Integration of 75MW Solar PV Plant: Transmission System Design Analysis

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***Abstract*—This report presents the design and analysis of transmission system modifications required to integrate a new 75MW solar PV plant while addressing existing system reliability concerns. The study evaluates various transmission line and transformer options to determine the most cost-effective solution that maintains system stability under both normal and N-1 contingency conditions.**

I. Introduction

- Project overview and objectives
- System requirements and constraints
- Design methodology

II. Initial System Analysis

A. Base Case Evaluation

- Existing system configuration
- Current system performance metrics
- Identification of existing violations

B. Contingency Analysis Results

- N-1 contingency findings
- Critical violations and their implications
- Key problem areas identified

III. Design Solutions

A. Design Options Considered

- Transmission line alternatives
- Voltage level considerations
- Transformer placement options

B. Technical Analysis

- Power flow studies
- Contingency analysis results
- System performance improvements

IV. Economic Analysis

A. Cost Components

- Fixed costs (lines, transformers, substations)
- Variable costs (distance-based)
- Loss reduction benefits

B. Solution Comparison

TABLE I
Cost Comparison of Design Options

Design Option	Capital Cost	Loss Savings	Net Cost
Option 1			
Option 2			

V. Recommended Solution

- Final design selection
- Technical justification
- Economic justification
- Implementation considerations

VI. Conclusion

Summary of key findings and recommendations

References

[1] PowerWorld Corporation, "PowerWorld Simulator Manual," 2024.
[2] IEEE Standard 1547-2018, "IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces."