

ESTIMATED REQUIREMENTS OF ELECTRICAL EQUIPMENTS FOR THERMAL POWER PROJECTS SCHEDULED FOR 11TH PLAN

INTRODUCTION:

1.0 Various Electrical components of Thermal Plants have been broadly divided in 16 packages as under :

- i) Generator Bus duct and Associated Equipment Package
- ii) Power Transformers
- iii) L.T. Transformer (Indoor)
- iv) L.T. Transformer (Outdoor)
- v) Natural Grounding Resistor
- vi) H.T. Switchgear
- vii) L.T. Switchgear
- viii) H.T. Motors
- ix) L.T. Motors
- x) D.C. Batteries and Battery Charger
- xi) Power Cables
- xii) L.T. Cable package
- xiii) Miscellaneous packages
- xiv) Generator/Generator transformer unit protection
- xv) Electrical Lab Equipments
- xvi) Equipments for overhead lines
- xvii) 400/132 KV Switchyard Equipments

2.0 Tentative Estimates for Electrical Equipments:

2.1 The list of projects identified for benefits during 11th Plan is given in **Appendix 'A'**

2.2 The tentative requirement of electrical equipments for a typical 660 / 800 MW, 500 MW & 250 MW units of coal / lignite and 360 MW Module of gas / LNG based thermal power projects envisaged during 11th Plan period, has been estimated and the same is summarized in **Annexure-I, II, III & IV** respectively.

3.0 Remarks:

3.1 EPC contract of various thermal projects will be awarded through ICB route and some of these projects will be awarded to the foreign EPC contractors / suppliers, who may intend to bring the Electrical equipments for that particular project from their own country / outside India. To this extent, the requirement of indigenous Electrical Equipments will be reduced .

- 3.2 **Cold Rolled Grain Oriented (CRGO) Steel** : In absence of any domestic manufacturer for CRGO steel (required for low loss stampings which are vastly used for transformers, Generators and other electrical equipments), there is 100 % dependence on International market . Its shortage often leads to unreasonable price increase and sometimes delays in supplies thereby affecting the price of electrical equipments. Indigenous sourcing of the steel is hence to be replaced.

Annexure-I

**Tentative Estimate of Electrical Equipments required
for Thermal Projects during 11th plan**

TYPICAL 660 MW/800 MW PROJECTS :

SI No.	Particulars	Total Quantity for 15 Nos.
1	GENERATOR BUSDUCT AND ASSOCIATED EQUIPMENT PACKAGE	
1.1	Isolated phase bus duct	
a.	20,500 Amp main run of single phase	2955
b.	12000 Amps, Delta run of single phase	1440
c.	2000 Amps, tap off run single phase	1170
1.2	VT & SP cubicles	45
1.3	NG equipments & CTs	15
1.4	Supporting structural steel	900
2	POWER TRANSFORMER	
2.1	Generator transformer 260 MVA Gen V/420/ 3 single phase withoff ckt. Tap changer	55
2.2	Interconnecting transformer 200 MA 400 / 132 KV OLTC +/-10%	10
2.3	Unit transformer - 35 MVA Gen V/11.5 KV with OLTC +/-10%	30
2.4	Station transformer - 90/45/45 MVA 132 KV/ 11.5/11.5 KV with OLTC +/-10%	15
2.5	Miscellaneous service transformer 20 MVA 132 KV/34.5 KV	10
2.6	Make up water transformer, 4 MVA 33/3.45 KV	15
2.7	AWRS transformer, 4 MVA, 33/3.45 KV	10
2.8	Colony transformer, 10 MVA, 33/11.5 KV-	10
2.9	Auxiliary transformers 11/3.45 KV class	
a.	Unit auxiliary transformer, 16 MVA	30
b.	Ash handling transformer 12.5MVA	15
c.	CHP transformers 7.5 MVA	20
3	L.T . TRANSFORMER (INDOOR)	
a.	Unit Service Transformer 11/0,433 KV, 2000KVA	45
b.	Station service transformer 11/0,433 KV,2000 KVA	30

