

Load Flow & Transient Stability Analysis For IEEE 5 Bus System Using UPFC

Dr R. Ilango, T. Santhosh kumar, S. Sathiesh kumar

Abstract— This paper explains to the performance analysis of IEEE-5 bus method having UPFC in terms of load flow and transient stability using MI power. UPFC is an electrical gadget for giving quick acting receptive force remuneration on high voltage transmission arrange. Force stream contemplations are utilized to decide the voltage, current, dynamic, receptive force stream in a given force framework. Electrical power systems operate in their steady state mode also, decide the attributes of this state is called as a heap stream. Stability is a two or more generator to keep on working after a change happens on the framework is a proportion of the dependability. This paper explains about the load flow and transient stability analysis for IEEE 5 bus in conjunction with UPFC.

Index Terms— Load Flow, MIPOWER, Transient stability, UPFC.

1 INTRODUCTION

The electrical vitality is created at producing stations, and through the transmission arranges, it is transmitted to the buyers. Producing stations and dissemination stations three distinctive degree of voltage (transmission, sub-transmission, and conveyance level of the voltage) are utilized. The high voltage is required for long separation transmission and low voltage is required for utility purposes [1]. The voltage level is continuing diminishing from the transmission framework to the dispersion framework. The age voltage is normally 11kv and 33kv. A force framework comprises of age, transmission and circulation framework. The parts of the force frameworks are generators, transformer, transmission lines, dispersion lines, load and repaying gadgets like shunt, arrangement, and static VAR compensators. So as to keep up power framework the mass force must be transmitted through transmission and circulation lines to the customers securely and monetarily.

1.1 Transformer

Transformer can be sorted in various manners relying on their motivation, use, and development and so on. The kinds of transformer are as per the following, Venture up transformer and venture down transformer – Generally utilized for venturing here and there the voltage level of intensity in transmission and dispersion power framework arrange. Appropriation transformer step down the voltage for dissemination reason to residential or business clients.

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1.2 BUSES

Transport turns into a hub and voltage can be indicated for an each transport. The transports are ordered dependent on the factors determined. There are three kinds of transports

- 1.Reference transports
- 2.Voltage control transports
3. Load transports

Reference bus:

Reference transport is voltage size and stage edge of voltage is indicated. This transport compensates for any shortfall between the planned loads and created power that are brought about by the misfortunes in the system. The genuine and responsive force isn't indicated for reference transport.

Voltage control bus:Genuine force and voltage size are indicated. Responsive force and stage point of voltage are resolved. Static VAR compensator transports are called as voltage controlled transports [3].

Load bus:

Genuine and responsive force is determined. Voltage greatness and stage point of voltage are obscure

2. LITERATURE SURVEY

Literature survey to be a more important advance in programming improvement process. This paper gives the heap stream and Transient security examination of utilizing Mi Power. This heap stream considers gives the each transport voltage, stage edge, genuine and receptive force stream, line misfortunes, determined an incentive in every emphasis and no. of cycle. The product assists with settling the heap stream procedure in a proficient way and leads the framework to viable usage of intensity and voltage.

3 LOAD FLOW ANALYSIS

Power stream investigation to be individual of basics tools used within control scheme study. This disturbed by means of the balanced condition study of the scheme when in this working under a normal balanced operating condition. Load flow or power stream examination is assurance of the voltage, flow, genuine force and receptive force at different focuses in electrical system. The data of burden stream is basic for investigating the powerful elective designs for framework extension to fulfill increment load need.

The load stream reads are significant for arranging, monetary booking, control and tasks of existing frameworks just as arranging its future extension relies on knowing the impact of interconnections. Burden stream investigation is performed on an even consistent state working state of a force framework under ordinary method of operation. The arrangement of burden stream gives transport voltage and line/transformer power stream for a given burden condition. This data is fundamental for long haul arranging and operational arranging. Burden stream examination delegated

1. Gauss Seidel
2. Newton Raphson
3. Fast Decoupled

The information obtained from the load stream contemplates are the greatness and stage point of voltage at each transport dynamic and responsive force stream in each line and force misfortune in the line. It additionally gives the underlying state of the framework when the transient conduct of the framework is to be considered.

3.1 Gauss Seidel Load Flow:

It is an iterative technique utilized for illuminating arrangement of non direct arithmetical conditions[2]. The underlying gauss esteem is supplanted by a determined worth. The procedure is then rehashed until the cycle arrangement unites. The intermingling is very touchy to the beginning qualities expected.

4.

3.2 Newton Raphson Load Flow:

The Gauss seidel calculation is extremely basic however the assembly turns out to be progressively delayed as the framework size develops [4]. The Newton – raphson method combines similarly quick for huge just as little framework normally in under 4 to 5 cycle however progressively practical assessment are required. It has gotten extremely main stream for enormous framework contemplates. The most broadly utilized strategy for explaining synchronous non-straight mathematical conditions is N-R technique. This strategy is a progressive guess method dependent on an underlying appraisal of the obscure and utilization of Taylor's not kidding extension.

4. TRANSIENT STABILITY ANALYSIS

Stability analysis is a capacity of the force framework comprising of at least two generators to proceed worked after the change happens of the framework is a proportion of the steadiness. Transient dependability examination is characterized as a capacity of intensity framework to remain synchronism under enormous aggravation condition and, for example, a shortcoming and exchanging activities. Blames on vigorously stacked lines are bound to cause insecurity than the shortcoming on softly stacked lines since they will in general produce more increasing speed during the issue. Three stage deficiencies produce more noteworthy increasing speeds than those including a couple of stage conductors. Issues which are not cleared by essential shortcoming produce more point deviations in the close by generators. Likewise, the reinforcement deficiency clearing is performed after a period delay and henceforth delivers serious motions.

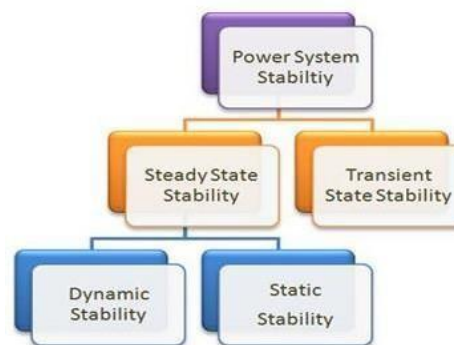


figure 1 power system stability

The departure of a significant burden or a significant creating station produces critical unsettling influence in the framework.

5. SOFTWARE USED

MI power is best in class window base force framework programming.

MI power is

1. High entomb dynamic.
2. User agreeable programming for all investigation.

Planning, plan and random force framework is simple. It incorporates a lot of modules for performing wide scope of intensity framework structure and investigation study.

5.1 Force Method Network:

- Icons of all force framework parts.
- Multi-Layering of items to see, choose edits & presents the outcomes.
- Multi-level settling of sub-frameworks.
- Resizing for singular drawing components.
- Panning to encourage quick and simple looking along X and Y bearing.
- Real-time zoom office for the chart to any parts of a zoom level.
- Reduction of the entire attracting to any part to fit any paper size.

5.2 Open Programmed Block:

- Planned for imitation in addition to test of organize Squares.
- Modified plan of committee, AVR'S, SVC'S, HVDC controller to be a conceivable.
- Control squares can be connected with Transient dependability for testing the presentation of the framework.

5.3 Ps Detailed / System:

- IEEE / IEC ordinary secret code
- Original-time zoom / pan

- Particular relate to record connection
- Show of learning consequences by means of SLD
- Dynamic load stream
- Design of contingency
- Nested network
- Multi-Layers
- Save / Load preview

Find a Bus / Node

6. COMPARISON OF MIPOWER SOFTWARE WITH OTHER SOFTWARES:

OTHER SOFTWARE	MIPOWER SOFTWARE
Less Accurate	More Accurate
Large Number of Iteration	Less Number of Iteration
Time Taken for the Execution and result is high	Time Taken for the Execution and results is low
Inconvenient	User friendly
Sketchy result only obtained	Detailed result are obtained
less interactive	high interactive

7. UPFC

A bound together force stream controller is an electrical gadget for giving quick acting receptive force pay on high-voltage power transmission systems. [5]. It utilizes a couple of three-stage controllable extensions to deliver current that is infused into a transmission line utilizing an arrangement transformer. Brought together [6]. Power Flow Controller (UPFC), as a delegate of the third era of certainties gadgets, is by a long shot the most thorough FACTS gadget, in power framework relentless state it can execute power stream guideline, sensibly controlling line dynamic force and receptive force, improving the transmission limit of intensity framework, and in power framework transient state it can understand quick acting responsive force remuneration, progressively supporting the voltage at the passage and improving framework voltage solidness, additionally, it can improve the damping of the framework and force edge strength. The UPFC utilizes strong state gadgets, which give practical adaptability, for the most part not achievable by traditional thyristor controlled frameworks[7-8]. The UPFC is a mix of a static synchronous compensator and a static synchronous arrangement compensator coupled by means of a typical DC voltage connect [9].

