

Power Quality Standards in India

Introduction

In India, the power quality problems in distribution system are not yet studied extensively by utilities and R & D organizations. Power quality standards are not largely developed and enforced in power distribution network. No recent power quality survey conducted by Indian utilities/ R&D organizations has been reported or published [1].

To establish power quality standards in India, first of all, power quality surveys have to be conducted to identify power quality problems and based on that, cost effective solution can be found.

Power quality surveys on 33 KV Indian industrial supply system and inter-harmonics in Indian power system network are conducted and the results are published in IEEE by Kushare et al [1], [2].

To quantify power supply reliability, Indian government electricity regulatory authorities use reliability indices (developed by IEEE) such as CAIDI, SAIDI and SAIFI. Since these complex indices require extensive measurements, their use is still in an initial phase in India.

The World Economic Forum carried out power supply survey on twenty countries including India on 1996. In their report on the Global Competitiveness, India was given the least rating of 1.85, the rating point of 1 to 6 for poor to excellent position of power supply [3]. Prayas, an Indian non-governmental, non-profit public charitable trust has now developed a complementary tool, the Electricity Supply Monitoring Initiative (ESMI). The concept of ESMI is to execute basic monitoring of supply continuity and voltage levels at ordinary consumer locations, in order to get an idea of the actual situation in the field and to increase the accountability of electricity utilities. The first three ESMI data loggers were installed in Pune City. The results being obtained from these surveys indicate the deterioration in quality of power supply in India [4].

Grid Side Voltage Criteria CEA Standards

At present, Indian Electricity Grid Code [5] is followed in the Transmission system. It specifies the system voltages at Transmission level to be maintained as follows

System Voltage

	Max RMS	Min RMS
400 kv	420 kv	360 kv
220 kv	245 kv	200 kv
132 kv	145 kv	120 kv

Frequency

The assured frequency of supply is 50 cycles per second with permitted variations of (-) or (+) 3%

Statutory limits	48.5 to 51.5 HZ
CERC standards	49.5 to 50.5 HZ

Maximum Limits of Voltage Harmonic Distortion in HT and EHT Systems

Harmonic Order n	Distortion %	
	HT	EHT
(Odd, non-triplen)		
5	6.0	2.0
7	5.0	2.0
11	3.5	1.5
13	3.0	1.5
17	2.0	1.0
19	1.5	1.0
23	1.5	1.0
25	1.5	0.7
>25	$0.2+1.3x25/n$	$0.1+0.6x25/n$

Harmonic Order n	Distortion %	
	HT	EHT
(odd, triplen)		
3	5.0	2.0
9	1.5	1.0
15	0.3	0.3
21	0.3	0.2
>21	0.2	0.2
(even)		
2	2.0	2.0
4	1.0	2.0
6	0.5	0.5
8	0.5	0.4
10	0.5	0.4

12	0.2	0.2
>12	0.2	0.2
Total Harmonic Distortion	8%	3%

Limits of Harmonic Current Distortion (%)

Harmonic Order (n)	P> 10kW or V< 33kV	P>50kW or V>33kV
Odd, Non triplen		
5	12	6
7	8.5	5.1
11	4.3	2.2
13	3	2.2
17	2.7	1.8
19	1.9	1.7
23	1.6	1.1
25	1.6	1.1
>25	$0.8+0.8*25/n$	0.4

Harmonic Order (n)	P> 10kW or V< 33kV	P>50kW or V>33kV
Triplen		
3	16.6	7.5
9	2.2	2.2
15	0.6	0.8
21	0.4	0.4
>21	0.3	0.4
Even		
2	10.0	10
4	2.5	3.8
6	1.0	1.5
8	0.8	0.5
10	0.8	0.5
12	0.4	0.5
>12	0.3	0.5
Total	20.0%	12%

Pursuit towards Excellence for Quality

Existing norms are unsatisfactory and we have to aim at achieving international standards in stages (ie)

- Preliminary stage
- Transition stage

- Final stage

Milestones for each stage are to be decided by regulators.

References

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