4	L,T. TRANSFORMER (OUTDOOR)	
	a. ESP Servoce, 11/0.433 KV 1600 KVA	120
	b. CW service/service water and chlointion 11/0.433 KVA, 1600 KVA	10
	c. Cooling tower service transformers 11/0.433 KV 1600 KVA	45
	d. CHP transformer	
	I) CHP service 11/0.433 KV 1000 KVA	10
	ii) CHP service 11/0.433 KV 1600 KVA	10
	iii) CHP service 11/0.433 KV 1600 KVA	10
	iv) CHP service 11/0.433 KV 2000 KVA	10
	v) Stacker reclaimr,3.3/0.433 KV 500 KVA	10
	iv) Bunker service 11/0.433 KV 1600 KVA	20
	e. WTP service Transformer 11/0.433 KV,2000 KVA	10
	f. Ash handling transformer 11/0.433 KV, 1600 KVA Ash water/aux.Boiler service transformer 11/0.433 KV, 1600 KVA	30
	g. 1600 KVA	10
	h. Ash slurry/transport air compressor Service trf.11/0.433 KV 1600 KVA	10
	I. Fuel oil service trf. 11/0.433 KV, 1000 KV	10
	j. AWRS service trf. 3.3/0.433 KV, 315 KVA	10
	k. Make up water service trf. 3.3/0.433 KV,630 KVA	10
	l. ADM/workshop bldg.service trf. 11/0.433 KV,1600 KV	10
	m. Service bldg./compressor trf.11/0.433,1600 KVA	10
	n. DM/Service water trf. 11/0.433 KV, 1600 KVA	10
	o. Switchyard service transformers 11/0.433 KV, 1000 KVA	10
	p. Fire water trf. 11/0.433 KV, 1600 KV	10
	q. Ash silo transformer 11/0.433 KV, 1000 KVA	10
	r. Workshop/canteen/o&m store 11/0.433 KV, 1000 KVA	10
5	NATURAL GROUNDING RESISTOR	
	a. 11KV, 300 A	60
	b. 3.3 KV, 300 A	85
6	H.T SWITCHGEAR	
	a. 33 KV 12.5 KA, 31.5 Kap Misc. swgr	125
	b. 11KV	
	I) Unit swgr.	510
	ii) Station swgr.	455
	iii) Colony swgr.	55
	c. 3.3 KV, 3000/2000 Amp	
	I) Unit aux. Service	555
	ii) Station aux.service	305
	iii) CHP swgn	210
	iv) AWRS switchgear.	70
	v) Make up water	125
	d. 11 KV busducts, segregated	
	I) 2500/2000A,40KA, 100 Kap	7430
	ii) Support structure	325

e.	3.3 KV Bus-duct (3000A)	1500
7	L.T. Switchgear	
a	415V swgr panels	1500
b	415V MCC panels	5250
c	AC fuse boards (15 feeders)	200
d	A.C lighting distribution board(5 feeders)	200
e	Aux. A.C distribution boards (100 feeders)	100
f	220V DCDB (main)	15
g	220V, solenoid VDB (100 feeders)	15
h	220V Aux. DCDB (30 feeders)	35
l	220V DC fuse boards (10 feeders)	200
j	220V swyd DCDB (40 feeders)	10
k	50 V PLCC DCDB (10 feeders)	10
l	L.T Bus duct 2500 A	3500
m	Local motor starter	1500
n	Local stop push button stations	9000
8	H.T.Motors	2190
9	L.T.Motors	21055
10	D.C battery	
	D.C battery (Ni-Cd)	
i	220 V unit batteries 1980 AH (2x990 AH)	30
ii	110V 80 AH AWRS & colony battery	20
iii	110V 80 AH Make up water battery	10
iv	220 V 250 AH switchyrd battery	10
v	50 V 250 AH PLCC battery	10
	Battery chargers (float cumboost)	
i	Unit batteries, 220V, 400 A	60
ii	Swyd. Batteries, 220V, 100A	10
iii	PLCC batteries, 50V, 100A	10
iv	110 V, 30A AWRS/colony/Make up water	30
11	Power cables	
a.	132 KV cable	
i	Single core 630 mm ² (cu) armoured XLPE	23.5
ii	132 KV single core 240 mm ² (cu) armoured XLPE	22.5
iii	Straight through joint (132 KV Class)	45
iv	Cable sealing end (132 KV)	180
b.	33KV grade XLPE armoured cable IC x 240 mm ²	50
c.	11/11KV grade XLPE(unarmoured)	
i)	3C/150 mm ²	360
ii)	IC-300 mm ²	320
d.	3.3/3.3 KV grade XLPE insulated unarmoured type	
i.	3C-150 mm ²	100
ii	IC-150 mm ²	120
iii	3C-95 mm ²	75

