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Cuckoo Search Algorithm Based Critical Load Restoratinwith Dgr using Virtual Instrumentation

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Abstract: ***Large blackouts are one of the rarest phenomenon's but restoration process is a complex process. But the objective of the process is quick restoration. Outrageous climate occasions significantly affect the maturing power system. It causes the expanded blackouts, furthermore loss of critical loads along these lines seriously influencing utility securities. It requires the essential to guarantee the spirit in the distribution network by rapidly restoring the loads during a sudden natural disaster victim. this paper proposed to restore the critical load using Distributed Energy Resources by the cuckoo search algorithm. The algorithm helps to allocate grids to pickup critical load with available DER. This method tested in IEEE 17 node feed with DER sources. The output is shown proposed method to restore maximum load with less restoration time.***

Key words: Power System Restoration, Distributed Energy Resources (DER), Cuckoo Search Algorithm, IEEE 17 node feeder.

I. INTRODUCTION

Power system restoration is a complex process in the power system industry. Due to population density, the power system builds complex huge network. As of much recent automation may also difficult to find the blackout before it occurs. Blackout occurs due to natural disaster as cyclone, tsunami etc. Blackout also occurs due to unbalance in power balance and demand. It causes the failure of the equipment's as it cascaded operation it affects the whole system. Many algorithms are used to restore the system as Build up strategy, build down strategy, PPSR parallel power system restoration etc. power system restoration process have policy and criteria. The main objective of the PSR process restores the system with less period of time and all the constraint should be satisfied. In the PSR process First Black start unit is should initiate to start then it energize other bus bar and provides start-up power to start-up units.

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Blackstart units are without start-up power it will activate as hydropower plant. After energizing the BS unit and NBS unit it picks up all the load demand. then all the subsystem synchronize with all the constraints satisfied. But before the restoration process intimate system should pick up all the critical load demand. Emergency loads are critical load demand. Many methodologies are used to pick up the critical load demand as an intelligent system, fuzzy logic system and optimization algorithm.

II. PROPOSED MODEL

Distributed energy resourses optimally connect to resilance grid to pickup the critical load demand by virtual instrumentation. DER are optimally connect to grid by cuckoo search algorithm, cuckoo search algorithm find the best optimized grid to recover more critical load demand with less restoration time. In this paper, restore the cirtical load due to disaster by utilizing Distributed Energy resources. we propose a framework to restore power supply to the critical loads in an event of a major disaster by optimally utilizing DERs.The proposed Cuckoo search algorithm restores critical loads in the feeder while:

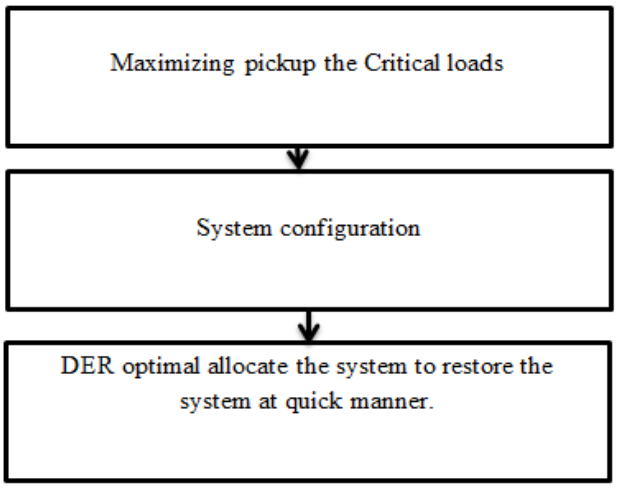

Figure 1 : Proposed Flow Model

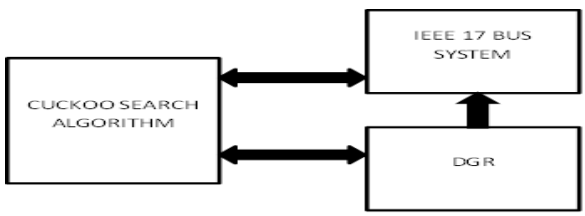

Figure 2: Block diagram

III. SYSTEM FORMATION

3.1 PROPOSED METHOD - Block Diagram

Proposed method build by graphical coding using VI System. Virtual Instrumentation Block diagram is shown in the figure 3. Block diagram designed by case structure, Boolean operators, string operators and arithmetic operators. The cuckoo search algorithm is imported in the VI block diagram. Case structure has four cases and default case. Depends upon the constraint level and transmission path energisation level the case will change to produce the optimized output on the block diagram.

