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PERFORMANCE OF RELIABILITY INDICES AND VOLTAGE INSTABILITY ANALYSIS FOR OPTIMAL POWER FLOW TECHNIQUE WITH RENEWABLE ENERGY RESOURCES

Mr.Siddappaji. M.R
Assistant Professor
Sir. MVIT, Bengaluru, Karnataka India

Dr.K.Thippeswamy
Sel. Grade Lecturer
Department of Electrical & Electronics Engineering
S. J. Govt. Polytechnic, Bengaluru, Karnataka India

Summarize:-**Its objective of this research was to learn more about identify the most acceptable parameters for assessing voltage unpredictability, dependability, and performance in the optimum power flow (OPF) approaches while keeping the most extremely unpleasant possibility or blocked position in mind. Voltage flimsiness may be modified by a variety of components and control mechanisms that act on different time steps. It includes an OPF and burden stream evaluation of the IEEE 14-bus system framework without and with DG units, as well as a load flow analysis undertaken using the MI-Power software tool. The appropriate allowable parameters and control methods, such as those used in an OPF technique, are considered to be essential in long-term voltage instability. OPF is said to be formed in order to limit either the substation's influence or the expense of effect.**

Index words**:-DG, Reliability index, power flow consistency, optimizing, peak demand, utility grid limit.**

I. INTRODUCTION

Unwavering quality evaluation of integrated era transmission (mass power structure) has substantially as of late turned into a significant thought in power framework system planning. For evaluating reliability indices, research studies [1–4] provide such a thorough bibliographical review. A composite framework can be isolated in many possible areas as far as the limit accessible to satisfy request susceptible to the inclination of safety limits in general (line streams and voltage limit). The computation required to assess an unwavering reliability list for a composite structure have risen exponentially. Dependability of a framework may be classified into two parts: sufficiency and security. Framework sufficiency is characterized as the framework's flexibility to provide its outages, line stream imperatives, and generator and branch blackouts, however framework capability of the power framework to sustain expansion induced by shortfalls or unplanned expulsion of mass power supply is defined as security (dynamic). This means that sufficiency evaluation is a composite power framework's consistent post-blackout state, while security evaluation in dependability assessment incorporates dynamic analysis using real-time [6].

Optimization technique was previously provided in the 1990s [1] and has maintained a major enhancement difficulty in electrical power frameworks investigation even now. The development of OPF has key challenges: first, it is a functional level problem that must be addressed at regular intervals; second, the computational resources are constrained. Second, for a massive power structure with a huge number of buses, generators, and constraints, it is a non-linear advancement concern. The significance of the problem, as well as the issues already described, has resulted in a considerable existing literature. Load stream extensive research is the most commonly used exploration model in the power structure. The assessment of the line blackout stream in transmission lines and transformers is referred to as load stream concentration. Transmission lines and transformers in an electrical network should not be overloaded, and voltages must be within stated cutoff thresholds for all transports and generator responsive age to remain within reasonable limits.

II. EVALUATION OF RELIABILITY INDICES

A power distribution framework's dependability is defined as its ability to provide continuous support to customers. Conveyance framework unwavering quality files can be presented in many different of methods to indicate the dependability for individual customers, feeders, and framework established information associated with substations. The reliability of circulating frameworks is evaluated by assessing the hugeness of the heap focuses in terms of providing a reasonable supply to customers [12]. Over the last several years, there has been a resurgence of interest inside this location. A large number of papers have been released illustrating the sequence of events and the use of the strategies for displaying the several components of a distribution framework and evaluating the data on reliability Furthermore, the evaluation of the probability distribution of the unwavering quality lists for radial frameworks has indeed been correctly considered by such a couple of distributions. In any event, because to the complexity of the research and the necessity to incorporate covering blackouts in coinciding networks. These methods are inadequate for estimating the probability distribution of such networks. Furthermore, in order to produce reliable and more reasonable features that impact the performance of the framework under review, further considerations in the assessment of interference costs/constant quality worth are still essential [10].

Structure Average Interruption Frequency Indicator (SAIFI), Structure Average Interruption Duration Indicator (SAIDI), Client Average Interruption Frequency Indicator (CAIFI), Client Average Interruption Duration Indicator (CAIDI), Energy Not Supplied (ENS), and Average Energy Not Supplied (AENS) have all been included in this paper's attempt at creating a Reliability list [20].

