

**NON-UTILITY GENERATION: AN ANALYSIS OF ITS
IMPACT ON THE KENYAN POWER SYSTEM**

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Non-Utility Generation: An Analysis of Its Impact on the Kenyan Power System

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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ABBREVIATIONS AND ACRONYMS

AGO	Automotive Gas Oil
BOO	Build Own and Operate
CD-RW	Compact Disk, Read and Write memory
CHP	Combined Heat and Power
EPP	Emergency Power Producer
ERC	Energy Regulatory Commission
FCA	Fuel Cost Adjustment
FY	Financial/Fiscal Year
GB	Giga Bytes
GEB	Gujarat State Electricity Board
GHZ	Giga Hertz
GIBCO	Gujarat Industrial Power Company
GTEC	Gujarat Torrent Electricity Company
GWh	Giga Watt hours
HFO	Heavy Fuel Oil
HMI	Human Machine Interface
Hz	Hertz; unit of measuring frequency (cycles per second)
ICE	Instituto Costarricense de Electricidad
Inc	Incorporated
IPP	Independent Power Producer
ISP	Institutional Strengthening Programme

KenGen	Kenya Electricity Generating Company
KWh	Kilo Watt hours
km	Kilometre
KPLC	Kenya Power and Lighting Company
Kshs	Kenya shillings
kV	kilovolts; measurement of voltage equal to 1,000 volts.
MOE	Ministry of Energy
MVA	Mega Volt Amperes
MW	Mega Watt
NCC	National Control Centre
NUG	Non-utility Generation
PLC	Programmable Logic Controller
PPA	Power Purchase Agreement
PSS	Power System Simulator
Rs	Indian Rupees
RTU	Remote Terminal Unit
SCADA	Supervisory Control And Data Acquisition
TANESCO	Tanzania Electricity Supply Company
UEB	Uganda Electricity Board
UETCL	Uganda Electricity Transmission Company Limited
USD	United States Dollars

ABSTRACT

With the increase in economic activities of the country and with the embracement of new technologies, the demand for the energy input into the production processes must rise. These economic activities in Kenya involve: industrial, agricultural and domestic processes. Electrical Energy is one of the inputs to these processes. Kenya like many other developing nations has for a long time depended on electrical power generated from hydro plants, to meet a large proportion of her national demand. Over time however, some significant occurrences have had a direct impact on the energy sector: increase in the electrical energy demand and the continuous degradation of the catchment areas due to the ever unpromising (unpredictable) climatic patterns.

To address this scenario, a number of changes have been done in the energy sector by the Kenyan Government through the Ministry of Energy. These include the unbundling of the power generation from transmission and distribution functions (for efficiency) and contracting Non-utility Generation (i.e. the Independent Power Producers-IPPs and industrial cogeneration) to supplement the power generation from the state controlled entities so as to meet the national electrical demand.

This research aimed at analyzing the effects/impact of the Non-utility Generation otherwise referred to as parallel generation on the operational flexibility of the Kenyan power system and the cost of electrical energy in Kenya. These studies have been done using the data acquired from the Supervisory Control and Data Acquisition (SCADA) system (as discussed in the appendix 2) from The Kenya Power and Lighting Company (KPLC) Limited. The economic aspect of this study has been done by taking a sample of four large power consumers as shown in

the research methodology and analyzing their electricity bills while focusing on the Fuel Cost Adjustment (FCA) from the year 2003 to 2007. The duration saw the largest rise of the Non-utility Generation in Kenya (most of the IPPs run on a variety of fuels – detailed in table 8, that are quite expensive and these costs are passed on to the customers at a rate proportional to the energy consumed).

This thesis presents an analysis that shows the effects of the Non-utility Generation (NUG) in Kenya, with emphasis on operational flexibility in the Kenyan Power system and the cost of electrical energy in Kenya. The findings of the research will assist all the stakeholders in the energy sector to plan, design and control power system operations. Further, the thesis brings out the need for prudent utilization of electrical energy by the customers.

The layout of this thesis is as follows: Chapter one gives the introduction; the background, objectives, the statement of the problem and justification of the study. Chapter two gives the review of related literature, while chapter three presents the methodology that was employed in data collection and data analysis. Chapters four and five detail the research findings namely: the impact of the NUGs on the operational flexibility of the Kenyan power system and economic impact of NUGs on electricity tariffs. The conclusion and recommendations are outlined in Chapter six.

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