International Journal of Technical Innovation in Modern Engineering & Science (IJTIMES)
Impact Factor: 5.22 (SJIF-2017), e-ISSN: 2455-2585
Volume 4, Issue 6, June-2018

A REVIEW ON UNIFIED POWER FLOW CONTROLLER (UPFC) TO IMPROVE POWER TRANSFER CAPABILITY OF INTERCONNECTED POWER SYSTEM

#1 M.CHANDRIKA (ASSISTANT PROFESSOR)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

KODADA INSTITUTE OF TECHNOLOGY AND SCIENCE FOR WOMEN,KODAD,NALGONDA,TELANGANA.

ABSTRACT

Unified Power Flow Controller (UPFC) is the most potent facts device. UPFC is able to control the true and reactive energy together with voltage magnitude and phase perspective. After we talk concerning the interconnected community, the foremost situation is highest use of the switch potential of interconnected line. Inside the line limits stipulations, UPFC is equipped to maximise the power transfer capacity between the 2 interconnected vigour techniques. This paper proposes use of phasor mannequin of UPFC to maximize the power transfer ability of interconnected power programs. UPFC is established on the interconnecting line. The modeling is completed in Matlab/Simulink utilizing scan method along with 20 bus system incorporating UPFC. The simulation results certainly show that the mannequin using UPFC has highest worth of vigour switch as compared to the model with out UPFC.

Index phrases—UPFC, Matlab/Simulink, lively vigor, reactive power.

1.INTRODUCTION

The power transfer between two or more vigour systems is a very valuable thought in restructuring. A quantity of experiments had been accomplished on energy programs to maximise its vigor switch capability. Unified energy glide Controller (UPFC) is essentially the most effective flexible Alternating current Transmission process (info) device which is ready to maximise the vigour switch ability of interconnected energy programs. The capability of UPFC to expand the potential of vigour transfer between two power methods was once first proven in [1]. On this paper simulation outcome exhibit the value of lively energy to be increased with use of UPFC. The idea of midpoint siting of UPFC in transmission line is outlined in [2]. This thought of mid-factor siting is very much effective in controlling the reactive energy and enhances the power switch potential to nearly twice as in comparison with the uncompensated line. The affect of UPFC on reliability of vigour system is examined in [3]. In this paper, two extraordinary parallel transmission strains are regarded for typical energy sharing. On these transmission lines UPFC is hooked up to make use of the maximum ability of transmission line for vigor switch.

The application of UPFC for maximizing the actual vigour transfer under three constraints: top-quality vicinity of UPFC, method topology and gear constraints are given in [4]. Whereas a process proposing UPFC to enhance the power transfer ability beneath voltage stability limits is done beneath [5]. This paper overcomes the difficulty associated with UPFC that it can't keep watch over the bus voltage set factor when operated at its rated capability. A Newton-Raphson load go with the flow algorithm is used for modeling and computation undertaking. In [6] the usage of stochastic headquartered manner is done to seek out the greatest sizing of UPFC whereby the UPFC is employed to regulate the typical power sharing within the energy process as well as for enhancement of steady-state voltage profile. In this paper, a maximized vigour switch capacity between interconnected energy systems is finished utilizing UPFC. The scan mannequin which include 20 bus systems is studied over two phases: stage I and stage II. Stage I represents the test mannequin with out UPFC being hooked up whereas the stage II incorporates UPFC phasor mannequin. The bus No. B10 is used because the interconnecting bus between the 2 power programs network. The values of actual energy on bus No. B10 in simulation outcome evidently shows an enhancement of real energy from stage I to stage II.

