ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

(An ISO 3297: 2007 Certified Organization)

Website: www.ijircce.com

Vol. 5, Issue 6, June 2017

Network Reconfiguration of Radial Distribution Network with DG using Cuckoo Search Algorithm

Anjali G, R.Chidanandappa, Dr.T.Ananthapadmanabha,

M.Tech, Department of Electrical and Electronics, The National Institute of Engineering, Mysuru, Karnataka, India

Assistant Professor, Department of Electrical and Electronics, The National Institute of Engineering, Mysuru, Karnataka, India

Principal, The national Institute of Engineering and Technology Mysuru Karnataka, India

ABSTRACT: This paper proposes a innovative method to solve the network reconfiguration problem in the occurrence of PV-type Distribution Generation-DG with an objective of minimizing the power loss and enhance voltage in Electric Distribution System -EDS. A Cuckoo Search Algorithm (CSA) is used to simultaneously reconfigure and recognize the optimal locations for installation of DGs by Loss sensitivity analysis .Different scenarios of DG placement and reconfiguration of network are considered to study the performance of the proposed method. The proposed method has been verified with 33-bus test system to demonstrate the performance and efficacy of the proposed method.

KEYWORDS: Distributed Generation; Cuckoo Search Algorithm; reconfiguration.

I. INTRODUCTION

In the current era of deregulated electricity markets, the EDS have attained a very important and crucial role in the industry. EDS plays an active and effective role in electricity markets, and can “positively impact” the market efficiency and make it more reliable, secure and beneficial to customers. There are several methodologies which are commonly recommended by researchers to lessen the power losses, either “network reconfiguration” or “installing capacitors” or “installing DGs” etc. However, the benefit of these methods can be achieved if they are cautiously coordinated in the distribution system.

Amongst totally DA functions, Distribution Network Feeder Reconfiguration (DNFRC) is a planning technique and a real-time operational control practice. DNFRC is outlined as changing the topological structured of distribution feeders with the aid of altering the “open & closed” conditions of the sectionalization & tie line switches. “Tie switches” are switches on the “open lines” and “sectionalizing switches” are those on closed switches. Open lines which offer an alternative delivery route to a number of buses are called “tie switches”. Closed ones are called “sectionalizing switches”. The Success of the reconfiguration process in achieving the specified results depends exclusively on the availability of these ties switches.

DNFRC means that rearranging the loads in the distribution network, area to the bodily infrastructure on hand on the ground so that you can fulfill the voltage restrictions, reduce “power loss” and balance the load on distinct feeders for its most ability utilization for steady usual operation at the same time not overloading the feeders and most greatly keep the radial configuration. In the proposed method, network reconfiguration and DG installation are dealt simultaneously for improved loss minimization and voltage profile.

DOI: 10.15680/IJIRCCE.2017. 0506026

II. RELATED WORK

In [2] Since DNFRC is a complex combinatorial, optimization problem, numerous calculations are proposed previously. Merlin and back [3] proposed the idea of energy delivery technique reconfiguration with an empirical methodology to work out the network reconfiguration with nominal or near "least line losses" grounded on a "particular variation of the branch-and-bound process". It requires an iterative process of removing branch with lowest power flow and then performing minimum power flow till radial network was obtained. This is proved to be time -consuming.

D.I.H. Sun et al. [4] conferred a new methodology for evaluating energy and potential losses on a distribution feeder in a rigorous manner. Right here common every day load shapes are built-in with a load flow method to provide an energy model. An unusual power flow approach for "loss deduction" in "network reconfiguration" crisis utilizing "branch exchange" process was offered.

S. Civanlar et al. [5] addresses the drawback of feeder reconfiguration within the context of feeder loss reduction. Right here additionally totally special "power flow" strategies were used for loss reduction in DNFRC centered on branch alternative methodology. This used to be confirmed on 23 kV systems.D. Shirmohammadi et al. [6] have developed a heuristic approach for the DNFRC with the intention to lessen their line losses under ordinary operational conditions. The projected procedure is characterized with the aid of convergence to the optimal or most appropriate answer and hence the individuality of the ultimate result from the preliminary condition of the network switches. Numerical results indicate that its appropriate for each planning and operational reports.