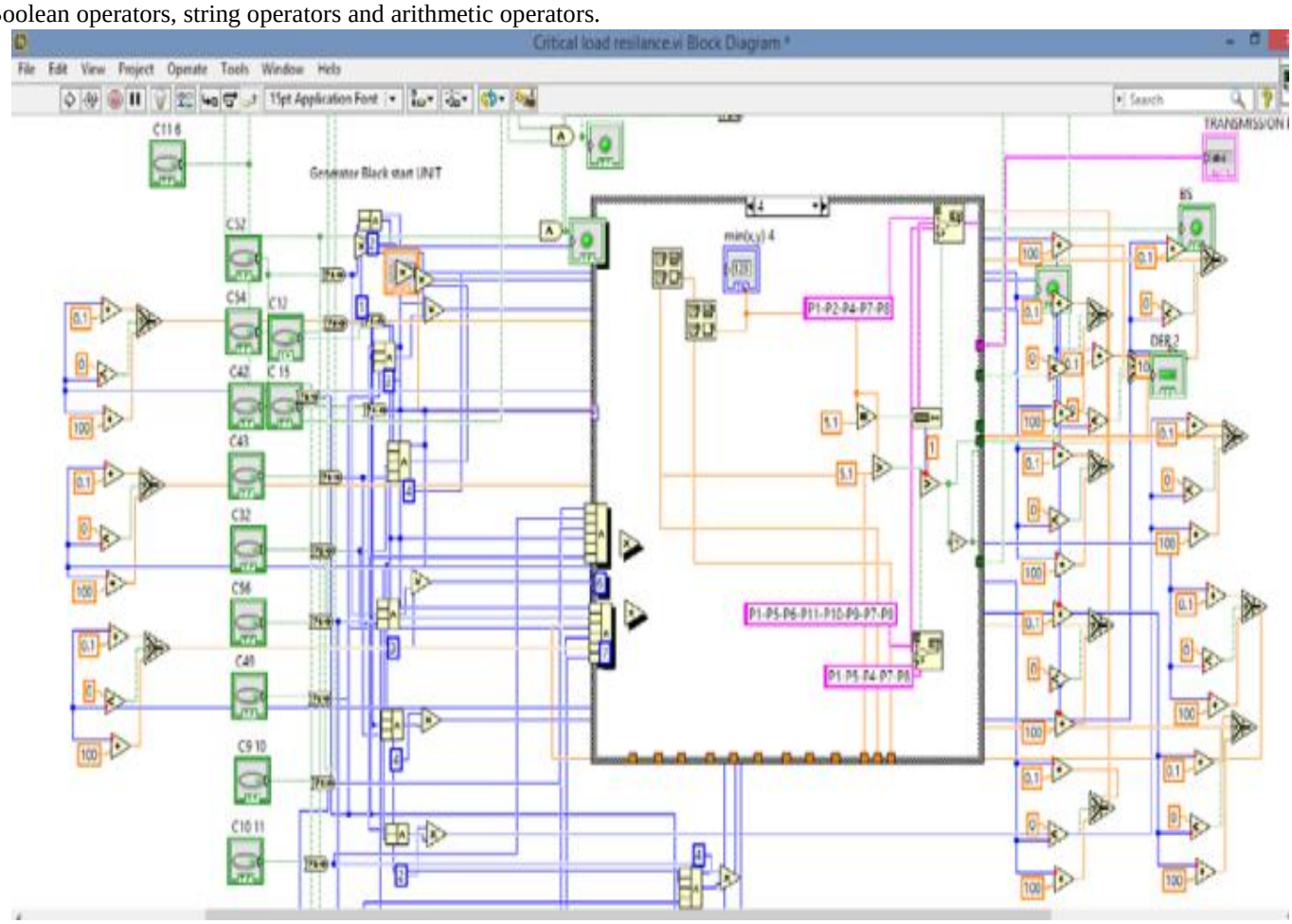

Figure 3: Proposed Method -VI Block Diagram

PROPOSED METHOD - Front Panel

VI Front panel operated on IEEE 17 bus system it has breaker indicator, load indicator, generation and bus indicator. It DGR level and generation black start unit energisation level and transmission path across two nodes to pick up the critical load.