2.MODEL DESCRIPTION

As the demand of power give in world is going on increasing day-to-day, this makes the energy system more and more difficult. The transmission network just isn't best to be upgraded but also maximum utilization to be completed of the existing transmission lines. As a way to maximize the vigour float of the interconnected power approach, a simulation is carried out. The simulation diagram includes a flexible Alternating current Transmission method (information) which is founded on shunt-series compensator i.E. Unified vigor go with the flow Controller (UPFC). The Unified vigour flow controller is a kind of bendy alternating present transmission method that can support now not handiest to maximize the power go with the flow but additionally manage voltage magnitude, line impedance as well because the phase angle. The energy system items used on this paper are tested in Matlab/Simulink. The model consists of a scan approach of 20 buses. The experiment process is based on interconnection of power programs. The experiment process of 20 buses is split into two subsystem. First subsystem involves 9 buses (B1-B9) and second subsystem involves 10 buses (B11- B20). The bus No. B10 is used for the interconnection of two systems having 9 buses and 10 buses as proven in Fig. 1 and Fig. 2. The bus No. B12 is connected with an R-LC- series three section load. This model can also be increased for additional broaden in interconnection of vigor methods on bus No. B12 through eliminating the existing load. The experiment mannequin consists of 6 three phase voltage sources (three voltages supply are of 500KV and other three are of 25KV rankings), 6 two winding transformers and seven R-L-C series three phase loads. For dimension purpose model involves a block known as VPQ measurement. This block is used for size of voltage magnitude, actual vigour and reactive energy of buses B1-B20. The simulation run time of model is 10 seconds. The UPFC is attached at bus No.B10 as shown in Fig. 2. The 2 subsystems together with 9 buses and 10 buses are interconnected with bus No. B10.

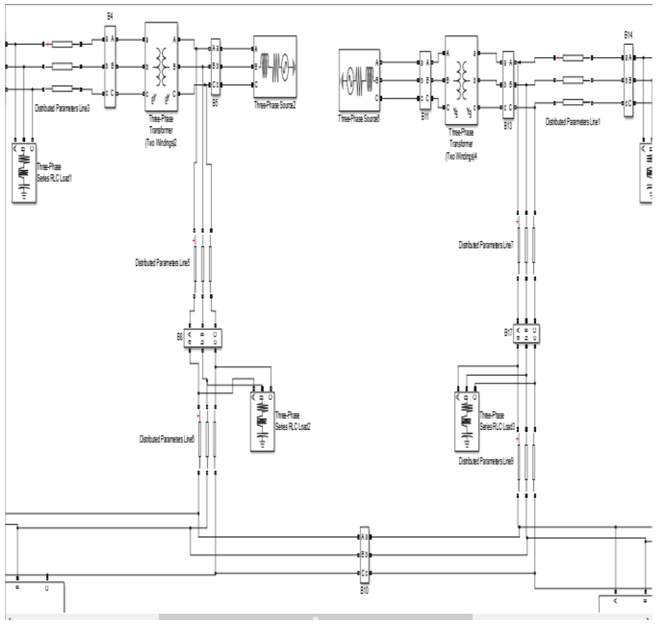

Figure 1. Portion of the Matlab simulation diagram of test system having 20 bus showing B10 bus without UPFC (stage I).

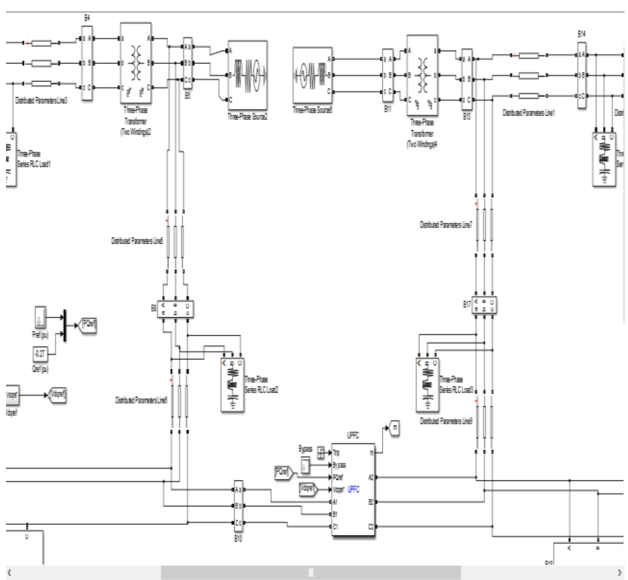

Figure 2. Portion of the Matlab simulation diagram of test system having 20 bus showing B10 with UPFC phasor model (stage II).