Chiang et al. [7] suggestion of the DNFRC problem as an overwrought, "multi-objective"&"non-differential" problem through both "equality and inequality constraints". Here the target was to minimize losses and load equalization. A structure is offered that employs DNFRC as a "planning and/or real-time control tool" to rearrange the prime feeder for loss deduction.R. P. Broadwater et al. [8] projected DNFRC algorithm on account that the time various loads. Both labour-intensive and programmed switches are the measure used to track the procedure for periodic revisions, whereas the simplest computerized switches rectangular measure idea of for day-to-day reviews. The weight estimation algorithmic program used to be accustomed get information for every time cause to be analyzed.

JI Yuan Fan et al. [9] grants an easy and amazing theme to with efficiency confirm the switch exchanges inside a hoop for leased line losses, and proposes an experimental theme to increase the most valuable switch launch with least switch operations so as to achieve the change from the preliminary configuration to the most suitable configuration.Hugh Rudnick et al. [10] have projected heuristic search algorithm supported branch exchange method for DNFRC problem and power summation process was used for load flow solution. This was utilized to 38 kV distribution network with 3 feeders. With this process, it's ascertained that the C.P.U. Time was lowered. Young-Jae Jeon et al. [11] grants a cost-effective algorithm for loss cut down by exploitation a computerized switching operation in huge scale distribution procedure. Simulated annealing methodology used to be used on an account that it appropriate for an enormous scale distribution system.R. SrinivasaRao *et al* [12] discussesthe reconfiguration for power loss minimization in the occurrence of DG. Here they used meta heuristic Harmony Search Algorithm for optimization and sensitivity analysis to identify optimal location for DG connection.

In this paper, CSA procedure has been projected the DNFRC problem in the presence DG. The algorithm is tested on 33-bus system and results obtained are compared with other methods available in the literature. The rest of the paper sorted by the following; the problem formulation of proposed work described in section III and also the sensitivity analysis for DG allocation is provided, section IV discuss about algorithm, Section V discusses the test system and results and Section VI presents conclusions of the work.

III.PROBLEM FORMULATION

To Maximize the power loss reduction in the distribution network the objective function is set to:

A. *Objective function*

Maximize f = max. $(\Delta P_{Loss}^{R} + \Delta P_{Loss}^{DG})$

Where, $\Delta \mathrm{P}_{\mathrm{Loss}}^{\mathrm{R}}$: power loss reduction after reconfiguration

ΔP_{Loss}^{DG} : power loss reduction after DG placement

B. Constraints

$$V_{min} \le |V_k| \le V_{max}$$
$$\text{and} \quad |I_{k,k+1}| \le |I_{k,k+1,max}|$$

C. Sensitivity analysis for DG connection

Sensitivity analysis is used to calculate sensitivity factors of candidate bus locations to connect DG units in the system. Estimation of these candidate buses helps in reduction of the search space for the optimization procedure [16].

Consider a line section consisting an impedance of $R_k + jX_k$ and a load of $P_{Lk,eff} + jQ_{Lk,eff}$ connected between k-1 and k buses shown in fig. 1.

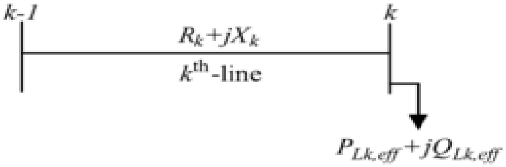


Fig..1. Line section between nodes k-1 and k**.**

Active power loss in the *kth*-line between *k-1* and *k* buses is given by

$$P_{lineloss} = \frac{(P_{Lk,eff}^2 + Q_{Lk,eff}^2)R_k}{V_k^2} \ldots\ldots\ldots\ldots..(1)$$

Now the loss sensitivity factor (LSF) can be obtained with the equation

$$\frac{\partial P_{lineloss}}{\partial P_{Lk,eff}} = \frac{2 * P_{Lk,eff} * R_k}{V_k^2} \ldots\ldots\ldots\ldots\ldots..(2)$$

Using above equation, LSFs are calculated from load flows and values are organized in descending order for all buses in system. It is price to note that LSFs adopt the order in which buses are to be selected for DG connection.