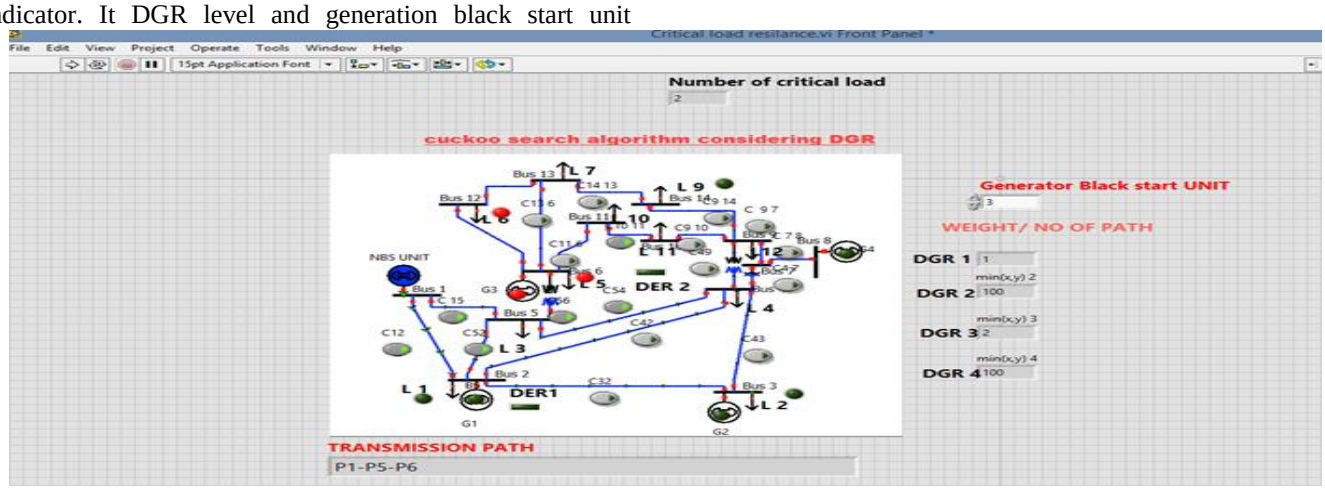

Figure 4: Proposed Method -VI Front Panel

IV. SIMULATION RESULT

Case I :One critical load

All DGR has full capacity power shown in the indicator tool. Due to optimized transmission path, critical load L6 is energized.

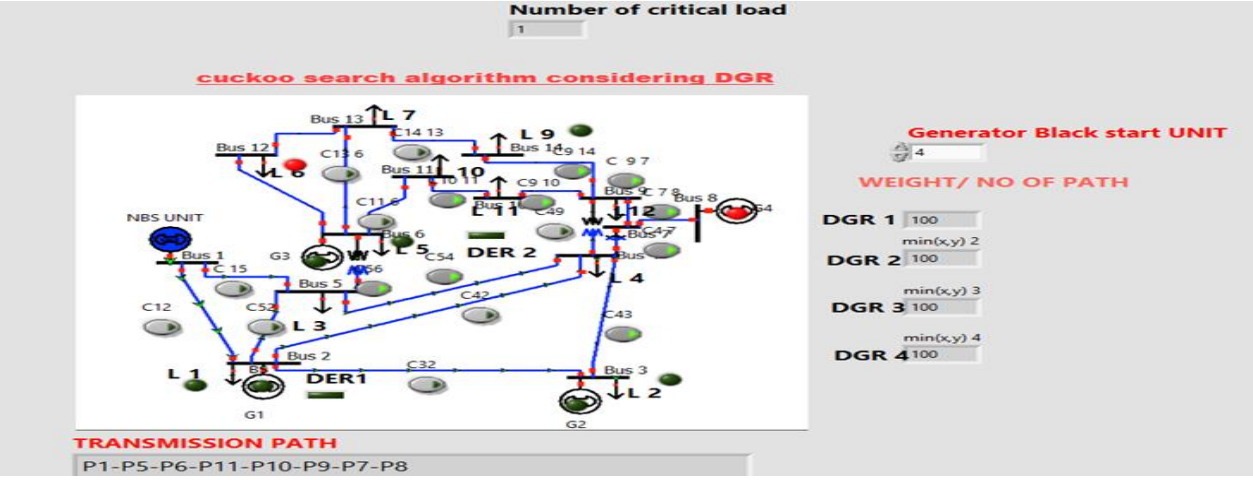

Figure 5: Simulation Result - Case 1

Case 2: Two critical load energisation

Due to DGR 3, 4 pickup the critical load demand L6 and L9 with optimized transmission path.