3.SIMULATION RESULTS

The simulation outcome of stage I and stage II are complied in table I and eight waveforms are shown from Fig. Three to Fig. 10. The simulation results obviously show the enhanced value of real power at bus No. B10. The values of actual vigor at bus no. B10 are 328.7MW and 591.5MW for stage I and stage II respectively. The simulation outcomes is this section show in two specific varieties one is numeric knowledge form and 2nd is within the type of waveforms which made the effect more clear to realise to the observer. By giving an in depth watch on the waveform, it is discovered that there's an enhancement in the actual vigor at bus No. 10 when the UPFC is mounted as in comparison with mannequin wherein UPFC is not installed.

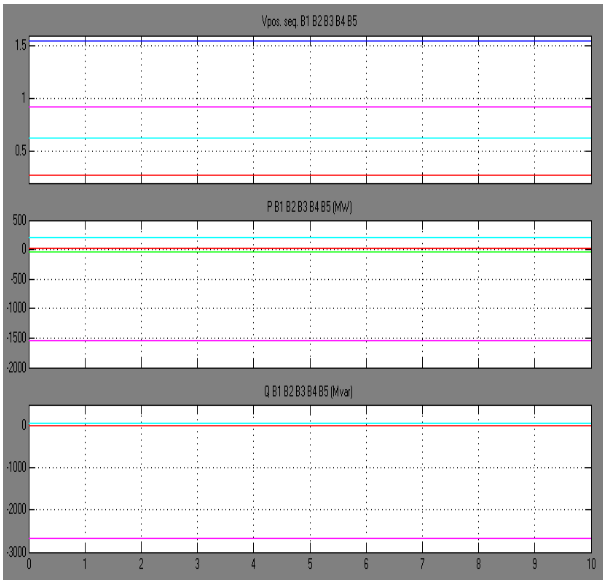

Figure 3. Voltage magnitude, real power and reactive power waveforms of bus (B1-B5) for stage I.

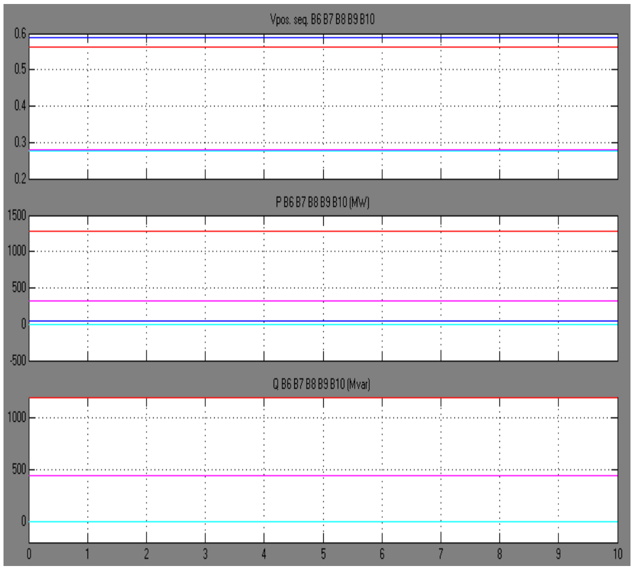

Figure 4. Voltage magnitude, real power and reactive power waveforms of bus (B6-B10) for stage I.

