cost, green energy.