IV. CUCKOO SEARCH ALGORITHM

Cuckoo search (CS) is proposed by Yang and Deb in 2009 [15] it is an optimization algorithm inspired by the brood parasitism of cuckoo species, which lay their eggs in the nests of other host birds nests.It has been applied into the engineering optimization problems and shown its promising efficiency. This algorithm is based on the obligate brood parasitic behavior of some cuckoo species along with the Lévy flight behavior of some birds like fruit flies. There are mainly three principal rules during the search process as follows:

1. Each cuckoo lays one egg at a time and dumps its egg in a randomly chosen nest among the fixed number of available host nests.
2. The best nests with high quality of egg (best solution) will be carried over to the next generation.
3. The number of available host nests is fixed, and a host bird can discover an alien egg with a probability Pa € [0, 1]. In this case, it can either throw the egg away which is discovered by the host bird so as to build a completely new nest .

For a maximization problem, objective function is proportional to the fitness or quality of the solution. For simplicity, we can use the simple representations that is each egg in a nest represents a solution, and a cuckoo egg represent a new solution, the aim is to have the new and potentially better solutions (cuckoos) to replace a not-so-good solution in the nests. For generating new solutions a L´evy flight is done. The initialized population of the host nests is set to the best value of each nest Xbesti (i = 1,. . . ,N) and the nest corresponding to the best fitness function is set to the best nest Gbest among all nests in the population.

Generation of new solution via Lévy flights

All the nests except for the best one are replaced based on the quality of new cuckoo eggs (solution) which are produced by Lévy flights from their current position as follows:

$$X_i^{new}=\text{round}[Xbest_i + \alpha \times \text{rand}\times \Delta X_i^{new}] \text{ ....(3)}$$

where α > 0 is the step size parameter rand is a normally distributed random number in [0,1] and the increased value X_i^{new} determined by:

$$\Delta X_i^{new} = \frac{randx}{(randy\ )1/\beta}\times\frac{\sigma x\,(\beta\,)}{\sigma y\,(\beta\,)} \times (Xbest_i\text{-}Gbest_i\ )\text{.........(4)}$$

where randx and randy are two normally distributed stochastic variables with standard deviation σ_x (β) and σ_y (β) given by:

$$\sigma x(\beta) = \left[\frac{\Gamma(1+\beta)\times\sin(\frac{\Pi\beta}{2})}{\Gamma\frac{(1+\beta)}{2}\times\beta\times 2^{(\beta-1)/2}}\right]^{1/\beta} \text{ ....(5)}$$

$$\sigma y\ (\beta) = 1$$

where β is the distribution factor (0.3 ≤ β ≤ 1.9)

Γ is the gamma distribution function.

The action of discovery of an alien egg in a nest of a host bird with the probability of Pa also creates a new solution using Lévy flights. Existing eggs will be replaced with a best quality of new generated ones from their current positions through random walks by appropriate step size.

$$X_i^{new} = \text{rand}[Xbest_i+k\times\Delta X_i^{new}] \text{ ....(6)}$$

where K is the updated coefficient determined based on the probability of a host bird to discover an alien egg in its nest:

$$K = \begin{cases} 1 \ if\ rand\ <\ Pa \\ \ \ 0\ otherwise \end{cases} \text{ ....(7)}$$

And the increased value X_i^{new} is determined by:

$$X_i^{new} = \text{rand}\times[\text{randp}_1(xbest_i)\text{-randp}_2(xbest_i)]\text{........(8)}$$

where rand is the distributed random numbers in [0, 1] and randp_1 ($Xbest_i$), randp_2($Xbest_i$) are the random perturbation for positions of the nests in $Xbest_i$. The value of the fitness function is calculated and the nest corresponding to the best fitness function is set to the best nest Gbest.