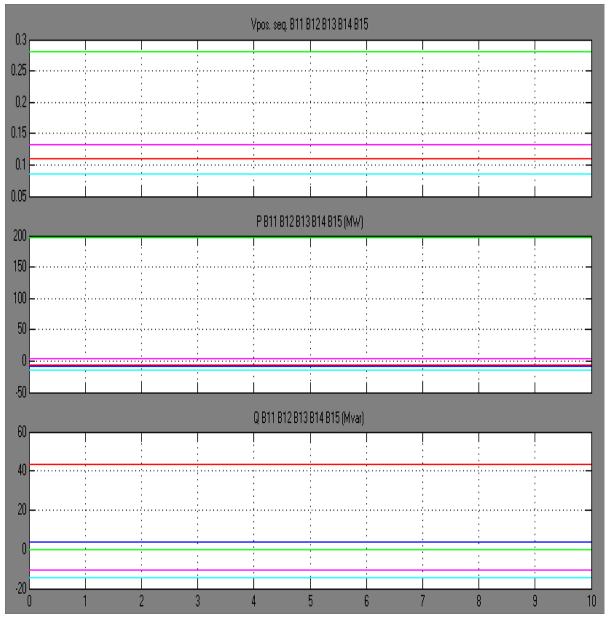

Figure 5. Voltage magnitude, real power and reactive power waveforms of bus (B11-B15) for stage I.

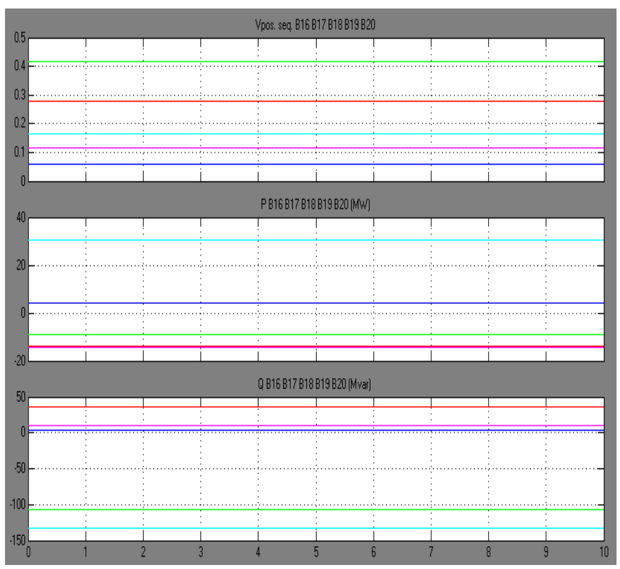

Figure 6. Voltage magnitude, real power and reactive power waveforms of bus (B16-B20) for stage I.

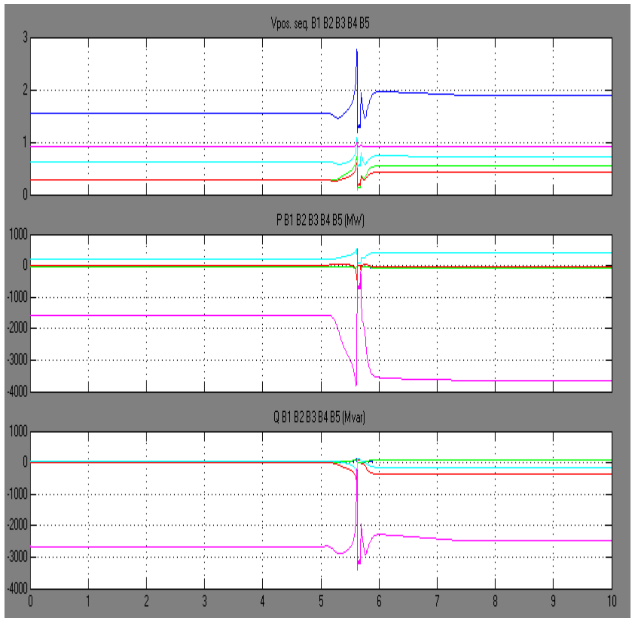

Figure 7. Voltage magnitude, real power and reactive power waveforms of bus (B1-B5) for stage II.