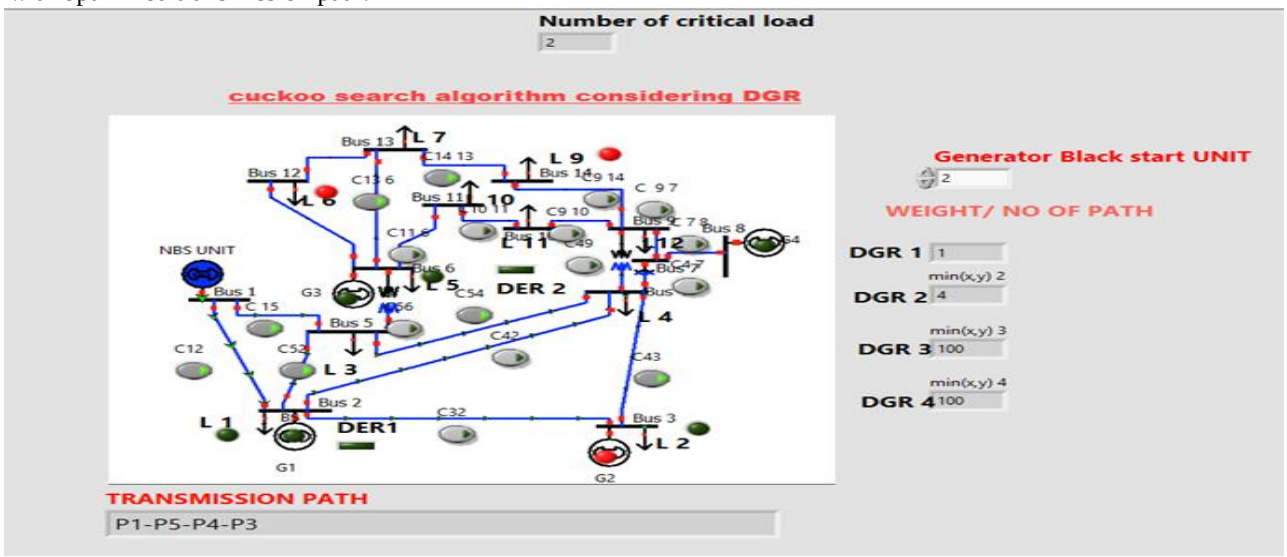

Figure 6: Simulation Result - Case 2

Case 3: Four critical load

Due to DGR 3, 4 pickup the critical load demand L1, L2, L6 and L9 with optimized transmission path.

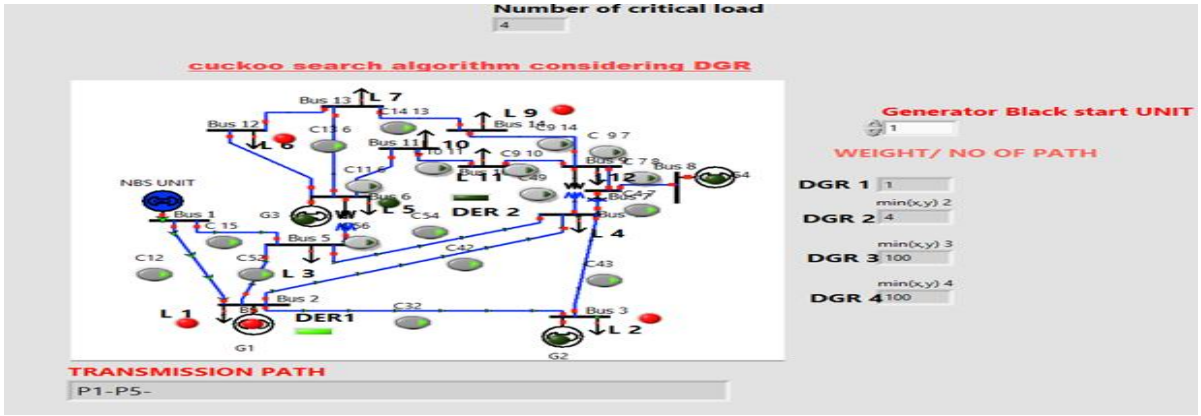

Figure 7: Simulation Result - Case 3

V. CONCLUSIONS

The proposed model tested and validated in IEEE 17 bus system using virtual instrumentation and cuckoo search algorithm when blackout occurs. Proposed model result shows the process of critical load restoration. Each island restores parallel manner then it synchronized. Simulation result shows the higher priority critical load restored with optimal selection of DER. In future this model embeds in artificial intelligence to make system as an effective manner.

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