Voltage instability has recently been identified as a critical concern in the highly concentrated and heavily networked power system [11]. This work uses a unique bus voltage Instability file named L-index and Voltage Centroid Proximity Index to investigate VSC-OPF. Optimal Power Stream: OPF-P-1&2, OPF-P-3: for Dynamic power usage, and OPF-Q: The L-index as an imbalance requisite for reactive power constraints outcomes in an upgrade of static voltage serious hazard and a reduction in dynamic power misfortunes of the framework [15]. The IEEE 14-bus test framework was used to evaluate the proposed VSC-OPF. The results of the tests suggest that this novel network identical approach is suitable for any multi-bus power network and is promising for voltage robustness evaluation of force framework in the current context [8].

III. DISTRIBUTED SYSTEM NETWORK & PLAN OF ACTION

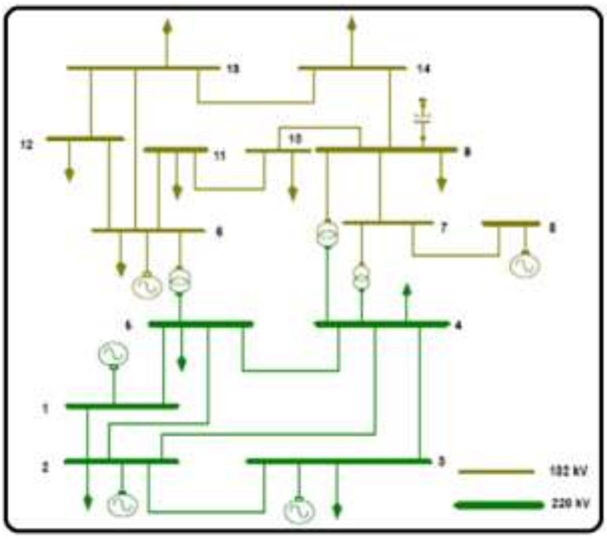

Fig 1: Sample 14-BusNetwork of the IEEE Analysis

Algorithm:-

The algorithm consists of five major steps to improve the Evaluated Reliability Index. These really are respective identities: -

1] Load flow method is used to evaluate reliability indices, voltage profiles, power quality problems, VSC-OPF, and perhaps line loss in the absence of distributed generation.

2] Assumes optimal DG allocation and size in various bus locations and demands.

3] Repeat load flow continue to study using DG units to assess system reliability, voltage stability, VSC-OPF, & line loss with % load bearing capacity.

4] A comparison of the outcomes obtained with and without the use of DG.

5] In a long-term voltage instability simulation, Mi-Power was used to study the behavior of components and control mechanisms such as Distributed generators.

IV. OPTIMAL PLACEMENT OF DG & DISCUSSION

The optimum rating of generation sources such as solar, wind, fuel, biogas, micro-grid Island, and many others is determined by the local distribution network configuration, such as bus voltages, and is not defined by the concept of distributed generation. However, introducing categories of varied DG ratings [3] is beneficial.

The categories are as follows:

DG 1 Watt - 5 kW

5 kW to 5 MW DG of a small size

Medium DG (5MW-50MW)

Large DGs have a capacity of 50 to 300 megawatts.

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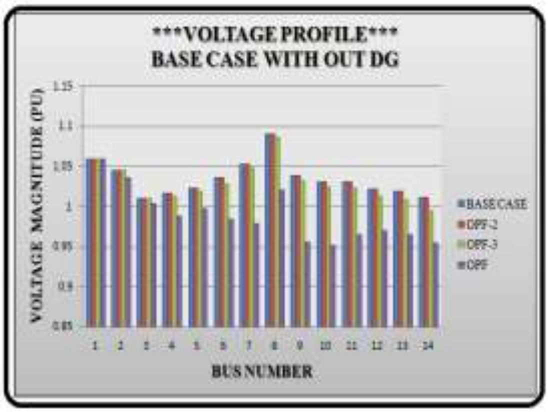

Fig. 2:-A voltage profile without DG units in the base scenario.

MVAr generation: 94.5389, MW generation: 272.4790.

