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***ASSESSING THE FINANCIAL IMPACTS OF SOLARIZATION ON A
DISTRIBUTION COMPANY IN PAKISTAN: A CASE STUDY***



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DEDICATION

This research work is dedicated to my parents, whose prayers and encouragement have always been my strength, and to my wife, whose support and belief in me made this journey possible. I also dedicate this work to future researchers in Pakistan who are striving to contribute meaningfully to the power sector and national development.

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Lastly, I extend my best wishes to the aspiring researchers in Pakistan's energy sector. May this work serve as a starting point for those who aim to bring about sustainable and impactful change.

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Appendix	Title	Purpose
Appendix A	Regression and Simulation Input Summary (FY 2017–2025)	Presents the actual audited financial, operational, and tariff data used for regression and simulation analysis, including revenue, units sold, energy purchase cost, O&M costs, tariff rate, capacity charges, gross profit, and GPM.
Appendix B	Variable Definitions and Formulas	Defines all variables used in the regression and scenario simulations, including units, sources, assumptions, and calculation logic aligned with the final econometric models.
Appendix C	Tariff Structure 2025–26 (IESCO)	Presents NEPRA-approved residential and commercial tariff structures relevant to net metering analysis and explains tariff-related revenue erosion under volumetric pricing.
Appendix D	Ethical Compliance and Data Transparency Statement	Confirms ethical compliance, absence of human subjects, public data usage, transparency of assumptions, reproducibility of results, and supervisor oversight.
Appendix E	Glossary of Financial and Power Sector Terms	Provides concise definitions of technical, regulatory, and modelling terms used throughout the thesis to support the reader's understanding and academic clarity.

ACRONYMS

APA	American Psychological Association
ARE	Alternative and Renewable Energy
BPC	Bulk Power Consumer
CAGR	Compound Annual Growth Rate
COD	Commercial Operations Date
CPPA-G	Central Power Purchasing Agency (Guarantee) Limited
CPI	Consumer Price Index
CRR	Cost Recovery Ration
CTBCM	Competitive Trading Bilateral Contract Market
DER	Distributed Energy Resources
DISCOs	Distribution Companies
FY	Fiscal Year
GPM	Gross Profit Margin
GWh	Gigawatt-hour
IESCO	Islamabad Electric Supply Company
IEEFA	Institute for Energy Economics and Financial Analysis
IGCEP	Indicative Generation Capacity Expansion Plan
IPP	Independent Power Producer
kW	Kilowatt
kWh	Kilowatt-hour
KE	K-Electric (formerly Karachi Electric Supply Corporation)
MO	Market Operator
MW	Megawatt
NEPRA	National Electric Power Regulatory Authority
NTDC	National Transmission and Dispatch Company
OLS	Ordinary Least Squares
PITC	Power Information Technology Company
PPA	Power Purchase Agreement
PV	Photovoltaic
ROE	Return on Equity
SRO	Statutory Regulatory Order
STATA	Statistical Data Analysis Software
TSP	Transmission Service Provider
VIF	Variance Inflation Factor
WAPDA	Water and Power Development Authority

ABSTRACT

This Research examined the financial effects of solarization and increased net metering on one of the Pakistani electricity distribution companies (DISCO), IESCO, and its consumers.

The regression analysis was conducted using the financial data of IESCO, which was obtained from its audited annual statements. The data on net metering was taken from the National Electric Power Regulatory Authority (NEPRA) State of Industry Reports. In the cases where NEPRA ratified data was not available, the supplementary data from the Power Information Technology Company (PITC) was utilized.

To assess utility-level financial stress, the study employed the Cost Recovery Ratio (CRR) as the primary indicator of financial performance, representing the ability of DISCO's revenues to cover fixed system costs such as capacity charges and network operating expenses. Solar Offset (%), defined as the total displacement of grid demand due to exported plus the self-consumed solar generation, was used as the key independent variable.

Regression analysis was applied to examine the association between Solar Offset (%) and CRR, with results interpreted as indicative rather than causal due to the regulated nature of the tariff in Pakistan. In addition, an accounting-based scenario simulation was conducted to assess how increasing solar penetration may affect both fixed-cost recovery and average tariffs for consumers of Last resort under a volumetric tariff structure.

The regression results indicate a negative association between Solar Offset (%) and the Cost Recovery Ratio, suggesting that rising solar penetration weakens the ability of volumetric revenues to absorb growing fixed system costs. The simulation results further demonstrate that increasing solar adoption places gradual but persistent pressure on utility cost recovery while shifting a greater tariff burden onto remaining grid consumers.

The research concludes with policy and regulatory recommendations to improve the financial sustainability of distribution utilities under rising levels of distributed solar generation.