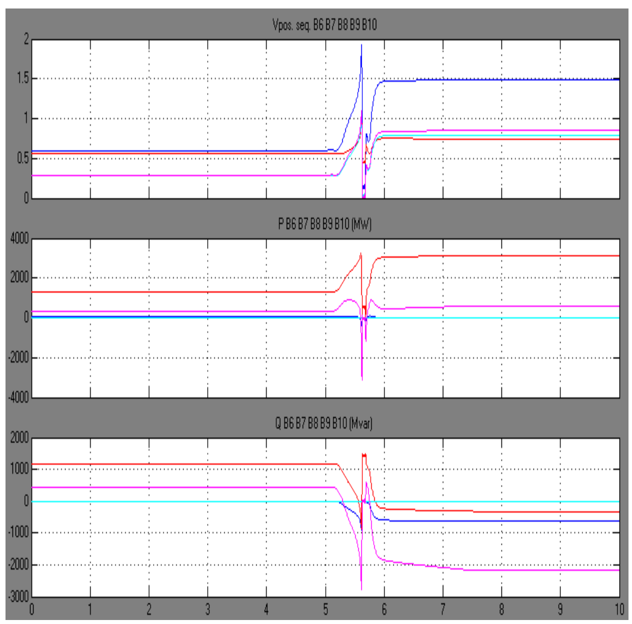

Figure 8. Voltage magnitude, real power and reactive power waveforms of bus (B6-B10) for stage II.

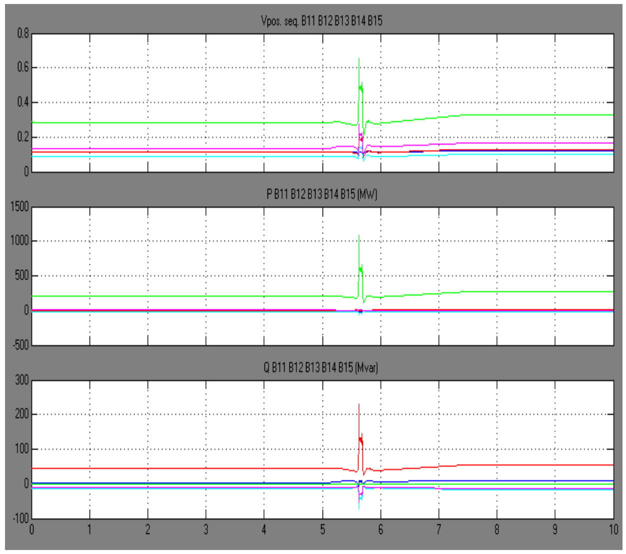

Figure 9. Voltage magnitude, real power and reactive power waveforms of bus (B11-B15) for stage II.

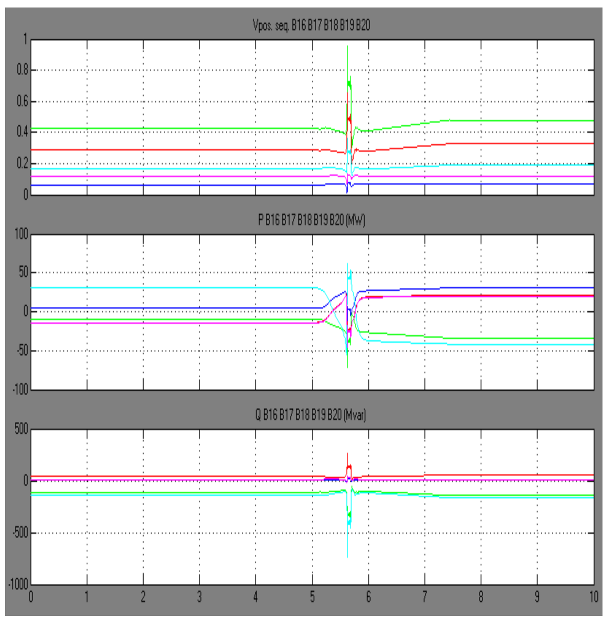

Figure 10. Voltage magnitude, real power and reactive power waveforms of bus (B16-B20) for stage II.