Table 1:- Line loss for percentage loading scenarios without DG units in the base case.
MVAr-loss: 33.7647, total MW-loss: 13.4795.

BASE CASE-LINE LOSSES WITH OUT DG

|***** LINE FLOWS AND LINE LOSSES *****|

SL. NO.	FROM NAME	TO NAME	% LOADING BASE CASE	OPF-P-2	OPF-P-3	OPF-Q
1	BUS 1	BUS 2	74.8$	70.6$	74.3$	85.7≠
2	BUS 5	BUS 1	35.5^	34.7^	36.5^	41.4^
3	BUS 2	BUS 3	35.3^	35.4^	36.2^	38.4^
4	BUS 2	BUS 4	27.3^	27.5^	29.0^	32.2^
5	BUS 2	BUS 5	19.5&	19.8&	21.0&	23.5&
6	BUS 3	BUS 4	11.8&	11.7&	11.2&	12.6&
7	BUS 4	BUS 5	34.0^	33.6^	34.8^	37.8^
8	BUS 6	BUS 11	1.4&	1.4&	1.3&	4.6&
9	BUS 6	BUS 12	3.6&	3.6&	4.0&	4.4&
10	BUS 6	BUS 13	7.9&	7.9&	9.3&	11.2&
11	BUS 7	BUS 8	10.4&	10.4&	11.0&	11.8&
12	BUS 7	BUS 9	13.2&	13.2&	14.8&	20.3&
13	BUS 9	BUS 10	5.7&	5.7&	5.9&	3.8&
14	BUS 9	BUS 14	6.6&	6.6&	9.8&	11.7&
15	BUS 10	BUS 11	0.7*	0.7*	0.7*	2.9&
16	BUS 12	BUS 13	0.5*	0.5*	0.9*	1.3&
17	BUS 13	BUS 14	1.2&	1.2&	3.0&	5.4&

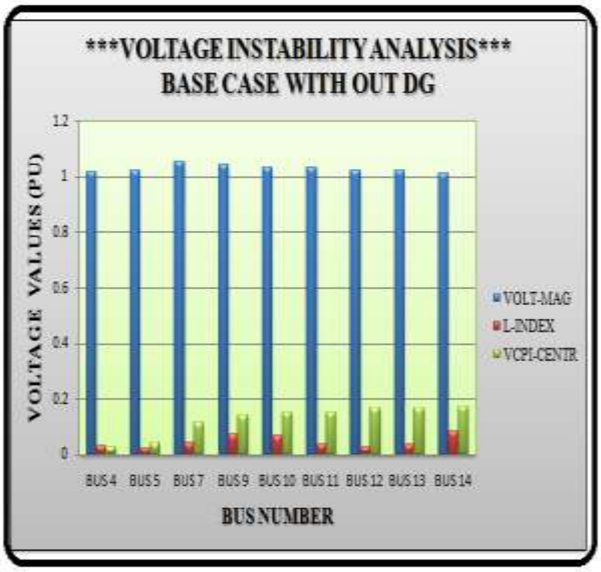

Fig. 3:-For baseline scenarios with Centroid Voltage of Generator Bus Voltages, analysis of voltage instability in the absence of DG units: (1.020407) + (j -0.197984)

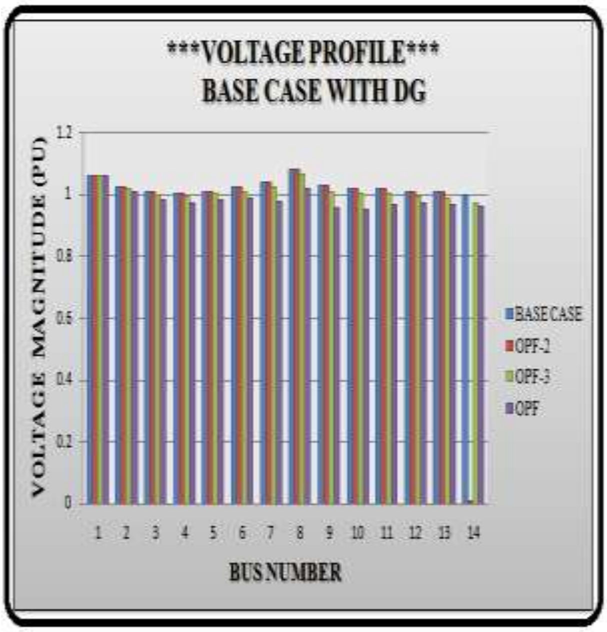

Fig 4: A voltage profile with DG units in the base case.