The process of implementation of CSA algorithm is as follows.

Step 1: The input data including network configuration parameter,status of DGs and switches are to be read.

Step 2: Initialize the population

Setup the set of parameters of CSA such as, host nest N, step size α, probability pa, distribution factor β. The initial population is determined by selecting the tie switches and DG size randomly from the set of the original population. A population of N host nests is represented by

$$xi = [\ X_1^i,\text{......}X^i_{d-1},X^i_d] \text{ with } d=1,2,\ldots n$$

each Xi represents a solution vector of variables given by:

$$Xi = \{S_1, S_2, \ldots \ldots \ldots S_t, p_{g1}, p_{g2}, \ldots \ldots .. p_{gD}\}$$

The variable for tie switches represented by S and as for DG size is represented by p_g. Where t is the number of tie line and D is the number of DG.

Step 3: Generation of cuckoo

A cuckoo is randomly generated by Lévy flight by using equation (3). Load flow is used to evaluate the Cuckoo and The quality of the solution is determined by the objective function.

Step 4: Replacement (discovering alien eggs)

A nest is selected among *n* random population, if the quality of egg (new solution) in the selected nest is better than the old egg (solution), it will be replaced by the new egg (solution) (cuckoo).

Step 5: Generation of new nest

Based on the probability (pa) the worst nest are not considered they are abandoned and new eggs are built by using equation (8).

Step 6: End conditions.

Check the end condition, if it is reached the algorithm stops, otherwise, repeat steps 3 to 5 until the end conditions are satisfied. The fitness value is recorded and the nest corresponding to the best fitness function is set to the best nest Gbest.compared with G_{best} . If the fitness of any particle is better thanG_{best} , then replace G_{best} .

Step 7: Bring up-to-date the velocity and position of the particles. Eq.(3) is applied to update the particles. Meanwhile, Eq.(4) is applied to update the position of the particles.

Step 8: End conditions. Check the end condition, if it is reached the algorithm stops, otherwise, repeat steps 3 to 7 un till the end conditions are satisfied.

V.RESULTS AND DISCUSSIONS

In order to establish the effectiveness of the projected PSO method, applied on test system. Five cases are simulated and measured to investigate the supremacy of the anticipated method.

Case I: Without Reconfiguration and DG (Base case);
Case II: only reconfiguration.
Case III: Only DGs are connected
Case IV: DGs are connected after Reconfiguration
Case V: System with simultaneous feeder reconfiguration
and DG allocation.

Figure 2. shows the IEEE 33-bus radial distribution system with five tie-switches and 32 sectionalizing switches. In the network, sectionalize switches are numbered from 1 to 32, and tie-switches are numbered from 33 to 37. The total real and reactive power loads on the system are 3715 kW and 2300 kVAR. The parameters of CSA algorithm are pa=0.5, α=0.5,β=3/2 and population size is 10.

Sensitivity factors are calculated are sorted and ranked to connect the DG units at bus locations. Only top three localities are selected to connect DG units in the system. DG locations for cases III, IV, and V are given in Table I. To evaluate the performance, the system is simulated at three different load levels: 0.5 1.0 and 1.5 and corresponding results are tabulated in Table I. The deliberations of results for specific cases are described below

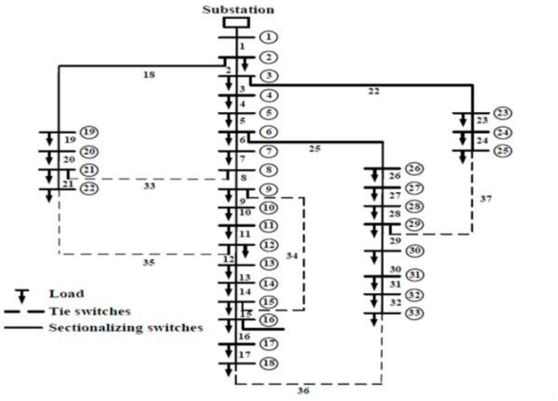


Fig.2. IEEE 33-Bus Radial Distribution System

Case I:Without Reconfiguration and DG

The base case power loss in kW and minimum voltage in pu are tabulated in Table I. For light, nominal and heavy load conditions computed losses are 49 kW, 208 kW, 589 kW respectively

Case II: The system with only reconfiguration.

In this case the network is reconfigured by changing the status of the sectionalizing switches. Here the switches 6, 8, 13, 16 and 27 are identified for opening, by keeping all other switches closed along with tie switches load flow is carried out and results are tabulated in Table I.

For a nominal load condition the loss is reduced from 208 kW to 146 kW. The loss reduction compared to case I is 28.57%, 29.8% and 31.91% for light, nominal and heavy load condition respectively. The enhancement in voltage contour for nominal load condition matched to case I is shown in figure 3a.

Case III: only DG units are connected

In this case only 3 PV-type DGs are connected at the sites recognized by the loss sensitivity analysis.

Simulation is carried out for the changed system and the results are tabulated in the Table I. From the table its observed that, for a nominal load condition the loss is reduced from 208 kW to 99.10 kW. The loss reduction compared to case I is 53.06%, 52.3% and 59.14% for light, nominal and heavy load condition respectively. The enhancement in voltage profile for nominal load condition compared to case I is shown in figure 3b.

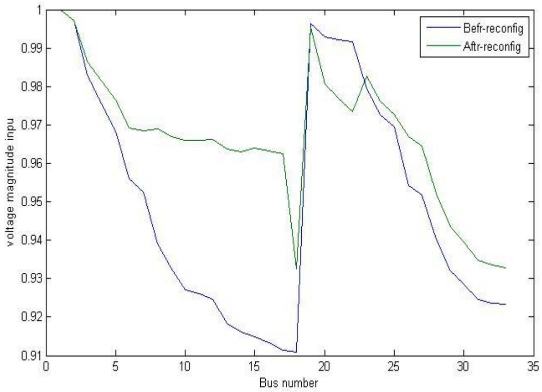
Case IV: DGs connected after reconfiguration

In this case the DGs are connected for the reconfigured network from case II. The load flow is carried out for the modified system and the results are tabulated in the Table I. From the table it is observed that, for a nominal load condition the loss is reduced from 208 kW to 70.98 kW. The loss reduction compared to case I is 64.73%, 65.8% and 72.11% for light, nominal and heavy load condition respectively. The enhancement in voltage profile for nominal load condition compared to case I and case II is shown in figure 3c.

Case V: Simultaneous feeder reconfiguration with DG allocation.

In case V, reconfiguration and simultaneous DG connection are carried out. Here the network is reconfigured by opening the switches 7,8,27,14 and 36 the corresponding DGs are installed. From the result it is observed that the loss is reduced to 56.05 kW which is less than all the scenarios. The improvement in voltage from case I to case V with the minimum voltage is 0.9775, is shown in the fig. 3d.

Similarly the benefits of perfection voltage and power loss minimization are obtained for light load and medium load condition. In all loading conditions, power loss decrease especially in case V is highest, which elicits the superiority of the proposed method over the other cases.



Fig,3a. Voltage profile of case I and II

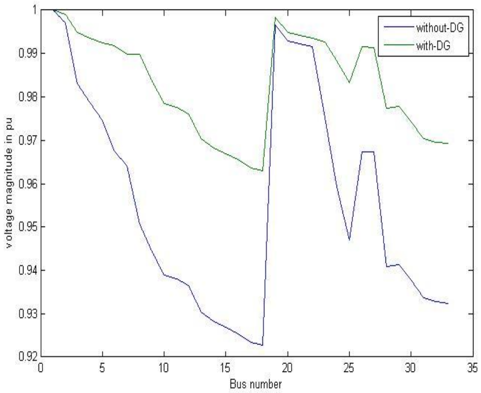


Fig.3b. Voltage profile of case I and III

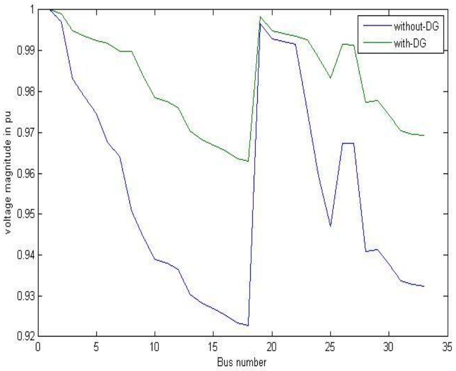
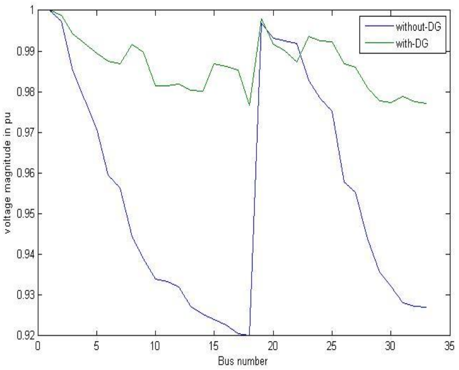


Fig.3c. Voltage profile of case I and IV



Fig,3d. Voltage plot for case I and V

TABLE I
RESULTS OF 33-BUS SYSTEM

Details		**Load Level**		
		Light (0.5)	**Nominal (1.0)**	**Heavy (1.5)**
Case I	A	33, 34, 35, 36, 37	33,34,35,36, 37	33, 34, 35, 36, 37
	B	49	208	589
	D	0.9572	0.9108	0.848
Case II	A	6, 8, 13, 16, 27	6, 8, 13, 16, 27	6, 8, 13, 16, 27
	B	35	146	401
	C	**28.57%**	**29.8%**	**31.91%**
	D	0.9673	0.9327	0.8879
Case III	A	33, 34, 35, 36, 37	33, 34, 35, 36, 37	33, 34, 35, 36, 37
	E	0.7902(8) 0.2230(24) 0.2700(25)	1.5952(8) 0.7248(24) 0.4566(25)	1.9734(8) 0.8824(24) 0.8409(25
	B	23.09	99.10	240.63
	C	**53.06%**	**52.3%**	**59.14%**
	D	0.9640	0.9622	0.9258
Case IV	A	6, 8, 13, 16, 27	6, 8, 13, 16, 27	6, 8, 13, 16, 27
	E	0.663(8) 0.2520(24) 0.5671(25)	1.1733(8) 0.6184(24) 1.3020(25)	0.8184(8) 1.0459(24) 1.7924(25)
	B	17.28	70.98	164.25
	C	**64.73%**	**65.8%**	**72.11%**
	D	0.9703	0.9622	0.9249
Case V	A	7,8,27,14,36	7,8,27,14,36	7,8,27,14,36

TABLE II:
COMPARISON OF SIMULATION RESULTS OF 33-BUS SYSTEM

Method	**Item**	**Case II**	**Case III**	**Case IV**	**Case V**
Proposed CSA	Switches opened	6,8,13,16, 27	33,34,35, 36,37	6,8,13,16, 27	7,8,14, 27,36
	Power Loss (kW)	146	99.10	70.98	56.05
	% Power Loss (kW)	29.8	52.3	65.8	72.2
	Min. voltage (p.u)	0.9327	0.9622	0.9602	0.9775
HAS[13]	Switches opened	7, 14, 9, 32, 37	33,34, 35,36, 37	7,14,9, 32, 37	7, 14,10, 32, 28
	Power Loss (kW)	138.06	96.76	97.13	73.05
	% Power Loss	31.88	52.26	52.07	63.95
	Min. Voltage (p.u)	0.9342	0.9670	0.9479	0.9700
GA[13]	Switches opened	33, 9, 34, 28, 36	33,34, 35,36, 37	33, 9, 34, 28, 36	7,10, 28,32,34
	Power Loss (kW)	141.60	100.1	98.36	75.13
	% Power Loss	30.15	50.60	51.46	62.92
	Min. Voltage (p.u)	0.9310	0.9605	0.9506	0.9766