12	L.T. Cable package	
	a 1.1 KV power cables	3500
	b 1.1 KV contrl cables	5500
13	Mis. Packages	
	1 Diesel genertior sets 1500 KVA, 415 V	20
	2 Cabling, earthing & lightning protection system	lot
	3 Lighting system	lot
14	Generator-generator TRF. Unit Protection.	15
15	Electrical Lab Equipment	lot
16	Equipment and O/H line for AWRS/Make up water/COLONY	
	a. 33 KV S/C OH Line (AWRS+MAKE UP+Colony)	200
	b Isolator 3 pole (400 A)	90
	c L.A	90

SL.NO	Particulars	Total Quantity for 15 Nos.
17	400/132 KV Switchyard Equipment	
	A. 400 KV Equipments	
	a. 400KV.2000A Isolators with double earth switch	180
	b 400KV. 3150A Isolators with single earth switch	150
	c 400 KV. 3150A breaker	65
	d 400 KV, 2000A breaker	50
	e 400KV, 2000A , Current Transformer	225
	f 400 KV. 3150A, Current Transformer	300
	g Wave trap	60
	h 400KV Capacitive voltage tranformer	150
	l 390KV Gapless lightning arrestor	165
	j 400KV bus post insulator	1800
	B. <u>Substation automation system (SAS) 400 KV swyd.</u>	
1	Panel Mounted Bay Control Units(BCUs) for:	
	a. 4 Diameters for 400 KV Generator Transformer Bays	40
	b. Diameters(Line-Tie-Line)for 400KV 2 Nos.Line Bays	15
	c. Diameters(Line-Tie-Line)for 400KV 4 Nos.Line Bays	40
2	Panel Mounted Bay Protection Units (BPUs) for:	
	a 400 KV Lines (One set for earch line; No. of Lines is 6)	30

	b. Bus section feeder	10
3	Panel Mounted Breaker Relay Panels/Bay Protection Unit for:	
	4 Diameters for 400 KV Generator Transormer Bays (GT#-Tie-Future)	20
4	Bus Bar Protection	
	400 KV Bus#1 ,3,4 with Duplicated Bus Bar Protection for each bus, including modules for at least 8 future bays	40
5	Disturbabce Recorders	
	Stand-alone Disturbance Recorders, one for each 400 KV line	30
6	Energy Metering System	
	a. Energy Meters (ABT Meters) for	
	I. 400 KV Lines	30
	ii. 400KV Generator-Transformers	15
	b. All Hardware/Software necessary for networking of energy meters,	5
7	Islanding Scheme	
	Islanding scheme for the project based on bus under frequency relays with two out f three logic including independent trip relays for each bay, including future bays.	5
8	SAS Accessories	
	a. I. Operator's Workstations with Printer for Bay equipment control, (Two sets for SCR and two sets for CCR)	15
	ii. 400 KV Network Controller	10
	iii. Programmer's Workstatiion with Printer	5
	iv. Portable engineering workstation	5
	v. Gateways for interface with remote control Centre	10
	vi. Gateways for interface with Generation Plant SCADA	10
	vii. Rear Projection Mimic Display	5
	b. Fibre Optic cable, including any other software/hardware items necessary for interconnecting BCUs and BPU's	lot
9	Time Synchronizing Equipment	10

10	Dynamicrelay Test Kit, including a Laptop PC	5
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C 132 KV Equipment

