

### 1.2.3.9. TRANSFORMERS

Following transformers shall be provided.

Item	Description	Qty	Voltage	Rating	Cooling
1.	Wind Collector Power T/F	1	220/33 kV	63MVA	ONAN/ONAF
2	Earthing Transformer	1	33kV	800A, 30s	ONAN

Note: 220kV & 33kV sides of power transformer, 33kV side of earthing transformer and neutral of earthing transformer shall be supplied with outdoor type bushings. This transformer is used for the connection of wind farm to 220kV network. The power transformer shall be capable of parallel operation with the existing power transformers. In addition to standards specified in the bidding document the “IEEE Std C57.110TM-2018 – IEEE Recommended Practise for Establishing Liquid Immersed and Dry-Type Power and Distribution Transformer Capability when Supplying Non-sinusoidal Load Currents” reference standard shall be specifically applied for the 220/33kV Wind Collector Power transformer proposed for Nadukuda Grid Substation. The allowable limits of the harmonic voltages at the 33kV busbar of the Nadukuda Grid Substation are as follows.

Odd harmonics non-multiple of 3		Odd harmonics multiple of 3		Even harmonics	
Harmonic order h	Harmonic voltage %	Harmonic order h	Harmonic voltage %	Harmonic order h	Harmonic voltage %
5	6	3	5	2	2
7	5	9	1.5	4	1
11	3.5	15	0.4	6	0.5
13	3	21	0.3	8	0.5
$17 \leq h \leq 49$	$2.27 \cdot \frac{17}{h} - 0.27$	$21 < h \leq 45$	0.2	$10 \leq h \leq 50$	$0.25 \cdot \frac{10}{h} + 0.25$

Note: The compatibility level for the total harmonic distortion is THD = 8%.