Optimal Rescheduling of Generators for Congestion Management by using Godlike Algorithm

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***Abstract*--Congestion charges can be analyzed in both the cases. In a pool market mode, the sellers (competitive generators) may propose their rise and reduce bid prices in a real-time balancing market. Correspondingly, in the crate of the joint market mode, each operation agreement may contain a reward charge that the purchaser-supplier pair is ready to agree that must its operation be shortened. This is capable of next be designed as a position of the connections dependent on the latter's sensitivities to the violated constriction in case congestion arises. By applying technique like GODLIKE, we can capable to compute this part of trouble. GODLIKE means for Global Optimum Determination by Linking and Interchanging Kindred Evaluators, and it is right what it does. It applies all four abovementioned techniques concurrently (connecting), and behind junction of either of them, or beyond exact predefined confines, it takes casual members from each inhabitants and apply then into casual other populations (modification) before abiding the optimization. The GODLIKE algorithm was written as an attempt to improve the robustness of the meta-heuristic algorithms, and to do away with the need to ¯ne-tune the algorithm of your choice for each optimization problem. The exchange operator is tremendously valuable for multi-aim troubles; when one inhabitants is totally non-dominated, modifying individuals among inhabitants will frequently result in a conquered inhabitant, which follows the seek for the Pareto front, instead of exposure convergence. GODLIKE does not objective to create either of the techniques more capable in case of function computations, (rather, it tends to involve more function computations).**

***Index Terms*—Flexible AC Transmission system(FACTS), unified power flow controller(UPFC),30 bus sytem,godlike algorithm.**

I. INTRODUCTION

Even though electricity is a very much engineered invention, it is more and more being measured and handled as a product[1]. To accomplish both set consistency and financial productivity, it has develop into clear that [4] extra proficient consumption and manage of the presented transmission system communications is required[5]. FACTS technologies permit for better transmission system action with negligible infrastructure savings, environmental collision, and achievement moment compared to the[7] structure of n higher solutions as money-making alternatives to fresh[8] transmission line production. With value to FACTS tools, voltage sourced converter (VSC) technology, which[10] consumes individual-commutated thyristors/transistors, has been productively applied in a amount of installations in the world.

The essential control for the UPFC is[11] such that the sequence converter of the UPFC reins the transmission line real/reactive power flow and the shunt converter of the [12]UPFC reins the UPFC bus voltage/shunt reactive power and the DC link capacitor voltage. The want for reactive[15] power coordination controller for UPFC ask from the piece of information that extreme bus voltage (the bus to which the shunt converter is connected) excursions arise during reactive power transmission.

II. SCOPE OF THE PRESENT EXPLORATION

UPFC which having series and a shunt converter coupled by a wide-ranging dc link capacitor can alongside do the job of transmission line real/reactive power flow control in adding to UPFC bus voltage/shunt reactive power control. The shunt converter of the UPFC pedals the UPFC bus voltage/shunt reactive power with the dc link capacitor voltage. The series converter of the UPFC pedals the transmission line real/reactive power flows by compensating a series voltage of flexible amount and segment position. The announcement along with the series injected voltage with the transmission line current better to real and reactive power key over between the series converter and the power system. Beneath locate state conditions, the real power necessity of the series converter is absolute by the shunt converter. But at several stage in temporary conditions, the series converter real power necessity is flourishing by the dc link capacitor. If the substance concerning the series converter real requirement is not messaged to the shunt converter control system, it may pilot to stop working of the dc link capacitor voltage and next removal of UPFC from process. Amazingly little or no perceive has been given to the important mark of coordination control along with the series and the shunt converter control systems.

The real power management supposed in this project is reliant on the recognized fact that the shunt converter have to give the real power necessity of the series converter. In this enclosure, the series converter shows the shunt converter control system an consequent shunt converter real power point out that including the error suitable to differ in dc link capacitor voltage with the series converter real power necessity. The control system structured for the shunt converter in cause's luxurious stoppage in relaying the series converter real power necessity in sequence to the shunt converter. This may bigger to immoral group on the whole UPFC control system with consecutive collapse of dc link capacitor voltage lower transient.