1	132 KV, 31.5 KA, C.B. 1250 A:	35
2	132 KV, 31.5KA, C.B. 2000A:	5
3	132 KV, 31.5 KA Isolators	
	a 1250 A	
	I) With single Earth switch	35
	ii) Without Earth switch	35
	iii) With double Earth switch	35
	b With double Earth switch (2000A)	10
4	132 KV, 31.5KA C.T., 1250A	105
5	132 KV, 31.5KA C.T., 2000A	15
6	120 KV Gapless surge arrester	105
7	132 KV Bus post insulator	1000
8	132 KV capacitor voltage transformer	30
9	132 KV switchyard erection including civil works, structure, cabling, earthing etc. consisting of 132 KV bays with standard double main bus switching scheme	40

SUBSTATION automation system (SAS)

10	Panel mounted bay control unit	40
11	Panel mounted protection unit	
	I STATION TRF. FEEDER	15
	iii Misc. STATION TRF.FEEDER	10
	iii ICT C.B. Protection (LBB)	10
	iv Bus coupler feeder	5
11	Bus bar protection unit	5
12	Metering panel	5

document/costsheet(Barh)

Annexure-II

**Tentative Estimate of Electrical Equipments required
for Thermal Projects during 11th plan**

TYPICAL 500 MW PROJECTS :

SI No.	Particulars	Total Quantity for 16 Nos.
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1	GENERATOR BUSDUCT AND ASSOCIATED EQUIPMENT PACKAGE	
1.1	Isolated phase bus duct	
a.	20,000 Amp main run of single phase	2000
b.	12000 Amps, Delta run of single phase	1040
c.	2000 Amps, tap off run single phase	1200
1.2	VT & SP cubicles	16
1.3	NG equipments & CTs	16
1.4	Supporting structural steel	640
2	POWER TRANSFORMER	
2.1	Generator transformer 200 MVA Gen V/765 single phase off ckt.	56
2.2	Unit transformer - 50 MVA Gen V/11.5 KV with OLTC +/-10%	16
2.3	Station transformer -80/40/40 MVA 132 / 11.5/11.5 KV with OLTC +/-10%	16
2.4	ICT, 400/132 KV,125 MVA	8
2.5	Auxiliary transformers 11/3.45 KV class	
a.	Unit auxiliary transformer, 16 MVA	32
b.	Coal plant Aux. transformer 5MVA	16
c.	Ash plant Aux. transformer 7.5MVA	16
d.	Raw Water Aux. transformer 2 MVA	16
3	L.T TRANSFORMER (INDOOR)	
a.	Unit Service Transformer 11/0.433 KV, 1750 KVA	32
b.	Station service transformer 11/04.33 KV,1750 KVA	32
4	LT TRANSFORMER (OUTDOOR)	
a.	ESP Servoce, 11/0.433 KV 1600 KVA	128
b.	CW service/service water and chlontion 11/0.433 KVA, 1000 KVA	16
c.	Cooling tower service transformers 11/0.433 KV 1250 KVA	48
d.	CHP transformer	
i)	CHP service 11/0.433 KV 1600 KVA	16
ii)	Stacker reclaimr,3.3/0.433 KV 500 KVA	16
iv)	CHP Bunker service 11/0.433 KV 1000 KVA	32
e.	WTP /DMP 11/0.433 KV,1250 KVA	16
f.	Ash Water slurry pump house//transport air compressor Service trf.11/0.433 KV 1600 KVA	16
g.	Fire water service trf. 11/0.433 KV, 1250 KV	16
h.	AWRS service trf. 11/0.433 KV, 315 KVA	16
i.	Raw water service trf. 11/0.433 KV, 630 KVA	16
j.	Ash handling trf. 11/0.433 KV,1600 KV	32
k.	Effluent treatment/CMB Service trf.11/0.433,500 KVA	16
l.	Service bidg./compressor/CPU service trf. 11/0.433 KV, 1000 KVA 1000 KVA	16
m.	F.O/ auxiliary boiler service trf. 11/0.433 1000 KVA	16

