



FACULTY OF ENGINEERING
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING.
FINAL YEAR PROJECT REPORT

**ASSESSING THE IMPACT OF DISTRIBUTING LARGE GRID-TIED PV SYSTEMS ON
LINE LOSSES: A CASE STUDY ON TORORO-BUSIA 33KV FEEDER AND BUSITEMA
SOLAR PLANT**

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**A final year project proposal submitted to the Department of Electrical Engineering in
partial fulfilment of the requirements for the award of a Bachelors degree of science in
Electrical Engineering of Busitema University**

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ABSTRACT

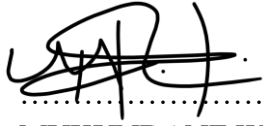
Renewable energy resources are increasingly being used in Uganda due to its abundance and cost. This includes solar energy, which is a promising alternative to the growing renewable energy usage, like hydro energy. Large solar power systems have gained popularity in Uganda, for example Busitema solar plant, Tororo Solar North, and the Soroti solar plant. The efficiency of these solar plants not only depends on the energy being generated but also on their integration into the existing grid infrastructure

In this study, an assessment of the impact of distributing these large grids tied solar PV systems along the network line using the Tororo-Busia 33kV feeder and Busitema solar plant as the case study is done so as to assess the efficiency of power transmission in these cases. The analysis is done through performing simulations using DIgSILENT PowerFactory to model the difference in network losses for both the centralized and distributed configurations. The effects of the solar power intermittencies influenced by effects like time of the day and weather conditions are also analyzed.

The results prove that, with a distributed solar PV configuration, power losses are reduced i.e., I²R losses and this improves the efficiency of power distribution. With these reduced power losses, more energy savings are experienced, hence translating to more power saved, hence supporting the case the distributed solar deployment in Uganda. This provides insight that can be used by regulatory bodies and utility companies on optimal planning strategies to maximize the economic and technical benefits. This is in line with the country's goals to reduce energy wastage.

DECLARATION

I, Mukundane Willis, hereby declare that the content in this report is purely my original and has not been presented for a degree award or an equivalent in any other university or institution.



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APPROVAL

This final year research project proposal has been submitted to the Department of Electrical Engineering under the supervision of



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Date: 27th/05/2025

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DEDICATION

The research project in this report, in the field of Electrical engineering, is dedicated my cherished and loving family through their financial support, have made this possible. Their constant belief in my abilities and the support through my challenges and triumphs have made this all possible

This is dedicated to my parents who have instilled in me the values of perseverance, hard work and the search for knowledge. They have never ceased to encourage me even in the most difficult stages of my education. This is also dedicated to my siblings who have provided me with emotional support and in understanding the academic pressures.

I also dedicate this work to my teachers and lecturers who have provided me guidance through in attaining knowledge through sharing their wisdom and expertise that helped me understand the concepts in Electrical Engineering that aided this research.

This work stands as a testament to the support and love that has surrounded me throughout my education.

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Special thanks go to our university, Busitema University for providing us with the opportunity to learn Electrical Engineering. We would also like to extend our gratitude to the lecturers who have given us the knowledge and understanding of the complex elements that we needed to get our project for all four years we have been here

I would also like to thank my fellow students for allowing me to consult them and for the progress we made together.

Contents

ABSTRACT.....	i
DECLARATION.....	ii
APPROVAL	iii
DEDICATION	iv
ACKNOWLEDGMENTS	v
LIST OF ABBREVIATIONS.....	x
1 CHAPTER ONE: INTRODUCTION	1
1.1 INTRODUCTION.....	1
1.2 Background.....	2
1.3 Problem statement.	3
1.4 Objectives of the study	3
1.4.1 Main Objective.....	3
1.4.2 Specific Objectives	3
1.5 Significance	3
1.6 Justification.....	4
1.7 Scope	4
1.7.1 Design scope	4
1.7.2 Geographical scope.....	4
1.7.3 Time scope	5
1.8 CONCEPTUAL FRAMEWORK.....	5
2 CHAPTER TWO: LITERATURE REVIEW	6
2.1 Introduction	6
2.2 Optimizing Solar Energy Delivery: Assessing the Impact of Distributing Large Grid-Tied PV Systems on Line Losses.	6
2.2.1 Solar energy landscape in Uganda	6
2.2.2 Impact of distributing solar panels instead of centralizing them	7
2.3 Understanding network losses	8
2.3.1 Effect of transmission distance on the I^2R losses.....	9
2.3.2 Transmission Distance	9
2.3.3 Effect on the I^2R losses	9
2.4 Impact of Distributed PV on Grid Parameters.....	10
2.4.1 Tororo- Main Busia 33KV distribution line.....	10
2.4.2 Busitema Solar Power Plant Technical Document.....	11

