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Reduction of Line Losses by using Interline Dynamic Voltage Restorer

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ABSTRACT

This work deals with, reduction of losses in two line system by employing interline dynamic voltage restorer. The IDVR is combination of two DVRS which can improve the voltage of weaker line. This paper considers Non-conventional sources like solar and wind generator system at the sending end. An increase in the load is considered in the line 2 and the additional drops due to this is compensated by using IDVR. The simulation results of 2 lines with and without IDVR are presented and the reduction in the loss is summarised

1. INTRODUCTION

Now days in power electronics, the equipment's are very sensible and tolerable. Due to this reason, the voltage sag seems to occur for a short time interruption. To overcome this issue and to enhance the power quality, the voltage compensation devices are used. Among those compensation devices DVR I most advanced device. Since, it is economical that can be used for voltage sag mitigation in distribution system. In order to improve the factor of power quality like regulation in phase shift, magnitude and wave shape. In the distribution system, the voltage sag is compensated by the injection of real and reactive power. This determines the capacity of DVR energy storage device in DVR. By using VSI of DVR, the reactive power which is needed is generated electronically. To meet the demand, external energy storage is required. The voltage sag compensation is the deciding factor of capability of DVR. At that time the maximum amount of real power is supplied to the load. This is especially carried out for the minimization of long duration sags. The long duration sag can be cleared by existing energy storage techniques. The deep sag with long duration of DVR can be minimised if DC link can be variably restored.

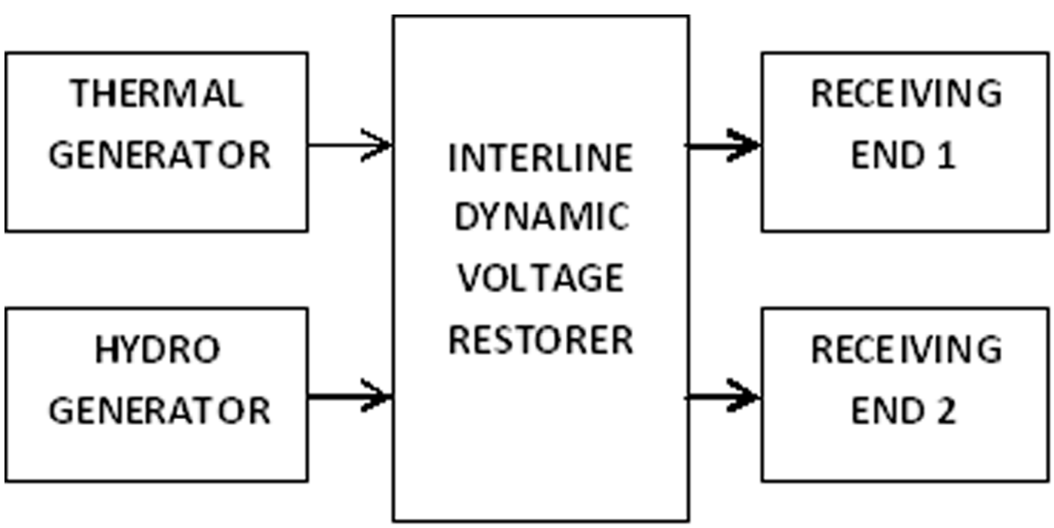

Figure 1: Conventional System

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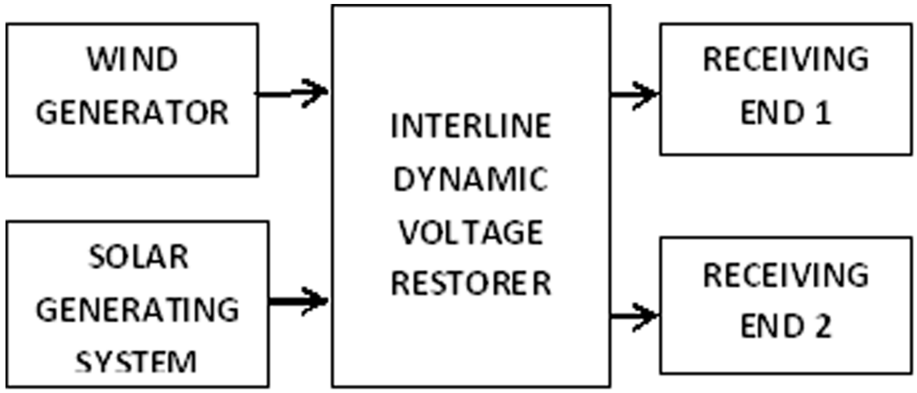