	E	0.0690(8) 0.5003(20) 0.2745(31)	0.7403(8) 0.9799(20) 0.6308(31)	1.0580(8) 0.6322(20) 1.4920(31)
	B	14.92	56.05	129.03
	C	**69.54%**	**72.2%**	**78.09%**
	D	0.9863	0.9775	0.9712

A: Switches Opened, B: Power loss (kW), C:%loss reduction D :Minimum Voltage (p.u, E: Size of the DG in MW(Bus number)

From Table I, it is seen that development in power loss reduction and voltage profile for case V are higher when compared to case IV. This implies that DG connection after reconfiguration does not yield desired results of maximizing power loss reduction and improved voltage profile.

To compare the performance of CSA, all the cases are simulated with HSA [13] and GA[13] only at nominal load and results are provided in Table II. The population size, crossover rate, and mutation rate are selected as 50, 0.8, and 0.05 for GA respectively. From the table, it is observed that the performance of the CSA is better compared to HSA and GA in terms of the quality of the solution in all cases.

In this proposed CSA method, the percentage of loss reduction is more in case V compared to case II, III and IV shown in fig 4. The system power loss obtained are 75.13 kW, 73.05 kW and 56.05 kW for GA,HAS and proposed CSA respectively. It is observed that proposed CSA method results in minimum power loss compared to other algorithms shown in fig 5.

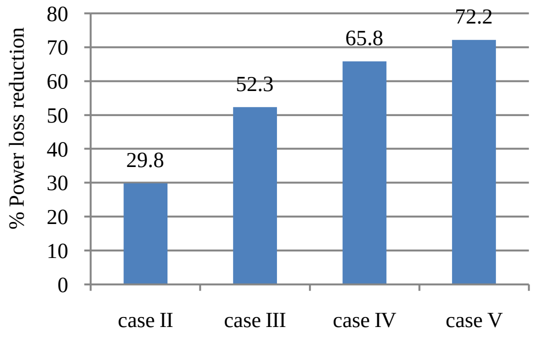


Fig.4.Power Loss reduction in different cases

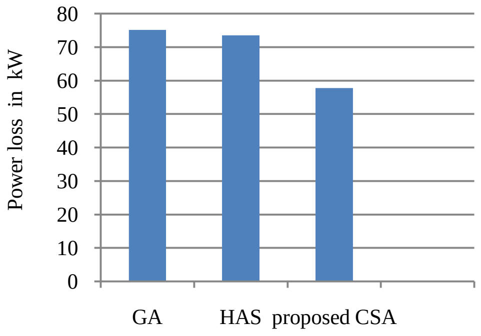


Fig.5.Comparison of Power Loss reduction

VI.CONCLUSION

In this paper, a new approach has been projected to reconfigure and DG connection simultaneously in distribution system. An efficient Cuckoo Search Algorithm is used in the optimization process. In addition, different cases are simulated to establish the superiority of the planned method. The proposed methods are tested on 33-bus systems at three different load levels. The results show that simultaneous network reconfiguration and DG connection method is more effective in reducing power loss and improving the voltage profile compared to other cases. The results obtained using CSA are compared with the results of Harmony search algorithm (HAS) and Genetic algorithm (GA) The computational results revealed that enactment of the CSA is better than HAS and GA.

REFERENCES

[1] T. Thakur and Jaswanti. "Study and Characterization of Power Distribution Network Reconfiguration" *IEEE PES Transmission and Distribution Conference and exposition* , vol.-160012 , no. 2, pp. 1-6, 2006.

[2] W. Wei, M. Sun, R. Ren, and Y. Wang, "Service restoration of distribution system with priority customers and distributed generation," *Innov. Smart Grid Technol. - Asia, 2012 IEEE*, pp. 1–6, 2012.

[3] A. Merlin and H. Back, "Search for a minimal-loss operating spanning tree configuration in an urban power distribution system," in Proc. of the Fifth Power System Conference (PSCC), Cambridge, 1975, pp. 1–18..

