

White Paper on Strategy for 11th Plan



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CHAPTER -1

INTERNATIONAL CONCLAVE ON KEY INPUTS- A BEGINNING

1.1 BACKGROUND- INTERNATIONAL CONCLAVE ON KEY INPUTS

An International Conclave on Key Inputs for Accelerated development of Indian Power sector for 11th Plan and beyond was held on 4th & 5th July 2007. It was attended by about 85 industries including BHEL, Dong Fang, L&T, MHI, Ansaldo, Alstom, VA Tech, and Toshiba. 125 nos. of Research Institutions, State Governments, CERC and State Regulatory Commissions, Ministry of Heavy Industry, PSUs and 25 other organizations also participated in the Conclave.

A separate interaction/meeting was taken by Chairperson CEA with the Industry Representatives to better understand the problems and issues being faced by both the Industries and the Utilities in the Power Sector.

The Members of Industries expressed their concerns and views on their experiences as well as lessons learnt for further development of the power sector. They also deliberated on the various critical inputs identified in the Conclave for timely implementation of the projects. During the discussion it emerged that a capacity addition of 78,577 MW is likely during the 11th Plan whereas during the 12th Plan the tentative capacity addition is expected to be 82,2000 MW. It has also been estimated that in the long term the projections of electricity requirement are expected to grow, with the Installed Capacity requirement by 2031-32 being about 7.6 lakh MW and 9.6 lakh MW, with 7% and 8% growth rates respectively. It was emphasized that the power sector was poised for long term capacity addition and the industry should take steps to increase production and project execution capacity to meet the targets. Power Generation Projects to the tune of 50,000 MW are currently under execution and efforts are being made to place letter of awards for more than 25,000 MW capacity by December 2007. This should provide adequate confidence to the industry for taking up investment decision for capacity augmentation. All companies, specially the larger ones in the Power Sector, are required

to gear up and substantially upgrade their production capacities to meet the unprecedented challenges of the growing requirement of the power sector

1.2 MAJOR ISSUES TO BE ADDRESSED

Some Major Issues were identified which need to be addressed in order to ensure timely Implementation of project during 11th Plan and beyond. These are:

- Manufacturing Capability of Main Plant and Balance Of Plant Equipment to be commensurate with capacity addition.
- Adequate Construction and Erection Agencies
- Availability of Adequate Fuel and Key materials
- Adequate Transportation facilities for Equipment and Fuel
- Manpower development including training facilities commensurate with large capacity addition
- Slow process of decision making and cumbersome payment procedure adopted by Utilities

1.3 RECOMMENDATIONS OF THE CONCLAVE ON KEY INPUTS

During the discussions, it was decided that certain Specific Initiatives/ Actions are required to be taken to resolve the various problems being faced by the Industries/ Utilities:

The major observations and recommendations of the Conclave during the various sessions are as under:

1. There is a need to substantially augment existing indigenous manufacturing facilities as well as to create additional capacity by new players in the thermal and hydro main plant equipments. There seem to be no constraints in meeting requirements of hydro power plant equipment proposed for commissioning during the 11th plan (about 16,000 MW) but the hydro capacity addition programme during the 12th plan is expected to increase substantially (30,000 MW). In addition requirement of hydro projects expected to be commissioned in Nepal and Bhutan should also be factored in while planning the manufacturing capacity. The existing capacity of BHEL is 6000 MW/year and is likely to be increased to 10,000 MW/year by December 2007, 15,000

MW/year in December, 2009 and further to 20,000 MW/year by 2012 in case demand is there. In addition, following Indian and foreign manufacturers have indicated their capacities as under:

Manufacturers	Capacity	Year from which available
JV of L&T and MHI	3000 –4000 MW/year (Boiler Only)	December, 2008
Dong Fang (China)	26,000 MW(Thermal) 5000 MW (Hydro)	Existing

2. BHEL should play an active role in development of ancillaries units/ vendors commensurate with their own enhanced capacity and to ensure that deliveries are complete and sequential. It was felt that the payment to the supplier should be on milestone basis viz. drum lifting, hydraulic test, light up etc. rather than tonnage basis to give correct signal for maintaining sequential supplies.
3. Advance procurement action is required for some of the critical long lead inputs namely, critical castings and forgings for turbines and generators, boiler quality plates, P-91 piping, CRGO sheet steel for transformers, etc, where world-wide shortages are being currently experienced. These items are being imported and the vendors available globally for these items are very few. It is also necessary to encourage indigenous industry to set up capacity in these areas as there is a spurt in power plant business world-wide.
4. Balance of Plants were identified as critical items for timely commissioning of Thermal Power Projects. It was observed that a number of Thermal units were getting delayed due to delay in commissioning of balance of plants such as coal handling plants, Ash handling plants, cooling tower etc. There is a need to develop more vendors for the following Balance of Plants;
 - i. Ash handling plant.
 - ii. Coal handling plant.
 - iii. DM plant.
 - iv. Condensate polishing unit.
 - v. CW and make up system.
 - vi. Cooling tower.
 - vii. Air compressors.
 - viii. Chimney.
 - ix. Civil and mechanical design consultancy packages.
 - x. Desalination plant.

There are very limited vendors for each of above BoPs and at times only single quotation is received.

There is also a need to develop adequate erection and construction agencies for executing civil and mechanical works and engineering consultants for engineering and design of various packages.

However, adequate capacity is available for the following balance of plants as per the presentation given by the various vendors:

- a. Ventilation and Air conditioning.
- b. Ash water recirculation.
- c. Bus ducts.
- d. HV/LV switchgear.
- e. Insulation.

It was also suggested that each BoP should invariably be awarded as a package instead of breaking up into equipment, civil contracts and mechanical erection contractors to have single point responsibility.

Supportive and developmental attitude should be adopted by the owners to encourage new vendors.

5. Stringent qualifying requirements for the vendors specified by utilities to be reviewed so that it should not act deterrent for participation by new players. It was felt that the new players could be qualified based on proven management experience provided they meet the financial requirements. New players could, however, be asked for additional performance guarantee.
6. A system of LDs for delay in execution of project and incentive for early execution may be adopted to provide correct signal for timely completion of the project.
7. There is a need for creation of indigenous manufacturing capacity for 765 kV transmission system equipment and up-gradation of testing facilities, online testing facilities and mobile repair facilities for transmission equipments.
8. There are inadequate short circuit testing facilities in India for transformers. CPRI testing equipments are old and require upgrading particularly for short circuit test of EHV transformers (765 kV).
9. Strengthening of erection and commissioning teams for transmission and generation projects is essential. Since projects to be commissioned every year would be large in

- number, number of commissioning teams may be required to work simultaneously to meet the target capacity addition.
10. Indigenous manufacturing capacity of CRGO should be created. The matter needs to be taken up with Ministry of Steel for CRGO manufacturing facilities by SAIL
 11. More agencies are required to be developed for turn key execution of distribution projects.
 12. IT based project management & monitoring should be introduced at all the project sites with on line connectivity with suppliers, project authorities, EPC contractor and CEA.
 13. It was felt that the future accelerated growth in power sector provides an opportunity for employment of youth. There is also a shortage of skilled man power at the project sites resulting in delay in their implementation. The project developers and major EPC contractors have to contribute to build up a large skilled man power pool for power sector. There was a consensus that each project developer and major EPC contractors should adopt ITIs near the project area and organize project specific training to obtain skilled workers for them and their contractors/ sub-contractors to ensure local availability of skilled man power. Project developers may coordinate the training activities for ITI with Director General Employment and Training, Ministry of Labour. HRD Division of CEA will overview the implementation of this recommendation. Similarly Power Utilities/CPSUs should train their engineers in Project Management to develop project management skills.
 14. There is a need to create at least ten accredited training institutions at different geographical locations for skills like HP welding, Aluminum welding, Crane operators, Cable jointing, etc.
 15. Quick implementation of the national training policy recommendation of allocation of separate funds of 1.5% of salary budget initially and to gradually increase to 5% for meeting training needs by each organization.
 16. Use of energy efficient equipments to be promoted to save energy. It is estimated that use of CFLs in place of incandescent lamps can save up to 10,000 MW of power in the country. It is also estimated by BEE that use of energy efficient power generating equipment in 11th Plan would save about 100 million tonnes of coal per annum.
 17. The payment procedures should be simplified by the utilities so that cash flows are maintained to facilitate timely payments to the suppliers/contractors so that the

schedule of project implementation is maintained. Similarly, the procedure for approval of construction drawings needs to be simplified and made time bound by the project authorities. Closing of a contract also takes a very long time by state power utilities and needs attention.

18. Chinese manufactures raised the issue of non issuance of long term visa as required for execution of the project. Their engineers and technicians have to go out of the country after every three months, thus delaying execution of works. Matter needs to be taken up with MEA.
19. The transportation facilities including port handling capacity facilities for equipment and fuel needs to be enhanced commensurate with capacity addition.
20. Adequate fuel availability has to be ensured for the proposed plants. Coal block allotment/coal linkage for all plants which are proposed to be commissioned during the 11th plan should be made on priority.
21. It has been decided to form Task Force comprising MoP, CEA and CII to coordinate with industry regarding the various inputs required by the power sector. CEA and CII will prepare a white paper on the areas of concern for timely commissioning of the units. CII will then organize dialogue with specific industry groups and interested entrepreneurs.

CHAPTER-2

TENTH PLAN REVIEW

2.1 BACKGROUND- PLAN-WISE TARGETS AND ACHIEVEMENTS

The growth of the Power Sector has been planned and structured in five year Plan periods. Details of the targets and actual achievements during the various Plans are furnished below:

Plan	Target(MW)	Achievement(MW)	%
1st (51-56)	1300	1100	84.6
2nd (56-61)	3500	2250	64.3
3rd (61-66)	7040	4520	64.2
4th (69-74)	9264	4579	49.5
5th (74-79)	12499	10202	81.6
6th (80-85)	19666	14226	72.3
7th (85-90)	22245	21401	96.2
8th (92-97)	30538	16423	53.8
9th (97-02)	40245	19015	47.5
10th (02-07)	41110	21180	51.76

2.2 INSTALLED CAPACITY AT THE BEGINNING OF 10TH PLAN

The total installed capacity at the beginning of the 10th Plan i.e. 1.4.2002 was 1,05,046 MW comprising 26,269 MW hydro, 74,429 MW thermal (including gas and diesel), 2,720 MW nuclear and 1628 MW wind-based power plants. Region-wise details of installed capacity as on 1.4.2002 are given in Table below

REGION	Hydro	Thermal					Nuc-lear	Wind	Total
		Coal	Lignite	Gas	Oil	Total			
NORTHERN	8,499	15470	-	2912	15	18,397	1,180	16	28,092
WESTERN	4,342	20124	465	5035	18	25,683	760	589	31,374
SOUTHERN	9,868	9972	2070	2551	939	15,430	780	1,021	27,099
EASTERN	2,454	13487	-	190	17	13,735	-	2	16,191
N-EASTERN	1,101	330	-	709	102	1,140	-	-	2,241
ISLANDS	5	-	-	-	44	44	-	-	49
ALL INDIA	26,269	59383	2535	11397	1135	74,429	2,720	1,628	1,05,046*
% OF TOTAL	25	56.6	2.4	11	1	71	3	1	100

In addition to above, **1697 MW** of capacity from remaining Renewable Energy Sources was connected to Grid, as per data from MNRE.

2.3 TARGET CAPACITY ADDITION DURING TENTH PLAN

A capacity addition of 41,110 MW was fixed as the target for the 10th Plan. The sector wise, type wise summary of this capacity addition target is given in Table below

(Figures in MW)

10TH PLAN CAPACITY ADDITION TARGET-SECTOR WISE				
SECTOR	Hydro	Thermal	Nuclear	Total
CENTRAL	8,742	12,790	1,300	22,832
STATE	4,481	6,676	0	11,157
PRIVATE	1,170	5,951	0	7,121
TOTAL	14,393	25,417	1,300	41,110

A moderate target was set for state and private sectors keeping in view the preparedness of various state power utilities and IPPs.

Region wise/ Sector wise summary of this capacity addition target is furnished at **Appendix-I** and the detailed list of the projects is given at **Appendix –II**.

2.4 10TH PLAN MID TERM APPRAISAL TARGETS

During the Mid Term Appraisal (MTA), it was seen that out of the 41,110 MW target set for capacity addition during the course of the 10th Plan, over 12,400 MW would no longer be feasible within the 10th Plan.

In order to retrieve the situation, new projects totaling 8,320 MW were identified and taken up for commissioning in the X Plan. These additional projects mainly were in the following three categories:

- (a) **Gas based projects:** Owing to the fact that setting up of gas based projects require comparatively less gestation period, there was a fair chance of completing these projects within 10th Plan.
- (b) **Extension thermal projects:** Due to availability of requisite clearances, it was considered that with saving of time on bidding process, these projects if given to BHEL through negotiated route are possible to be completed within 10th Plan.
- (c) **Advancing commissioning date of some of the 11th Plan projects:** With the new benchmarks being set for execution of the power projects, a few projects like Sipat and Kahalgaon were attempted to be preponed to give benefit in 10th Plan in consultation with BHEL and the generation company.

On the basis of the status of original Tenth plan projects and possibility of taking up back up projects under best effort scenario at the time of Mid Term Appraisal, following capacity addition was considered feasible:-

(figs in MW)

Source	Central	State	Private	Total
Hydro	6177	4248	700	11125
Thermal	11070	7992	4199	23261
Nuclear	2570	0.00	0.00	2570
Total	19817	12240	4899	36956

2.5 TENTH PLAN ACTUAL CAPACITY ADDITION

A capacity addition of 21,180 MW has been achieved during 10th Plan. Sector wise details are given in the table presented below:

Sector	Hydro	Thermal	Nuclear	Total	% achievement
Central	4495	7330	1180	13005	56.9
State	2691	3553.6	0	6244.6	55.9
Private	700	1230.6	0	1930.6	27.1
Total	7886	12114.2	1180	21180.2	51.6
% Achievement	54.8	47.6	90.8	51.6	

- ✚ From above table it is evident that though shortfalls in all the 3 segments i.e. Central, State and Private Sector have been reported, the shortfall in achieving the Private sector targets of capacity addition are notable.
- ✚ In terms of inter fuel mix comparison, nuclear sector was able to achieve 90.8% of the modest target set for it.
- ✚ In Hydro segment 54.8% of the target was achieved and 10th Plan is notable in the context of clearing the backlog. There were number of hydro projects which were originally due for commissioning in the 8th Plan or even before. But these projects due to associated problems were brought into the 10th Plan with a long history of time and cost over run. These projects included Naptha Jhakhri HEP (1500 MW), Tehri HEP (1000 MW), Dulhasti HEP (390 MW) and Sardar Sarovar (1450 MW).
- ✚ The dismal performance of Thermal segment at 47.6% of the target is mainly due to most of the coal based backup projects which could not fructify due to supply constraint on part of equipment manufacturers especially BHEL.
- ✚ It emerges that despite achieving more than half the capacity addition in the last 2 years of the plan, it fell far short of the targets set for the last 2 years. This clearly indicates that tail end bunching of projects is required to be avoided.

A Summary of Actual Capacity Addition during the 10th Plan viz. a viz. the target is furnished below

SUMMARY OF CAPACITY ADDITION DURING 10th PLAN (MW)			
➤	Original Target	41,110	
➤	Capacity Slipped / Dropped	21,281	
➤	Net Capacity Addition from Original Target	19,829	
➤	Additional Projects identified during the Plan		8,320
▪	Capacity Slipping from additional projects		6,969
▪	Net Capacity Addition from additional Projects	1,351	
Net Capacity added during 10th Plan		21,180	

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As shown above, from the original Tenth Plan projects aggregating 21,281 MW have slipped from the Tenth Plan. Of this 13,554 MW pertains to thermal segment and 6207 MW to hydro segment. Out of 8,320 MW additional projects identified for commissioning within the Tenth Plan under best efforts, projects aggregating 6969 MW have slipped the Tenth Plan timeline. In nutshell apart from 41,110 MW original Tenth Plan projects, 8320 MW were identified as additional backup projects and thus under these two exercises, projects aggregating 49,430 MW were identified out of which actual capacity addition is slated to be 21,180 MW. Thus projects aggregating 28,250 MW have slipped from the Tenth Plan.