Figure 2: Proposed System

The interline IDVR proposed in this paper is to introduce a new way that recovers the energy in the common variable DC energy storage. IDVR is the combination of different DVRs which protect the sensitive loads in various distribution feeders. These feeds are originated from different grid substations. These DVRs are connected to common DC link. The above proposed theory deals with the balancing problems in no of transmission lines at a given substation. In IPFC, the real power is transferred directly between the compensating lines and the reactive power is transferred within each individuals lines. Similarly in IDVR transfer the real power between the sensitive loads in individual's lines. In IPFC the lines are originated from single grid substation whereas IDVR lines are originated from different substations. In IDVR one of the DVR, compensate the voltage sag by transferring the real power from DC link while the DC link voltage at specific level other DVRs are used.

2. SIMULATION RESULTS

The Simulink model of 2 line systems with IDVR is shown in fig 2.1 power measurement blocks is connected in line 2 to measure real power and reactive power. The output voltage of wind generator is shown in fig 2.2.the DC output of solar system is shown in fig 2.3 the output of the inverter in the solar system is shown in fig 2.4.the circuit of IDVR alone is shown in fig 2.5 the voltage across load 1 and load 2is shown in fig 2.6.the voltage decreases at t=0.3 sec it reduces normal value at t=0.5 sec due to the injection of IDVR.the real and reactive power at the receiving end of line 2 are shown in fig 2.7

The Simulink model of 2 line system without DVR is shown in fig 3.1.the line losses are measured using p,q blocks. The measurement of line loss in two line systems with IDVR is shown in fig 3.2 the summary of line losses