2.5	Solar Power Intermittency	12
2.5.1	Sources of solar intermittency.....	12
2.5.2	Effects of Solar Power Intermittency on Network Losses	13
2.6	LOAD FLOW ANALYSIS.....	13
	DigSILENT PowerFactory	13
3	CHAPTER THREE: METHODOLOGY	14
3.1	Introduction.	14
	Quasi-experimental/simulation:	14
	Experimental:	14
3.2	RESEARCH APPROACHES.....	14
3.3	GEOGRAPHICAL AREA OF STUDY.	14
3.4	DATA COLLECTION METHODS.....	14
3.4.1	Researching.....	14
3.4.2	Survey.	15
3.4.3	Field Measurements and Data Acquisition	15
3.4.5	Interviews.....	16
3.4.6	Graphing	16
3.5	Design of the project.....	17
3.5.1	Steps taken to achieve each objective	17
3.6	Measurements used in the study.....	19
3.6.1	Losses to the Average Load Profile.....	19
	Theoretical Basis.....	19
3.6.2	Load Profile	20
3.6.3	Energy saved.....	20
3.7	Tools used to analyze these losses	21
	3.4 Solar PV Integration Impact on System Losses	25
3.8	Data quality control	26
4	CHAPTER 4: RESULTS AND DISCUSSIONS	28
4.1	Results	28
4.1.1	AVERAGE LOAD PROFILE ON THE TORORO-BUSIA 33KV LINE.	28
4.1.2	Load Distribution Analysis.....	30
4.1.3	Load Profile Characteristics	30
4.1.4	Solar Irradiance Levels at the Busitema Plant.....	31

Measurement of Irradiance and Analysis.....	31
4.1.5 Solar Power Production.....	32
4.1.6 Simulations.....	34
4.2 Discussions.....	39
4.2.1 Economic Analysis of Loss Reduction.....	39
4.3 Discussion of Results.....	41
4.3.1 Technical Implications.....	41
4.3.2 Economic Implications.....	41
5 CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS.....	42
5.1 Summary of Key Findings.....	42
Solar PV Integration Impact on Network Losses.....	42
Distributed vs. Centralized PV System Performance.....	42
Financial and Operational Implications.....	42
5.2 Conclusions.....	43
5.3 Recommendations.....	43
5.3.1 Technical Recommendations.....	43
5.3.2 Policy Recommendations.....	44
5.4 Limitations and Challenges.....	44
5.4.1 Research Limitations.....	44
5.4.2 Financial and Operational Implications.....	45
5.4.3 Research Implementation Challenges.....	45
5.5 Directions for Future Research.....	46
5.6 Works Cited.....	47
5.7 APPENDIX.....	49

List of figures and tables

Figure 1: Showing the conceptual framework of the project	5
Figure 2: Showing the design of the project	17
Figure 3: Showing the ArcGIS shapefile of Tororo-Busia 33kV distribution line	23
Figure 4: Showing google earth diagram of the Tororo-Busia 33kV distribution line	24
Figure 5: Showing the model of the Tororo-Busia 33kV distribution line used for simulation ...	25
Figure 6: Showing an example of the project characteristics	26
Figure 7: Showing normalized load patterns for the Tororo-Busia 33kV line across a 24-hour period	29
Figure 8: A graph of the Half-hourly Load Measurements on the Tororo-Busia 33kV Line	30
Figure 9: Showing Solar Irradiance Profile at Busitema Plant	32
Figure 10: Showing a Solar Power Production Profile at Busitema Plant:.....	34
Figure 11: Losses on the Tororo-Busia 33kV Line Over 24 Hours	36
Figure 12: Showing the network losses for the centralized configuration of the solar plant.....	36
Figure 13: Comparative analysis of distributed configurations	37
Figure 14: Showing the losses on with Distributed PV Integration.....	38
Figure 15: Showing the Percentage Loss Reduction with Distributed PV Integration.....	39
Figure 16: Shows us using optical eye software to obtain power production data (Left) and us interviewing an official at busitema Solar plant (right)	50
Figure 17: Showing an image of a solar irradiance sensor (top right sensor) and the WN-FS2 solar radiation monitor displaying the solar irradiance for each time	51
Table 1: Resistivity of Common Conductor Materials	19
Table 2: Showing a summary of the methodology	27
Table 3: Solar Irradiance Levels at Busitema Plant for 11th February 2024	31
Table 4: Solar Power Production at Busitema Plant	32
Table 5: Losses on the Tororo-Busia 33kV Line	34
Table 6: Averages of the losses at times between 6:30-19:00	38
Table 7: Economic Benefit of Loss Reduction	40

LIST OF ABBREVIATIONS.

DigSILENT: Design Intelligent Grid Simulation Integrated Laboratory Engineering Network Technology

- AC: Alternating Current
- DC: Direct Current
- PCU: Power Conditioning Unit
- ECP: Electricity Connection Policy
- MTU: Master Terminal Unit
- UEDCL: Uganda Electricity Distribution Company Limited
- ERA: Electricity Regulatory Authority
- RES: Renewable Energy sources
- A: Amperes (current)
- V: Volts (voltage)
- kV: Kilo Voltage
- PV: Photo-Voltaic
- MW: Mega Watts
- MWh: Mega Watts hours
- KW: Kilo Watts
- UETCL: Uganda Electricity Transmission Company Limited
- I^2R : I- Current squared times Resistance (Ohmic loss)
- SCADA: Supervisory Control and Data Acquisition
- RTU: Remote Terminal Unit
- p.a: per annum
- GOU: Government Of Uganda
- RMSE: Root Mean Square Error.
- Pu.:Per Unit
- VAT: Value added Tax
- LOE: Loss of Enegy
- BU: Busitema University
- LV: Low Voltage
- MV: Medium Voltage
- GIS: Geographic Information System (GIS)

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