The input to the reactive power organization controller is the transmission line reactive power location. The shunt converter Q-axis power system with the reactive power coordination controller shown. The breakdown circuit talk about the reactive power coordination controller. The raise of the breakdown circuit has been selected to be 1.0. This is for the cause that, a few swell/cut in the transmission line reactive power flow outstanding to adapt in its location is abounding by the shunt converter. The breakdown time constant is structured due to the response of the power system to step adjustment in transmission line reactive power flow not counting the reactive power coordination controller.

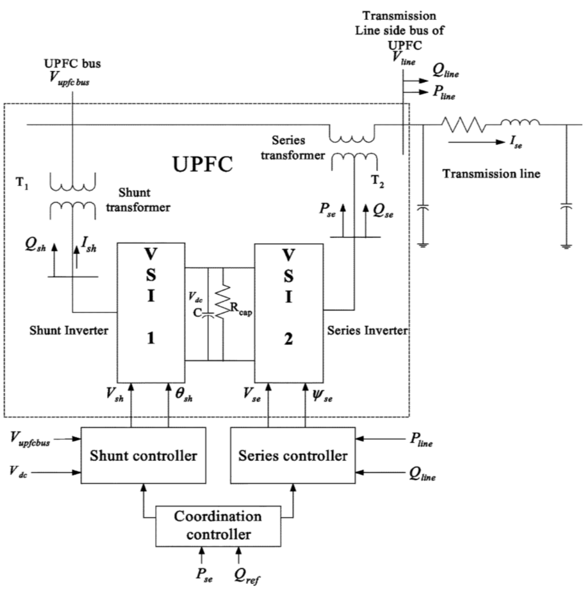
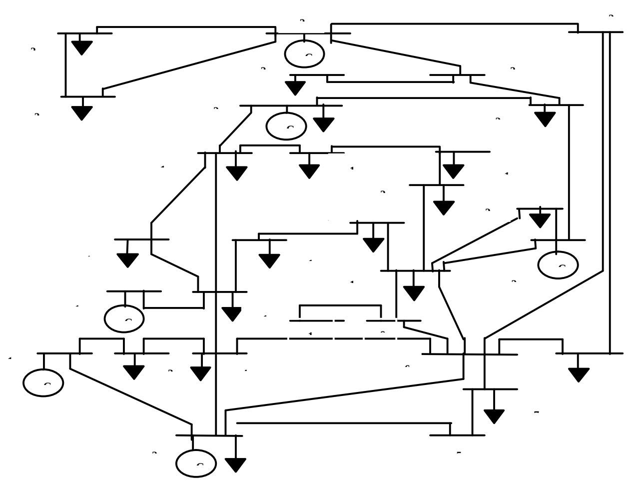


Fig. 1. UPFC connected to a transmission line.

conditions. In this project, a innovative real power coordination controller has been urbanized to avoid unsteadiness/unnecessary loss of dc link capacitor voltage during transient conditions.

In distinction to real power coordination among the series and shunt converter control system, the control of transmission line reactive power flow superier to unnecessary voltage excursions of the UPFC bus voltage for the duration of reactive power transfers. This is owing to the fact that any vary in transmission line reactive power flow analyzed by varying the magnitude/phase angle of the series injected voltage of the UPFC is in fact supplied by the shunt converter. The too much voltage excursions of the UPFC bus voltage is owing to absence of reactive power coordination among the series and the shunt converter control system. This portion of UPFC control has too not been inspected previously. A new reactive power coordination controller amongst the series and the shunt converter control system has been structured to diminish UPFC bus voltage excursions for the duration of reactive power transfers.