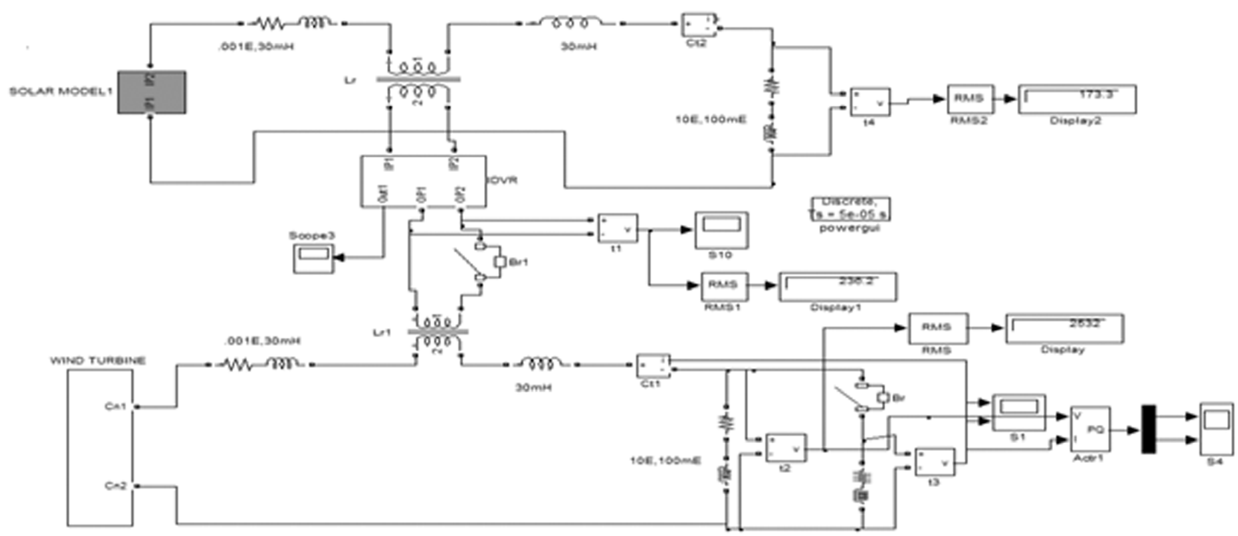

Figure 3: Two Line System with IDVR Disabled

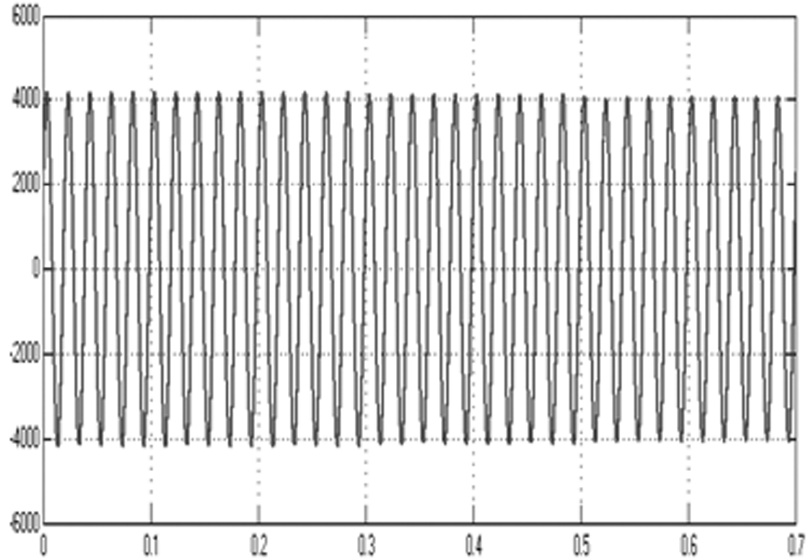

Figure 4: Output Voltage of Wind Generator

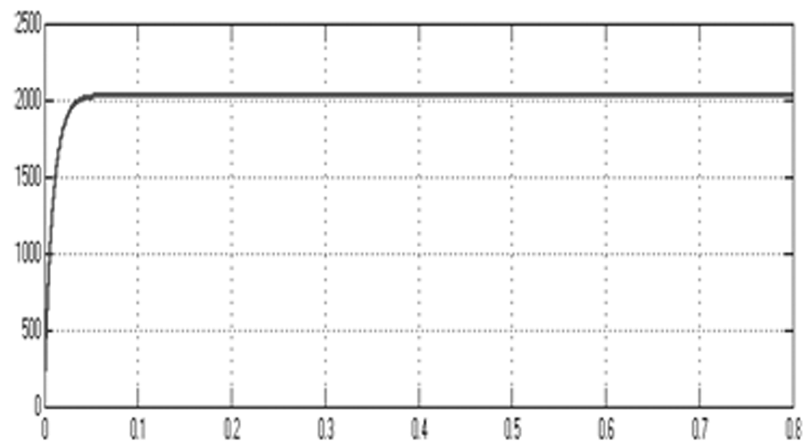

Figure 5: Output Voltage of Solar System

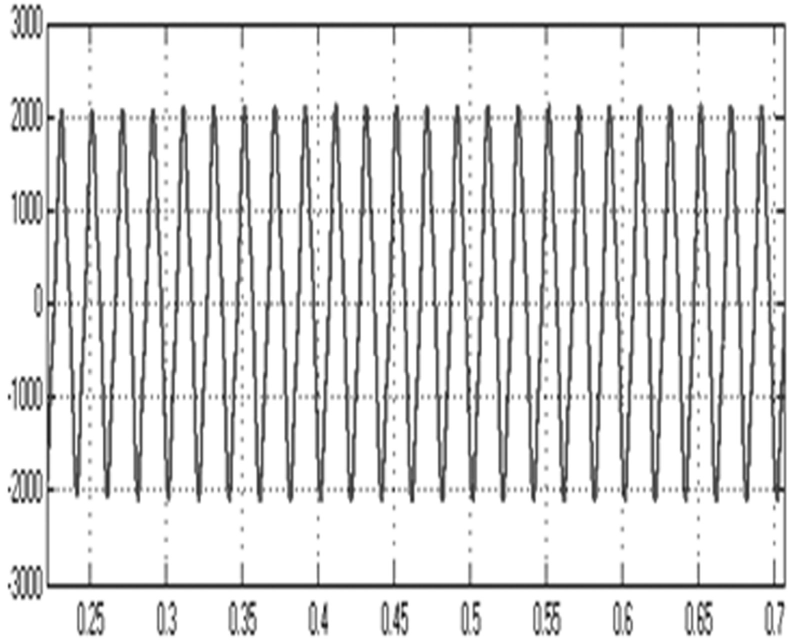

Figure 6: Output Voltage of Solar Generating Station

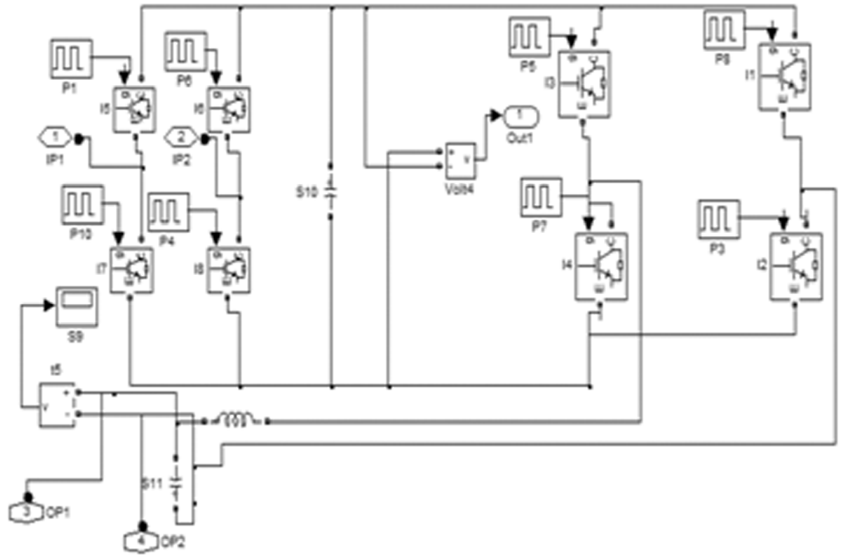

Figure 7: Circuit Diagram of IDVR