5	NATURAL GROUNDING RESISTOR	
	a. 11KV, 300 A	48
	b. 3.3 KV, 300 A	80
6	H.T SWITCHGEAR	
	a. 11KV	
	I) Unit swgr.	560
	ii) Station swgr.	440
	iii) AWRS swgr.	16
	b. 3.3 KV, 3000/2000 Amp	
	I) Unit aux. Service	552
	ii) Ash plant aux.service	216
	iii) CHP swgn	184
	iv) Raw water switchgear.	104
	c. 11 KV busducts, segregated	
	I) 2500 A,40KA, 100 Kap	5600
	ii) Support structure	240
	d. 3.3 KV Bus-duct (3000A)	1200
7	L.T. Switchgear	
	a 415V swgr panels	1200
	b 415V MCC panels	4600
	c AC fuse boards (15 feeders)	200
	d A.C lighting distribution board(5 feeders)	200
	e Aux. A.C distribution boards (100 feeders)	120
	f 220V DCDB (main)	16
	g 220V, solenoid VDB (100 feeders)	16
	h 220V Aux. DCDB (30 feeders)	40
	I 220V DC fuse boards (10 feeders)	200
	j 220V swyd DCDB (15 feeders)	16
	k 50 V PLCC DCDB (10 feeders)	16
	l L.T Bus duct 2500 A	2400
	m Local motor starter	1600
	n Local stop push button stations	8000
	o. 110V AWRS/Raw water	16
8	H.T.Moters	1896
9	L.T.Moters	18160
10	ELECTRICAL EQUIPMENT SUPPLY	
	D.C battery (Ni-Cd)	
	l 220 V unit batteries ,990 AH	32
	a. 110V 120 AH AWRS battery	16
	b. 110V 120 AH Raw water battery	16
	ii Battery chargers (float cumboost) for	
	a. Unit batteries, 220V, 400 A	32
	b. 110 V,50A AWRS	16
	c. 110 V, Raw water	48

11	132 KV, 11KV & 3.3 power cables	
	a. 132 KV cable	
	I Single core 500 mm2 armoured XLPE	60
	iii Straight through joint (132 KV Class)	120
	iv Cable sealing end (132 KV)	96
	c. 11/11KV grade XLPE(unarmoured)	
	I) 3C/150 mm2	280
	ii) IC-300 mm2	200
	c. 11/11KV grade XLPE(armoured)	
	I) 3C/300 mm2	48
	d. 3.3/3.3 KV grade XLPE insulated unarmoured type	
	I. 3C-150 mm2	96
	ii IC-150 mm2	120
	iii IC-300 mm2	64
	iv 3C-95 mm2	32
	e. 3.3/3.3 KV grade XLPE insulated armoured type	
	I. IC-300 mm2	32
	ii 3C-95 mm2	12
12	LT cable	
	a 1.1 KV power cables	3200
	b 1.1 KV contrl cables	6000
13	Mis. Electrical Packages	
	a Diesel genertior sets 1250 KVA, 415 V	24
	b Cabling, earthing & lightning protection system	lot
	c Lighting system	lot
14	(a) Numerical Protection and metering for Generator , Generator Trf. Unit	16
	(b) Numerical Protection for 132KV Class (Station Trf..80/40/40 MVA)	16
15	Electrical lab equipment	lot
16	Construction power /Township	
	Inside Power Plant :	96
	b. 11KV overhead line	80
	c. 11/6.35KV XLPE Al. conductor armoured 3CX 185 mm2	16
	d. 11KV Termination (3 Phase)	80
	Township Power Supply Arrangement :	
	a. LT Substation with 1MVA Transformer	48
	b. !! KV O/H Line (ring main)	48
17	Equipment and O/H line (11KV)	
	a. AWRS	32
	b Isolator 3 pole (400 A)	64
	c L.A	96

18	765/ 400/132 KV Switchyard	
	A 765 KV Equipments 40 for 1 sec.,2000 A	
	a. Circute breaker	48
	b Isolators Vertical-3 phase	128
	c. Current Transformer	240
	d Gapless lightning arrestor	48
	e Bus post insulator	960
	f. CVT	48
	g. Bay control unit and protection IEDs	32
	h. C.B. relays for:	
	i Generator Transormer feeder	16
	ii Bus section feeder	16
	I Numerical bus bar differential	16
	B 400 KV Equipments 40 for 1 sec.,2000 A	
	a. Circute breaker	16
	b Isolators (HCB Type)	48
	c. Current Transformer	72
	d Gapless lightning arrestor	24
	e Bus post insulator	160
	g. Bay control unit and protection IEDs	8
	h. C.B. relays for ICT	8
	c. 132 KV Equipments 31.5KV for 1 sec.,1250 A	
	a. Circute breaker	24
	b Isolators Vertical-3 phase	72
	c. Current Transformer	72
	d Gapless lightning arrestor	72
	e Bus post insulator	360
	g. Bay control unit and protection IEDs	24
	h. C.B. relays for:	
	i Station Transormer feeder	16
	ii ICT	8

Annexure-III

**Tentative Estimate of Electrical Equipments required
for Thermal Projects during 11th plan**

TYPICAL 250 MW PROJECTS :

SI No.	Particulars	Total Quantity for 17 Nos.
1	GENERATOR BUSDUCT AND ASSOCIATED EQUIPMENT PACKAGE	
1.1	Isolated phase bus duct	

a.	1200 Amp main run of single phase	2125
b.	1600 Amps, tap of run of single phase	1275
c.	3000 Amps, common tap off run single phase	204
1.2	VT & SP cubicles	17
1.3	NG equipments & CTs	17
1.4	Supporting structural steel	510
2	POWER TRANSFORMER	
2.1	Generator transformer 315 MVA Gen V/237 three phase off ckt.	17
2.2	Unit transformer - 20 MVA Gen V/6.9 KV with OLTC +/-10%	34
2.3	Station transformer -55/27.5/27.5 MVA 220 / 6.9/6.9 KV with OLTC +/-10%	17
2.4	Misc. service Transformer 6.6/11.5 KV 10MVA with OLTC +/-5%	17
3	L.T TRANSFORMER (INDOOR)	
a.	Unit Service Transformer 6.6/0.433 KV, 1600 KVA	34
b.	Station service transformer 6.6/0.433 KV, 1600 KVA	34
4	LT TRANSFORMER (OUTDOOR)	
a.	ESP/ Ash Extraction Service, 6.6/0.433 KV, 1600 KVA	68
b.	CW service/service water and chlorination 6.6/0.433 KV, 1000 KVA	17
c.	Cooling tower service transformers 6.6/0.433 KV 1250 KVA	34
d.	CHP transformer	
i)	CHP service 6.6/0.433 KV, 1600 KVA	17
ii)	Stacker reclaim, 6.6/0.433 KV, 500 KVA	9
iii)	CHP r service 6.6/0.433 KV, 1000 KVA	17
iv)	CHP Bunker service 6.6/0.433 KV, 1200 KVA	17
e.	PT /DM Plant/H2 gen./Ash Water Treatment /FO 6.6/0.433 KV, 2000 KVA	17
f.	Ash Water /Ash slurry seservice trf. 6.6/0.433 KV, 1600 KVA	17
g.	transport air compressor house /Aux. Boiler Service Trf 6.6/0.433 KV, 1000 KVA	17
h.	Fire water service trf. 6.6/0.433 KV, 1600 KVA	17
i.	AWRS service trf. 11/0.433 KV, 1000 KVA	17
j.	Raw water service trf. 6.6/0.433 KV, 630 KVA	17
k.	Ash silo service trf. 6.6/0.433 KV, 1000 KVA	17
l.	Effluent treatment/CMB Service trf. 6.6/0.433 KV, 630 KVA	17
m.	Service bidg./compressor/CPU service trf. 6.6/0.433 KV, 630 KVA	17
n.	ADM/workshop bldg. service trf. 11/0.433 KV, 1600 KV	17
o.	Switchyard service transformers 6.6 /0.433 KV, 630 KVA	17
p.	Workshop/permanent store service trf. 6.6/ 0.433 KV, 630 KVA	17