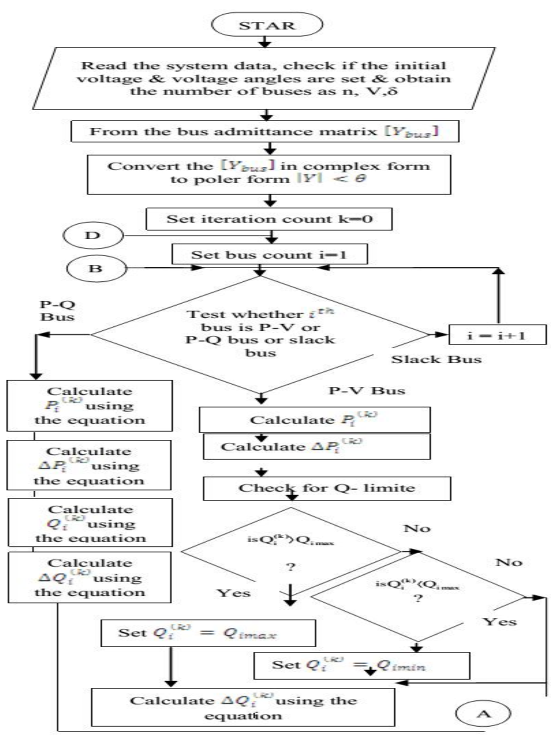
III. 30 BUS SYSTEM

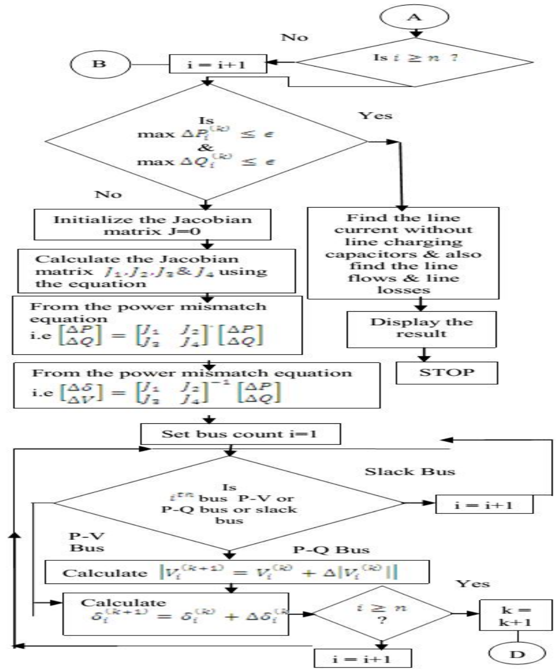


To recognize the design of a real power coordination controller for a UPFC, consider a UPFC linked to a transmission line as shown in Fig. 3. The communication between the series injected voltage (Vse) as well as the transmission line current (Ise) bigger to swap over real power linking the series converter and the transmission line. The real power (Pse) necessity of the series converter (Pse) induces the dc link capacitor voltage (Vdc) to moreover swell or cut depending on the track of the real power flow from the series converter. This cut/swell in dc link capacitor voltage (Vdc) is fed by the shunt converter controller to facilitate controls the dc link capacitor voltage (Vdc) with constraints to swell/cut the shunt converter real power flow to carry the dc link capacitor voltage (Vdc) reverse to its planned value. Or else, the real power necessity of the series converter is documented by the shunt converter controller only by the cut/swell of the dc link capacitor voltage (Vdc). Thus, the shunt and the series converter operation are in a method divided from each one other. To offer for good coordination among the shunt and the series converter control system, a opinion from the series converter is give to the shunt converter control system. The comment signal used is the real power necessity of the series converter (Pse). The real power necessity of the series converter (Pse) is converted into an correspondent D-axis current for the shunt converter (iDse).