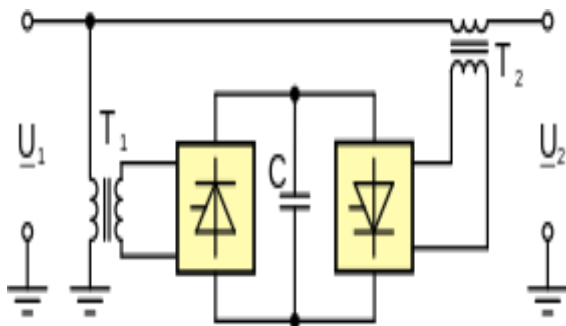


Figure 2 unified power flow controller

|***** OUTPUT DATA *****|

```
Total Specified MW Generation      : 480.00000
Total Minimum MVar Limit of Generator : 0.00000
Total Maximum MVar Limit of Generator : 310.30000
Total Specified MW Load             : 405.00000 Changed to 405.00000
Total Specified MVar Load           : 200.00000 Changed to 200.00000
Total Specified MVar Compensation   : 0.00000 Changed to 0.00000
```

```
Total (Including Out of Service Units)
Total Specified MW Generation      : 480.00000
Total Minimum MVar Limit of Generator : 0.00000
Total Maximum MVar Limit of Generator : 310.30000
Total Specified MW Load             : 405.00000 Changed to 405.00000
Total Specified MVar Load           : 200.00000 Changed to 200.00000
Total Specified MVar Compensation   : 0.00000 Changed to 0.00000
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8. SOFTWARE IMPLEMENTATION

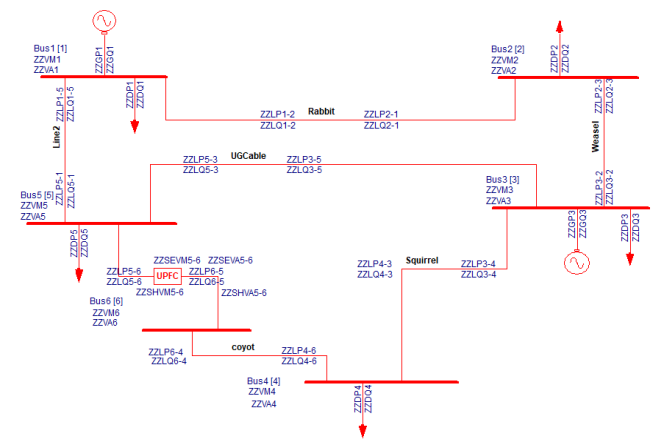


Figure 3 bus system of power flow analysis

9. FAST DECOUPLED OUTPUT

|***** UPFC DATA *****|

DEVICE	STATUS	FROM NODE	TO NODE	MVA-RATING	kV-RATING	P-REF (MW)	Q-REF (MVar)	V-REF (p.u.)
Xse	Xsh	Vse_MIN	Vse_MAX	Vsh_MIN	Vsh_MAX	TOLERANCE	CHECK-LIMIT	
(p.u.)	(p.u.)	(p.u.)	(p.u.)	(p.u.)	(p.u.)			
UPFC1	3	5	6	100.00	11.000	0.00	0.00	0.000
0.2000	0.2000	0.0100	0.200	0.900	1.100	0.000100	0	

10. TABULATION

TABLE.1 TRANSMISSION LINE DATA

Line bus to bus	Length km	R in p.u	X in p.u	Charging MVAR	Positive Sequence Susceptance	Thermal Rating
1-2	64.4	0.042	0.168	4.1	0.0205	100
1-5	48.3	0.031	0.126	3.1	0.0155	100
2-3	48.3	0.031	0.126	3.1	0.0155	100
3-4	128.7	0.084	0.336	8.2	0.041	100
3-5	80.5	0.053	0.21	5.1	0.0255	100
4-5	96.5	0.0363	0.252	6.1	0.0305	100

TABLE: 2 GENERATOR DATA

Name	Generator 1	Generator 2
De-rated MVA	500	225
Scheduled power	300	180
Real power minimum	0	0
Real power maximum	300	180
Reactive power minimum	0	0
Reactive power maximum	200	110.3

TABLE: 3 LOAD DATA

Load number	Load 1	Load 2	Load 3	Load 4	Load 5
Bus number	1	2	3	4	5
Real power	65	115	70	70	85
Reactive power	30	60	40	30	40

11. CONCLUSION

This paper gives the load stream and Transient solidity investigation of used Mi Power. This load flow studies gives the each transport voltage, stage point, genuine and receptive force stream, line misfortunes, determined an incentive in every cycle and no. of emphasis. The product assists with explaining the heap stream strategy in a proficient way and leads the framework to compelling use of intensity and voltage.

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