MVAr generation: 105.2782, MW generation: 275.2365.

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Table 2:-Line loss in percentage loading scenarios with DG units based on the maximum percentage loading
MVAr-Loss: 44.0276, total MW-Loss: 16.2347

BASE CASE-LINE LOSSES WITH DG

***** LINE FLOWS AND LINE LOSSES *****						
SL	FROM	TO	%LOADING			
NO.	NAME	NAME	BASE CASE	OPF-P-2	OPF-P-3	OPF-Q
1	BUS1	BUS2	91.0≠	91.0≠	94.9≠	103.2@
2	BUS5	BUS1	39.1^	39.1^	41.2^	45.6^
3	BUS2	BUS3	35.9^	35.9^	36.8^	38.7^
4	BUS2	BUS4	26.6^	26.6^	28.2^	31.6*
5	BUS2	BUS5	18.3&	18.3&	19.6&	22.3&
6	BUS3	BUS4	13.3&	13.3&	12.9&	12.6&
7	BUS4	BUS5	36.1^	36.1^	37.5^	40.3^
8	BUS6	BUS11	1.4&	1.4&	1.4&	4.6&
9	BUS6	BUS12	3.6&	3.6&	4.1&	4.4&
10	BUS6	BUS13	8.0&	8.0&	9.6&	11.1&
11	BUS7	BUS8	11.1&	11.1&	11.3&	11.8&
12	BUS7	BUS9	13.5&	13.5&	15.2&	19.6&
13	BUS9	BUS10	5.8&	5.8&	5.9&	3.7&
14	BUS9	BUS14	6.7&	6.7&	10.0&	12.0&
15	BUS10	BUS11	0.7*	0.7*	0.7*	2.9&
16	BUS12	BUS13	0.6*	0.6*	0.9*	1.3&
17	BUS13	BUS14	1.2&	1.2&	3.1&	5.5&

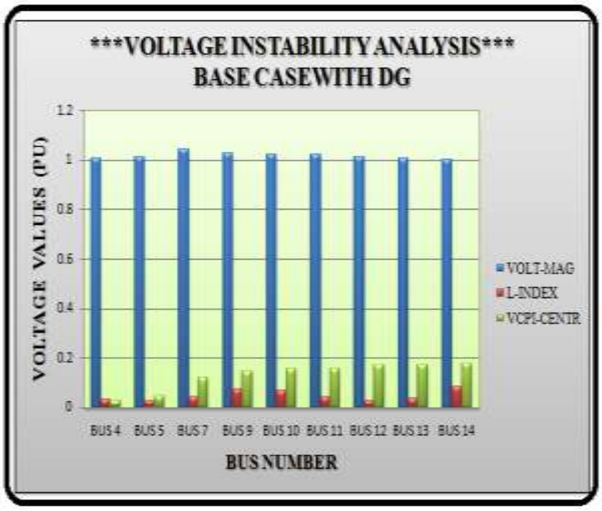

Fig. 5: Analysis of voltage instability in the base scenario with DG units. Generator Bus Voltages' Centroid Voltage: (1.007214) + (j -0.211684).

Fig. 6: Evaluating different scenarios using reliability indices.

Figure.6 shows the impact of interruptions on system dependability with and without distributed generation, ENS, and AENS. Distributed generation, ENS, and AENS would have a bigger influence on the system. The remaining indices will cause a halt.

V. CONCLUSION

This report proposes execution indices and methods for predicting voltage breakdown in a power framework. In all the cases considered, power stream arrangement has been used to arrive at a solution. The recommended approaches' correlation is completed by discarding the power-stream-based voltage breakdown proximity index. The use of that information on the IEEE 14-bus testing framework provided precise outcomes. The recreations demonstrate that the IEEE 14-bus-bar test framework's, the bus line 14 is regarded as the framework's most vulnerable bus. The index of a line provides accurate data on the stability condition of the lines; the indices data which may be necessary by the power framework can be utilized efficiently by the strategy.

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