2.6 REASONS FOR 10TH PLAN SLIPPAGES

Summary details of reasons associated with the projects that have slipped the Tenth Plan is given below:

S. No	Major Reasons for slippage	Original Plan			Additional Projects	Total
		Thermal	Nuclear	Hydro		
1.	Delay in supplies/erection by suppliers/contractors	2670	220	679	3350	6919 (24.9%)
2.	Delay in tie-up super critical technology	3960				3960 (14.0%)
3.	Non-availability of Gas	1713			1450	3163 (11.2%)
4.	Delay in award of works mainly in state sector/NLC	1423		222	835	2480 (8.8%)

S. No	Major Reasons for slippage	Original Plan			Additional Projects	Total
		Thermal	Nuclear	Hydro		
5.	Projects not taken up/Escrow cover not given/financial closure not achieved/funds not tied up	5278			23	5301 (18.8%)
6.	Delay in clearance/investment decisions (Hydro Projects)			2391		2391 (8.5%)
7.	Hydro Project-delay in environmental clearance, geological surprises, natural calamities, R&R issues, delay in signing of MoU, Court Cases			3155		3155 (11.17%)
8.	Law & Order Problems	500		60		560 (1.2%)
9.	Nuclear projects included on best effort basis (otherwise scheduled for 11 TH Plan)				1220	1220 (4.4%)
10.	Adjust due to change of size	-990			91	-899
	Total	14554	220	6507	6969*	28250

2.7 PRESENT INSTALLED CAPACITY

The installed generation capacity in the Power Utilities in the country as on 31.07.2007 was 1,35,006.63 MW. Region-wise and Category-wise break-up of installed capacity is given below:

(All figures in MW)

SL. NO.	Region	Hydro	Thermal	Nuclear	R.E.S.@	Total
1	Northern	12671.15	21475.68	1180.00	1220.18	36547.01
2	Western	6743.50	29090.70	1840.00	2670.34	40344.54
3	Southern	10646.18	20498.12	1100.00	5899.33	38143.63
4	Eastern	2598.93	14557.08	0.00	227.81	17383.82
5	N. Eastern	1116.00	1244.24	0.00	146.01	2506.25
6	Island	0.00	70.02	0.00	11.36	81.38
7	All India	33775.76	86935.84	4120.00	10175.03	135006.63

@ = Renewable Energy Sources (RES) includes Small Hydro Project (SHP), Biomass Gas (BG), Biomass Power (BP), Urban & Industrial waste Power (U&I) and Wind Energy

CHAPTER-3

LESSONS FROM 10TH PLAN

3.1 PROBLEMS AND CONSTRAINTS

Various problems and constraints being faced by both the Industries and Power Sector were discussed in depth, the major ones being as follows :-

- Industries felt that projects drag on due to the slow process of decision making and cumbersome payment procedures being adopted by the Power Utilities. This also affects the cash flow of the suppliers.
- The new entrants as well as small suppliers are experiencing problems due to stringent qualifying requirements stipulated by the power sector and Utilities. This acts as a deterrent for participation by new players.
- Problems are experienced in availability of raw materials like CRGO, Copper, special piping materials etc. and inputs such as turbine forging.
- Inadequate testing facilities in India for transformers i.e. open circuit tests. CPRI testing lab needs urgent up gradation to meet our requirements.
- Availability of adequate number of young and talented manpower in Power Sector has become an issue mainly because such manpower is attracted by the high salaries in IT Sector. