

## 8. ELECTRICAL RESISTIVITY TEST

**REPORT ON**  
**ELECTRICAL RESISTIVITY TEST FOR**  
**NTPC RAMAGUNDAM TPS STAGE- I & II**  
**(3X200MW + 3X500MW) FGD PACKAGE**

**INTRODUCTION:**

Electrical Resistivity Test was carried out for the proposed 3 x 200 MW + 3 x 500 MW FGD package, stage I & II at Ramagundam thermal power plant, Ramagundam, Telangana using resistivity meter (model DDR2, Geo Sensors) following Indian standard at Seven (07) locations on 14<sup>th</sup> and 15<sup>th</sup> February, 2020 and 03 (three) points on 7<sup>th</sup> March, 2020 total 10 (ten) points.

**METHODOLOGY:**

The Soil Resistivity Survey is a method to find out the Electrical Resistivity (Specific Resistance) of a medium. It is the resistance offered by a unit cube of a particular medium (so called strata below the ground level) when a unit current passes perpendicular to the surface of a cross-sectional area A. The relation is given by Ohm's Law is –

$$\frac{A}{I} = \frac{m^2}{m} = \text{ohm} - \text{m}$$

= R -- ohm --- = ohm – m where

= Resistivity, R = resistance offered by the medium of length L and Cross-sectional area A.

In electrical resistivity survey a known current I (direct current or low frequency alternating current) is sent into the ground through a pair of current electrodes A & B and the potential difference ( $\Delta V$ ) created in the medium is measured between another pair of electrodes M & N. The resistivity of the formation is then given

$$\frac{\Delta V}{I}$$

by  $\frac{\Delta V}{I} = K$  ----- where  $\frac{\Delta V}{I}$  is the apparent resistivity, K is the geometric factor.

In the Earth Resistivity Test, the Wenner configuration was followed. In this configuration two potential electrodes M & N are placed in a line with the current electrodes A & B, all four

being situated equidistance from one to another and disposed symmetrically with respect to a central point such that  $AM=MN=NB=S$ . The outer two electrodes A & B were used for sending current ( $I$ ) and inner two M & N were used for measuring the potential differences ( $\Delta V$ ). The distance between each consecutive electrode (a) was kept constant and was progressively increased to reach the depth at which resistivity information are wanted. Suitable electrode spacing determines the conductivity of the top soil as well as the various subsurface layers occurring in the area under study.

At each location, with respect to centre point, measurements were carried out in four perpendicular direction namely N-S, E-W, NE-SW and NW-SE and in each direction ten (10) different electrode spacing (s) viz  $S = 0.50m, 1.0m, 2.0m, 3.0m, 4.0m, 5.0m, 6.0m, 7.0m, 8.0m$  and  $10.0m$  have been used to know the nature of change of resistivity with depth

The apparent resistivity was determined by the formula –

$$\frac{\Delta V}{I} = 6.28 s \quad \text{---- where 's' is the distance between the two consecutive}$$

$$\Delta V$$

Electrodes and ---- is  $R$  which is the observed resistance for measuring resistivity. A

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Resistivity Meter model DDR - 3 of Geo-sensor make was used during the operation.

The mean value of the resistivity estimated was taken as the representative one. The depth of investigation in an isotropic and homogeneous formation can be approximated to the distance between the consecutive two electrodes (s).

**TEST RESULTS:**

The overall mean resistivity values at each ERT locations are presented below.

**APPARENT RESISTIVITY VALUES**

Sl. No.	ERT Location	Overall Mean Resistivity (Ohm-m)
1.	ERT - 01	70.934
2.	ERT - 02	77.846
3.	ERT - 03	28.785
4.	ERT - 04	28.510
5.	ERT - 05	14.463
6.	ERT - 06	11.825
7.	ERT - 09	50.903
8.	ERT - 10	26.768
9.	ERT - 11	27.319
10.	IERT - 02	53.743

**ERT No. 01**

SI No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	0.50	118.572	118.258	118.415	118.415	118.42
2	1.0	56.546	56.547	56.861	57.175	56.78
3	2.0	50.264	52.148	50.892	77.280	57.65
4	3.0	77.280	77.280	73.511	73.511	75.40
5	4.0	72.882	74.139	76.652	70.369	73.51
6	5.0	61.259	61.730	61.730	62.044	61.69
7	6.0	64.465	64.465	64.465	64.276	64.42
8	7.0	70.371	71.470	70.810	72.350	71.25
9	8.0	62.077	62.076	62.831	61.574	62.14
10	10.0	67.857	67.857	68.799	67.857	68.09

**Mean Resistivity at ERT- 01 is 70.934 Ohm - m.**

**ERT No. 02**

SI No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	0.50	69.416	69.101	69.102	69.259	69.22
2	1.0	68.798	68.484	68.484	69.113	68.72
3	2.0	77.908	79.165	77.909	76.650	77.91
4	3.0	82.935	87.647	86.705	86.705	86.00
5	4.0	62.829	67.856	62.830	65.343	64.71
6	5.0	69.584	69.898	69.427	69.584	69.62
7	6.0	75.397	75.209	75.209	75.398	75.30
8	7.0	84.445	85.544	83.565	84.445	84.50
9	8.0	87.712	87.461	85.701	86.706	86.90
10	10.0	96.445	96.445	94.874	94.560	95.58

**Mean Resistivity at ERT- 02 is 77.846 Ohm - m.**

**ERT No. 03**

SI No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	0.50	28.912	28.897	28.944	28.944	28.92
2	1.0	25.822	25.854	25.760	25.916	25.84
3	2.0	20.230	20.796	20.419	20.608	20.51
4	3.0	24.314	24.503	24.691	24.314	24.46
5	4.0	23.372	23.498	24.126	23.624	23.66
6	5.0	38.326	41.310	39.425	38.797	39.46
7	6.0	35.625	35.625	36.191	36.379	35.96
8	7.0	31.447	32.766	31.666	32.546	32.11
9	8.0	25.383	25.383	25.383	25.635	25.45
10	10.0	32.357	31.101	32.043	30.472	31.49

**Mean Resistivity at ERT- 03 is 28.785 Ohm - m.**

**ERT No. 04**

SI No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	0.50	10.694	10.679	10.741	10.742	10.71
2	1.0	45.362	45.363	45.551	45.645	45.48
3	2.0	31.226	31.163	30.912	31.100	31.10
4	3.0	26.859	27.142	26.482	26.388	26.72
5	4.0	30.661	30.409	30.409	30.660	30.53
6	5.0	28.430	28.587	28.273	28.744	28.51
7	6.0	28.839	28.651	28.651	28.462	28.65
8	7.0	26.389	27.048	24.849	26.169	26.11
9	8.0	27.896	28.399	27.143	27.896	27.83
10	10.0	29.216	30.158	28.901	29.530	29.45

**Mean Resistivity at ERT- 04 is 28.510 Ohm - m.**

**ERT No. 05**

SI No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	0.50	2.669	2.701	2.669	2.685	2.68
2	1.0	3.078	3.204	3.078	3.078	3.11
3	2.0	10.995	11.372	10.995	11.183	11.14
4	3.0	9.800	10.083	9.612	9.706	9.80
5	4.0	28.524	28.650	28.650	28.901	28.68
6	5.0	28.430	27.802	28.744	28.587	28.39
7	6.0	20.168	19.226	19.414	19.226	19.51
8	7.0	28.148	27.708	29.028	27.928	28.20
9	8.0	6.031	6.785	6.031	6.282	6.28
10	10.0	6.597	7.225	6.597	6.911	6.83

**Mean Resistivity at ERT- 05 is 14.463 Ohm - m.**

**ERT No. 06**

SI No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	0.50	13.113	13.066	13.207	13.066	13.11
2	1.0	19.791	19.979	20.231	20.419	20.11
3	2.0	11.246	11.748	11.435	11.183	11.40
4	3.0	10.366	10.555	9.989	10.366	10.32
5	4.0	12.063	12.063	12.440	12.691	12.31
6	5.0	10.680	9.110	10.052	9.581	9.86
7	6.0	11.309	8.858	9.612	7.162	9.24
8	7.0	8.576	10.555	9.675	9.895	9.68
9	8.0	9.550	12.063	10.555	10.555	10.68
10	10.0	10.366	12.880	11.623	11.309	11.54

**Mean Resistivity at ERT- 06 is 11.825 Ohm - m.**

**ERT No. 09**

SI No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	0.50	132.393	132.236	132.079	131.922	132.16
2	1.0	73.510	73.511	72.568	73.196	73.20
3	2.0	57.803	61.573	56.547	57.803	58.43
4	3.0	51.834	55.604	49.949	50.892	52.07
5	4.0	37.698	38.325	37.572	38.074	37.92
6	5.0	28.430	27.959	27.802	28.116	28.08
7	6.0	32.044	32.044	31.667	31.855	31.90
8	7.0	33.866	34.085	32.986	33.646	33.65
9	8.0	30.158	30.159	29.405	29.907	29.91
10	10.0	31.729	32.357	31.100	31.729	31.73

Mean Resistivity at ERT- 09 is 50.903 Ohm - m.

**ERT No. 10**

SI No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	0.50	59.364	59.521	59.521	59.679	59.52
2	1.0	43.038	43.038	42.724	43.038	42.96
3	2.0	33.927	35.812	32.671	33.928	34.08
4	3.0	22.053	21.864	21.958	21.864	21.93
5	4.0	18.974	19.225	18.849	19.100	19.04
6	5.0	20.419	20.576	20.419	20.419	20.46
7	6.0	17.529	17.906	17.529	17.529	17.62
8	7.0	17.152	17.152	16.713	17.372	17.10
9	8.0	15.833	15.833	15.833	16.335	15.96
10	10.0	19.163	19.791	18.220	18.849	19.01

Mean Resistivity at ERT10 is 26.768 Ohm - m.

**ERT No. 11**

SI No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	0.50	24.185	24.342	24.499	24.342	24.34
2	1.0	25.132	25.760	26.074	25.760	25.68
3	2.0	33.299	35.812	34.556	37.069	35.18
4	3.0	30.158	32.043	32.043	32.043	31.57
5	4.0	23.498	23.624	23.623	23.875	23.66
6	5.0	25.289	25.131	25.132	25.446	25.25
7	6.0	26.012	26.849	26.577	26.577	26.50
8	7.0	24.190	24.849	25.289	25.509	24.96
9	8.0	25.634	25.383	25.634	25.634	25.57
10	10.0	30.158	30.158	31.101	30.472	30.47

Mean Resistivity at ERT- 11 is 27.319 Ohm - m.

**IERT No. 02**

SI No.	S (M)	Apparent Electrical Resistivity (Ohm-m)				Mean
		(N - S)	(E - W)	(NE - SW)	(NW - SE)	
1	0.50	127.524	127.367	127.210	127.367	127.37
2	1.0	76.024	75.710	76.024	76.024	75.95
3	2.0	57.803	57.803	57.803	58.431	57.96
4	3.0	49.007	51.834	48.064	49.007	49.48
5	4.0	43.980	45.237	40.211	43.980	43.35
6	5.0	37.383	37.383	37.226	37.383	37.34
7	6.0	32.232	32.421	32.044	32.421	32.28
8	7.0	35.185	35.185	34.745	34.965	35.02
9	8.0	37.447	37.698	36.944	37.698	37.45
10	10.0	41.154	41.468	40.840	41.468	41.23

**Mean Resistivity at IERT- 02 is 53.743 Ohm - m.**

## APPARENT RESISTIVITY CURVES