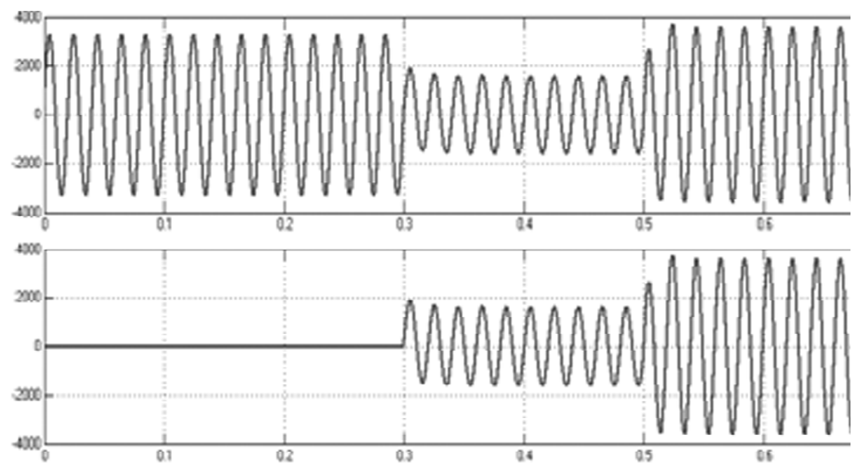

Figure 8: Voltage across load 1 and load 2 of line 2

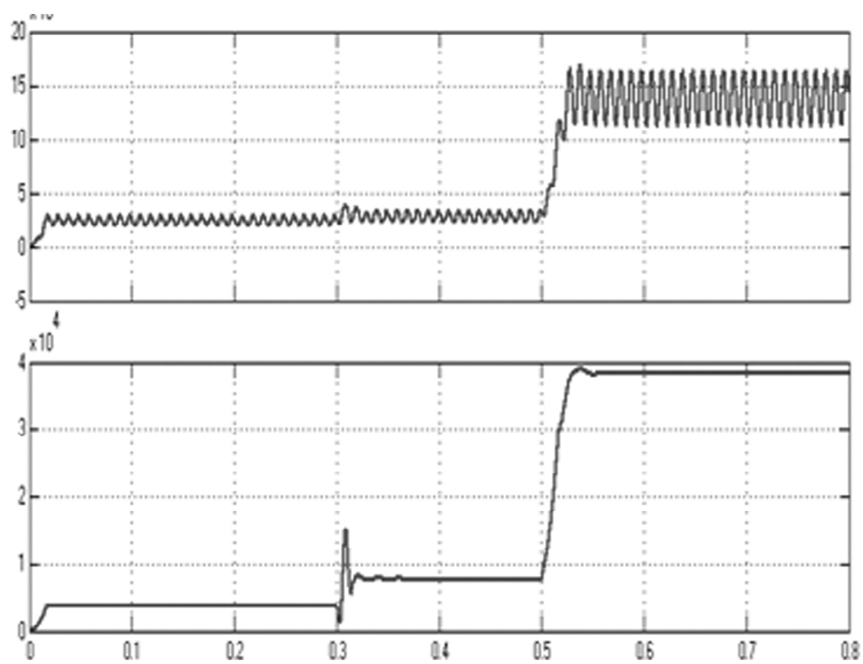

Figure 9: Real and Reactive Powers

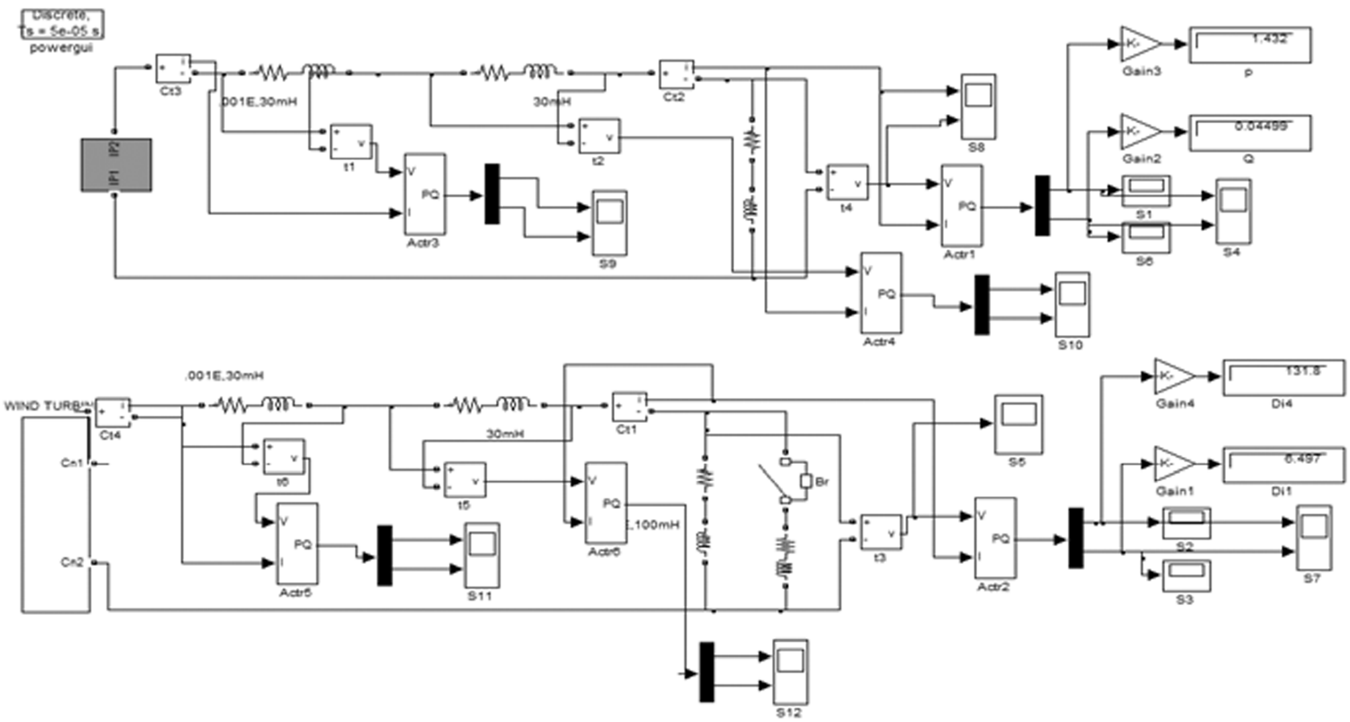

Figure 10: Power Measurement without DVR

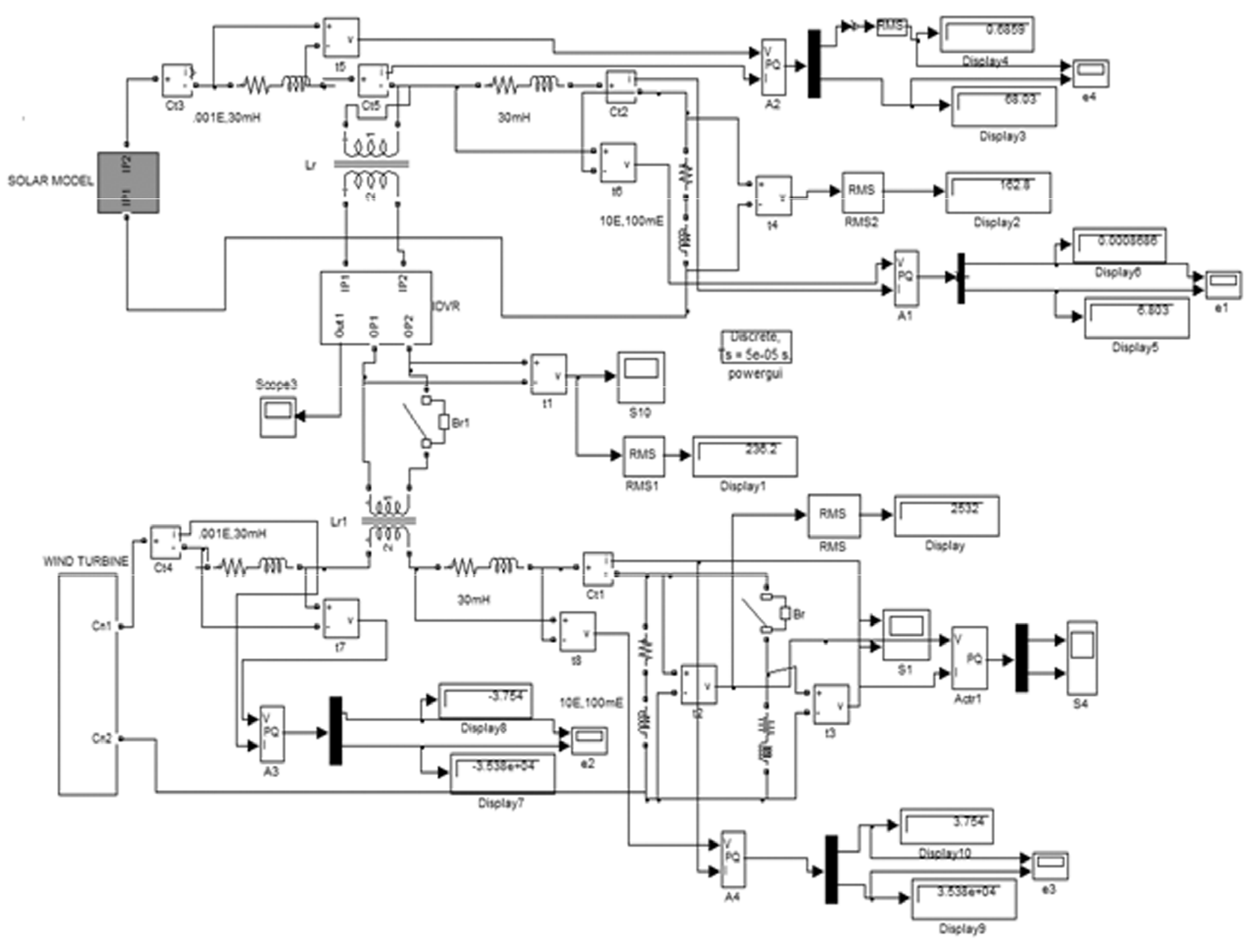

Figure 11: Two line system with IDVR

Table 1
Comparison of Real & Reactive Power loss with DVR and without DVR

Line	*Real power loss without DVR*	*Real power loss with DVR*	*Reactive power loss without DVR*	*Reactive power loss with DVR*
1	0.0754	0.0521	0.0351	0.0278
2	0.0712	0.0504	0.0324	0.0256
3	0.3671	0.2184	0.0321	0.2047
4	0.4782	0.3241	0.4314	0.3784

with and without IDVR are given in table 1. It can be seen that the real and reactive power losses are reduced by about 15

4. CONCLUSION

Power loss measurement in two line system with and without IDVR is successfully done and the corresponding results are presented. The results show that there is considerable reduction in real and reactive power loss using IDVR. Non-conventional source based IDVR system is successfully used in the present work

The modelling and simulation is done using single phase circuit model. The three phase circuit modelling and simulation will be done in future

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