[4] D. I. Sun, D. R. Fanis et al., "Optimal Distribution Substation and Primary Feeder

[5] Planning via the Fixed Charge Network Formulation", IEEE Transactions on Power Apparatus and System, vol. PAS 101, March 1982. pp. 602-609.

[6] S. Civanlar, J. Grainger, H. Yin, and S. Lee, "Distribution feeder reconfiguration for loss reduction," Power Delivery, IEEE Transactions on, vol. 3, no. 3, pp. 1217–1223, 1988.

[7] D.Shirmohammadi, H.W.Hong, 'Reconfiguration of electric distribution networks for resistive line losses reduction.' IEEE Trans.Power Delivary , Yo1 4, No 2, April 1989, pp 1492-1498

[8] H. D. Chiang and R. J. Jumeau, "Optimal network reconfigurations in distribution systems: Part 2," IEEE Transactions Power Delivery, vol.5, pp. 1568- 1575, July 1990

[9] R. P. Broadwater, A. H. Khan, H. E. Shaalan, and R. E. Lee, "Time varying load analysis to reduce distribution losses through reconfiguration," *IEEE Trans. Power Deliv.*, vol. 8, no. 1, pp. 294–300, 1993.

[10] Ji-Yuan Fan, Lan Zhang and John D. McDonald, "Distribution Network Reconfiguration: Single Loop Optimization," IEEE Trans. on Power Syst., Vol.11, No. 3, Aug 1996, pp. 1643-1647.

[11] Hugh Rudnick, Ildefonso Harnisch and Raul Sanhueza, "Reconfiguration of Electric Distribution Systems," Revista facultad De Ingenieria, U.T.A. (CHILE), Vol. 4, No. 2, Feb. 1997, pp. 341-344.

[12] Young-Jae Jeon, Jae-Chul Kim, Jin-O Kim, Joong-Rin Shin, and Kwang Y. Lee, "An Efficient Simulated Annealing Algorithm for Network Reconfiguration in Large-Scale Distribution Systems," IEEE Trans. Power Del., Vol. 17, No. 4, Oct. 2002, pp 1070-1078

[13] R. S. Rao, K. Ravindra, K. Satish, and S. V. L. Narasimham, "Power Loss Minimization in Distribution System Using Network Reconfiguration in the Presence of Distributed Generation," *IEEE Trans. Power Syst.*, vol. 28, no. 1, pp. 1–9, 2012.

[14] W. M. Dahalan and H. Mokhlis, "Network reconfiguration for loss reduction with distributed generations using PSO," *PECon 2012 - 2012 IEEE Int. Conf. Power Energy*, no. December, pp. 823–828, 2012.

[15] Yang X S and Deb S, "Cuckoo Search via Levy flights",: Proc: World Congress on Nature and Biologically Inspired Computing, IEEE Publications, USA,pp. 210-2.

BIOGRAPHY

Anjali.G pursuing M.Tech degree from Department of Electrical and Electronics Engineering, The National Institute of Engineering,Mysuru.Karnataka,India.Her research fields of interest include distribution system Operationand controland Distributed Generation.

Chidanandappa R received the M.Tech. degree in Electrical Energy Systems from the Visvesvaraya Technological University and working as Assistant professor in department of Electrical and Electronics Engineering, The National Institute of Engineering Mysuru, Karnataka, India . He is currently working towards Ph.D. degree in Electrical Engineering. His research fields of interest include Distributed Generation, Power quality and Smart grid.

Dr.T.Anathapadmanabha received the Ph.D degree in Electrical Engineering from the university of Mysuru , currently working as Principal, The National Institute of Engineering and Technology –NIEIT Mysuru, Karnataka,India. His research fields of interest include Distributed Generation, Power system operation and control and Smart grid.He is a fellow of Institution of Engineers (India) and member of IEEE.He has guided many students for their Doctoral and Master degrees.

DOI: 10.15680/IJIRCCE.2017. 0506026