5	NATURAL GROUNDING RESISTOR	
	a. 6.6KV, 300 A	68
6	H.T SWITCHGEAR	
	a. 11KV	
	I) Misc. swgr.	145
	ii) Colony swgr.	94
	iii) AWRS swgr.	17
	b. 6.6 KV, 2750/2000/630 Amp	
	I) Unit swgr.	799
	ii) Station swgr.	459
	ii) Ash plant aux.service	230
	iii) CHP swgn	153
	c. 6.6 KV busducts, segregated	
	I) 2750/2000 A,40KA, 100 Kap	7650
	ii) Support structure	340
7	L.T. Switchgear	
	a 415V swgr panels	1275
	b 415V MCC panels	3825
	c AC fuse boards (15 feeders)	128
	d A.C lighting distribution board(5 feeders)	170
	e Aux. A.C distribution boards (100 feeders)	128
	f 220V DCDB (main)	17
	g 220V, solenoid VDB (30 feeders)	34
	h 220V Aux. DCDB (30 feeders)	17
	I 220V DC fuse boards (10 feeders)	170
	j 220V swyd DCDB (40 feeders)	17
	k 50 V PLCC DCDB (25 feeders)	17
	l L.T Bus duct 2500 A	5525
	m Local motor starter	1700
	n Local stop push button stations	5100
	o. 110V AWRS/colonyDCDB(10 feeders)	26
8	H.T.Moters	1581
9	L.T.Moters	17697
10	ELECTRICAL EQUIPMENT SUPPLY	
	I D.C battery (Ni-Cd)	
	a. 220 V unit batteries ,540 AH	34
	b. 220 V swyd. batteries , 250 AH	17
	c. 110V 120 AH AWRS battery	17
	d 110V 120 AH colony battery	17
	e 50 V PLCC batteries , 250 AH	17
		17
	II Battery chargers (float cum boost)	
	a. Unit batteries, 220V, 250 A	34
	b. 220 V swyd. batteries , 100 AH	17

	c.	110 V, 50A AWRS batteries	17
	d	110 V, 50 A colony batteries	17
	e	50 V PLCC batteries , 100 AH	17
11		Power cables	
	a	220 KV power cables	
	b	11/6.35 KV (armoured)	
		l) IC/300 mm2	34
		l) 3C/150 mm2	26
	c	6.6 / 6.6 KV (armoured)	
		i) IC-500 mm2	26
	d.	6.6 /6.6 KV grade XLPE insulated unarmourd type	
	l.	3C-150 mm2	272
	ii	IC-150 mm2	77
	iii	IC-300 mm2	204
12		LT cable package	
	a	1.1 KV power cables	3400
	b	1.1 KV contrl cables	6800
13		Diesel genertior sets 1250 KVA, 415 V	17
14		(a) Numerical Protection and metering for Generator , Generator Trf. Unit	17
		(b) Disturbance recorder for Generator ,	17
15		Construction power /Township	
		Inside Power Plant :	
	a.	LT sub station with 500 KV Transformer	85
	b.	11KV overhead line	60
	c.	11/6.35KV XLPE Al. conductor armoured 3CX 185 mm2	17
	d.	11KV Termination (3 Phase)	85
		Township Power Supply Arrangement :	
	a.	LT Substation with 800 kVA Transformer	51
	b.	!! KV O/H Line (ring main)	26
16		Electrical lab equipment	lot
17		Equipment and O/H line (11KV)	
	a	11 KV O/H line	85
	b	AWRS	68
	c	colony	17
	d	Isolator 3 pole (400 A)	68
	e	L.A	204
18		220 KV Switchyard	