Fig. Three to Fig. 6 show the simulation outcome of the stage I where UPFC will not be mounted. The simulation outcomes includes the waveforms of the voltage magnitude, actual and reactive vigour. Fig. Four shows clear value of the actual power at bus No. 10 is 328.7MW. Fig. 7 to Fig. 10 exhibit the simulation outcome of the stage II wherein UPFC is established. Fig. 8 shows clear price of the true energy at bus No. 10 is 591.5MW. Outcomes suggests a clear enhancement of the real vigor switch from 328.7MW to 591.5MW.

TABLE I. REAL POWER VALUES OF BUSES FOR STAGE I AND STAGE II

Bus Sr. No.	Real Power (MW) (stage I)	Real Power (MW) (stage II)
B1	-28.71	-60.93
B2	-28.51	-60.91
B3	22.22	-40.48
B4	207.9	412.2
B5	-1542	-3643
B6	50.32	10.17
B7	-4.627	-16.87
B8	1282	3126
B9	-4.66	-17.06
B10	**328.7**	**591.5**
Bus Sr. No.	Real Power (MW) (stage I)	Real Power (MW) (stage II)
B11	-7.87	4.808
B12	196.6	267.5
B13	-6.872	5.968
B14	-14.03	-25.21
B15	4.152	-0.01768
B16	4.093	30.46
B17	-9.101	-33.93
B18	-13.78	21.16
B19	30.31	-41.64
B20	-14.47	20.08

These simulation results offers us a transparent suggestion about the makes use of of UPFC on the interconnection of two extraordinary power procedure in an effort to maximize the real vigour flow between them. As the potential of UPFC are to control the real and reactive vigour as well as the line impedance, phase angle and voltage magnitude. So it is rather clear that UPFC in a position to manage the flow of actual energy, which is without doubt one of the aspects of UPFC.

4.CONCLUSION

Unified vigor float controller is used to enhance the vigour switch capacity of vigour system. Our power process is an interconnection of unique electrical power grids and distinct electrical masses facilities. In such situation it end up quintessential to highest utilizes the vigour transfer capacity of the interconnecting strains inside the line restrict stipulations. On this paper, a phasor model of UPFC is used to maximize the true power transfer from one vigour process to different power method by means of interconnection for a test procedure of 20 bus method. This paper validates the positive implementation of phasor mannequin of UPFC for enhancement of real vigor transfer ability of interconnected power methods.

5.REFERENCES

[1] J. Bian, D. G. Ramey, R. J. Nelson, and A. Edris, “A study of equipment sizes and constraints for a unified power float controller,” IEEE Trans. Vigor Del., vol. 12, no. Three, pp. 1385-1391, Jul. 1997.
[2] B. T. Ooi, M. Kazerani, et al., “Mid-point siting of details gadgets in transmission traces,” IEEE Trans. Energy Del., vol. 12, no. 4, pp. 1717-1722, Oct. 1997.
[3] R. Billinton, M. Fotuhi-Firuzabad, S. O. Faried, and S. Aboreshaid, “impact of unified power go with the flow controllers on power approach reliability,” IEEE Trans. Vigor systems, vol. 15, no. 1, pp. 410-415, Feb. 2000.

[4] H. Cai, Z. Qu, and D. Gan, "selection of the vigour switch capability of a UPFC with consideration of the approach and gear constraints and of installation locations," IEE Proc. Gener., Transm. Distrib., vol. 149, no. 1, pp. 114-one hundred twenty, Jan. 2002.
[5] X. Wei, J. H. Chow, B. Fardanesh, and A. Edris, "A dispatch approach for a unified vigor-glide controller to maximise voltage-stability-limited energy transfer," IEEE Trans. Vigor Del., vol. 20, no. 3, pp. 2022-2029, July 2005.
[6] S. O. Faried, R. Billinton, and S. Aboreshaid, "Probabilistic process for sizing information contraptions for regular-state voltage profile enhancement," IET Gener. Transm. & Distrib., vol. 3, no. 4, pp. 385-392, April 2009.