The real power necessity of the series converter (Pse) is the real part of creation of the series converter injected voltage (Vse) with the transmission line current (Ise). It represents the voltage of the bus to which the shunt converter is linked with the corresponding additional D-axis current that ought to flow throughout the shunt converter to provide the real power necessity of the series converter. The corresponding D-axis supplementary current signal (iDse) is fed to the middle manage system, thereby raising the usefulness of the coordination controller. Further, the middle control system loops are express acting PI controllers and make sure express supply of the series converter real power necessity (Pse) by the shunt converter.

IV. NR METHOD





V SIMULATION RESULTS

POWER FLOW RESULTS FOR 30 BUS SYSTEM		POWER FLOW RESULTS FOR 30 BUS SYSTEM(AFTER CONGESTION)	
Total Generation in P (MW)	191.64	Total Generation in P (MW)	192.01
Total Generation in Q(MVAR)	100.41	Total Generation in Q(MVAR)	95.84
Total Load in P (MW)	189.20	Total Load in P (MW)	189.20
Total Load in Q(MVAR)	107.20	Total Load in Q(MVAR)	107.20

Fig.1.Power flow calculation

POWER FLOW RESULTS FOR 30 BUS SYSTEM		POWER FLOW RESULTS FOR 30 BUSSYSTEM(AFTER CONGESTION)	
Total Loss in P (MW)	2.444	Total Loss in P (MW)	2.813
Total Loss in Q(MVAR)	8.99	Total Loss in Q(MVAR)	4.59

Fig.2.Total loss calculation

LINE LIMIT CALCULATION FOR 30 BUS SYSTEM							
LINE	RA	RB	RC	**LINE**	RA	RB	RC
1-2	130	130	130	**6-8**	32	32	32
1-3	130	130	130	**6-9**	65	65	65
2-4	65	65	65	**6-10**	32	32	32
3-4	130	130	130	**9-11**	65	65	65
2-5	130	130	130	**9-10**	65	65	65
2-6	65	65	65	**4-12**	65	65	65
4-6	90	90	90	**12-13**	65	65	65
5-7	70	70	70	**12-14**	32	32	32
6-7	130	130	130	**12-15**	32	32	32

Fig.3.Line limit calculation

LINE LIMIT CALCULATION FOR 30 BUS SYSTEM							
LINE	RA	RB	RC	**LINE**	RA	RB	RC
LINE	RA	RB	RC	**LINE**	RA	RB	RC
12-16	32	32	32	**10-22**	32	32	32
14-15	16	16	16	**21-22**	32	32	32
16-17	16	16	16	**15-23**	16	16	16
15-18	16	16	16	**22-24**	16	16	16
18-19	16	16	16	**23-24**	16	16	16
19-20	32	32	32	**24-25**	16	16	16
10-20	32	32	32	**25-26**	16	16	16
10-17	32	32	32	**29-30**	16	16	16

Fig.4. Line limit calculation

LINE LIMIT CALCULATION FOR 30 BUS SYSTEM(AFTER CONGESTION)							
LINE	RA	RB	RC	**LINE**	RA	RB	RC
1-2	138	138	138	**6-8**	32	32	32
1-3	137	137	137	**6-9**	68	68	68
2-4	71	71	71	**6-10**	34	34	34
3-4	134	134	134	**9-11**	71	71	71
2-5	140	140	140	**9-10**	66	66	66
2-6	70	70	70	**4-12**	69	69	69
4-6	93	93	93	**12-13**	68	68	68
5-7	74	74	74	**12-14**	32	32	32
6-7	131	131	131	**12-15**	33	33	33

Fig.5. Line limit calculation during congestion

LINE LIMIT CALCULATION FOR 30 BUS SYSTEM(AFTER CONGESTION)							
LINE	RA	RB	RC	**LINE**	RA	RB	RC
12-16	33	33	33	**10-22**	34	34	34
14-15	17	17	17	**21-22**	33	33	33
16-17	16	16	16	**15-23**	16	16	16
15-18	17	17	17	**22-24**	16	16	16
18-19	16	16	16	**23-24**	17	17	17
19-20	34	34	34	**24-25**	16	16	16
10-20	33	33	33	**25-26**	17	17	17
10-17	34	34	34	**29-30**	16	16	16
10-21	34	34	34	**6-28**	32	32	32

Fig.6. Line limit calculation during congestion

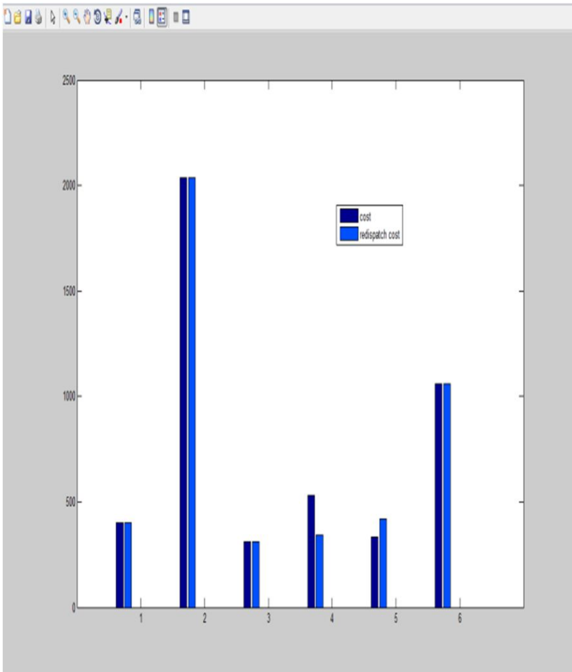


Fig.7.Godlike algorithm

POWER FLOW RESULTS FOR 30 BUS SYSTEM(SOLVED BY GODLIKE ALGORITHM)	
Total Generation in P (MW)	191.64
Total Generation in Q(MVAR)	100.41
Total Load in P (MW)	189.20
Total Load in Q(MVAR)	107.20
Total Loss in P (MW)	2.444
Total Loss in Q(MVAR)	8.99

Fig.8. Power flow results solved by Godlike algorithm

LINE LIMIT CALCULATION FOR 30 BUS SYSTEM(SOLVED BY GODLIKE ALGORITHM)							
LINE	RA	RB	RC	**LINE**	RA	RB	RC
1-2	130	130	130	**6-8**	32	32	32
1-3	130	130	130	**6-9**	65	65	65
2-4	65	65	65	**6-10**	32	32	32
3-4	130	130	130	**9-11**	65	65	65
2-5	130	130	130	**9-10**	65	65	65
2-6	65	65	65	**4-12**	65	65	65
4-6	90	90	90	**12-13**	65	65	65
5-7	70	70	70	**12-14**	32	32	32
6-7	130	130	130	**12-15**	32	32	32

Fig.9. Line limit calculation during Godlike algorithm

LINE LIMIT CALCULATION FOR 30 BUS SYSTEM(SOLVED BY GODLIKE ALGORITHM)							
LINE	RA	RB	RC	**LINE**	RA	RB	RC
LINE	RA	RB	RC	**LINE**	RA	RB	RC
12-16	32	32	32	**10-22**	32	32	32
14-15	16	16	16	**21-22**	32	32	32
16-17	16	16	16	**15-23**	16	16	16
15-18	16	16	16	**22-24**	16	16	16
18-19	16	16	16	**23-24**	16	16	16
19-20	32	32	32	**24-25**	16	16	16
10-20	32	32	32	**25-26**	16	16	16
10-17	32	32	32	**29-30**	16	16	16

Fig.10. Line limit calculation during Godlike algorithm

VI.CONCLUSION

In this venture, the concert of UPFC linked to a transmission line has been structured and analyzed. This development also explains the control plan for real and reactive power of the transmission line using UPFC. For the study of redispatch method, simulation using MATLAB performed. The performance of UPFC was computed in mutually with open loop as well as closed loop control conditions. The consequences of the simulation evidently shows that using godlike algorithm we capable to find out the redispatch value and charge are added in power system in sort to keep up the market clearing cost.

VII.REFERENCES

[1] K.Vijayakumar," Multiobjective optimization methods for congestion management in deregulated power system" Hindawi Publishing Corporation, Journal of electrical and Computer Engineering, volume 2012, Article ID 962402,8 pages.

[2] L. S. Hyman, "Transmission, congestion, pricing, and incentives,"IEEE Power Engineering Review, vol. 19, no. 8, pp. 4–10,1999.

[3] F. C. Schweppe, M. C. Caramanis, R. D. Tabors, and R. E. Bohn,Spot Pricing of Electricity, Kluwer Academic Publishers, Boston, Mass, USA, 1988.

[4] S. Dutta and S. P. Singh, "Optimal rescheduling of generators for congestion management based on particle swarm optimization,"IEEE Transactions on Power Systems,vol.23,no.4, pp. 1560–1569, 2008.

[5] K. P. Wong and Z. Dong, "Differential evolution, an alternative approach to evolutionary algorithm," inProceedings of the 13th International Conference on Intelligent Systems Application to Power Systems (ISAP '05), pp. 73–83, November 2005.

[6] S. Rahnamayan, H. R. Tizhoosh, and M. M. A. Salama, "Quasi-oppositional differential evolution," inProceedings of the IEEE Congress on Evolutionary Computation, CEC 2007,pp. 2229–2236, September 2007.

[7] L. dos Santos Coelho and V. C. Mariani, "Combining of chaotic differential evolution and quadratic programming for economic dispatch optimization with valve-point effect,"IEEE Transactions on Power Systems, vol. 21, no. 2, pp. 989–996, 2006.

[8] P. Somasundaram and K. Kuppusamy, "Application of evolutionary programming to security constrained economic dispatch,"International Journal of Electrical Power and Energy Systems, vol. 27, no. 5-6, pp. 343–351, 2005.

[9] R. C. Burchett, H. H. Happ, and D. R.Vierath, "Quadratically convergent optimal power flow," IEEE Transactions on Power Apparatus and Systems, vol. 103, no. 11, pp. 3267-3276, November 1984.

[10] L. S. Vargas, V. H. Quintana, and A.Vannelli, "A tutorial description of an interior point method and its application to security-constrained economic dispatch," IEEE Transactions on Power Systems, vol. 8, no. 3, pp. 1315-1324, August 1993.

[11] J. A. Momoh, S. X. Guo, E. C. Ogbuobiri, and R. Adapa, "Quadratic interior point method for solving power system optimization problems,"IEEE Transactions on Power Systems, vol. 9, no. 3, pp. 1327-1336, August 1994.

[12] R. S. Fang and A. K. David, "Transmission congestion management in an electricity market," IEEE Transactions on Power Systems, vol. 14, no. 3, pp. 877-883, August 1999.

[13] H. Glatvitsch and F. Alvarado, "Management of multiple congested conditions in unbundled operation of a power system," IEEE Transactions on Power Systems, vol. 13, no. 3, pp. 1013-1019, August 1998.

[14] D. Shirmohammadi et al., "Transmission dispatch and congestion management in the emerging energy market structures," IEEE Transactions on Power Systems, vol. 13, no. 4, pp. 1466-1474, November 1998.

[15] K. Bhattacharya, M. H. J.Bollen, and J. E. Daalder, Operation of Restructured Power Systems. Boston: Kluwer Academic Publishers, 2000.

[16] GAMS Release 2.25, A User's Guide, Washington: GAMS Development Corporation, 2000.

[17] N. G. Hingorani, "Flexible AC transmission," IEEE Spectrum, April 1993, pp. 40-45.

[18] E. J. de Oliveri, J. W. M. Lima, and J. L. R. Pereira, "Flexible AC transmission system devices: Allocation and transmission pricing," International Journal of Electric Power and Energy Systems., vol. 21, no. 2, pp. 111-118, February 1999.