A 220 KV Equipments 40 KA		
a.	Circute breaker 220 KV, 40 KA 1600 A	94
b	Circute breaker 220 KV, 40 KA 2500 A	9
c	Isolators (HCB Type) 1600 A with 2 Earth switch	94
d	Isolators (HCB Type) 1600 A with single Earth switch	94
e	Isolators (HCB Type) 1600 A without Earth switch	179
f	Isolators (HCB Type) 2500 A with 2 Earth switch	17
g	Current Transformer 1600 A	281
h	Current Transformer 2500 A	26
l	Gapless surge arrestor	255
j	Capacitive voltage Transformer	204
k	Wave trap	102
l	Bus post insulator	1275
m	Bay control unit	102
n	Bay circuit breaker protection unit (including metering system)	
	l)Generator transformer feeder	17
	ii)Station transformer feeder	17
	iii)Line feeder	51
	iv)Bus coupler feeder	9
	iv)Bus transfer feeder	9
19	(a) Numerical Bus bar differential Protection	9
	(b) Numerical line Protection including built in Disturbance Recorder	51
	(c) Numerical Protection for 22032KV Class (Station Trf..55/27.5/27.5 MVA)	17

Annexure-IV

Tentative Estimate of Electrical Equipments required for Thermal Projects during 11th plan

TYPICAL 360 MW MODULE GAS PROJECTS :

SI No.	Particulars	Total Quantity for 31Module.
1	GENERATOR BUSDUCT AND ASSOCIATED EQUIPMENT PACKAGE	
	a Generator bus duct 11 KV 1000 A	93
	b V.T.panel NG Equipment +CT set	93
	c 66 KV bus duct	1550
2	TRANSFORMER	
	a Generator transformer 10.5 / 230 KV three phase 114 MVA	62
	b Generator transformer 10.5 / 230 KV three phase 146 MVA	31
	c Unit auxiliary transformer -10.5 / 6.6 KV 20 MVA three phase	62
	d L.T. Unit auxiliary transformer 6.60/ 0.433 KV 2.5 MVA three phase	310
3	Neutral grounding resistors 6.6 kv	62

4	H.T SWITCHGEAR	
	a 220 KV Generator circuit breaker 2000 A, 11 KV	93
	b Generator circuit breaker 10000 A, 11 KV	93
	c 6.60 kv Switchgear, Station Switchgear panel 2000 A,40 KA, L.T. Switchgear	961 527
5	H.T.Moters	403
6	L.T.Moters	1116
7	D C SYSTEM	
	I D.C batteries	
	a. 220 V ,300 AH (GT)	62
	b 220 V , 1000 AH (ST)	62
	c. 220 V 400 AH (swyd.)	31
	d 50 V 400 AH (swyd.)	62 62
	II Battery chargers	
	a 220V, 60 Amp (GT)	62
	b 220 V 200 Amp (ST)	62
	c 220 V, 80 Amp (swyd.)	31
	d 50 V, 80 Amp (swyd.)	62
8	D. C. Distribution board (GT&ST)	93
9	D. C. Distribution board (SWYD) 220 V &50 V each	31
10	Station Lighting System and Misc. Lighting	lot
11	Generator Generator transformer unit protection panels	93
12	Power and Control cables	
	a HT	6200
	b LT	15500
13	Black Start Facility 6.6 A,1250 KVA	31
14	Construction power /Township	
	a 415V swgr panels (outdoor) 630 A,13 KA	62
	b 6.35/11 KV cable 3Cx150 mm2 (armoured)	15.5
	c 11KV Isolators	155
	d 11KV L.A.	186
	e 11 KV Voltage Transformer	186
	f 11KV overhead line	124
	g LT Substation (11/0.433 kV Transformer,ACB etc)	155
	h 11 KV load break Isolators (200A)	124
15	Switchyard	
	A 220 KV Equipments 40 KA sec fault rating, 1600A	
	a. Circute breaker	93

b	Isolators 2 Earth switch	93
c	Isolators with single Earth switch	93
d	Isolators without Earth switch	93
e	Current Transformer	279
f	Gapless lightning arrester,216 KV	279
g	Bus post insulator	1395
h	220 KV control panel	93
l	220 KV Relay,Protection and metering panel	
	l)Generator transformer C.B. relay and metering panel	93
	ii) Bus bar diferencial panel	31
j	Disturbance recorder	93
k	Tariff metering equipment	31
l	Time synchronisation equipment	31
m	Relay test kit	31
n	synchronising trolley	31
o	Shifting of bus PT	lot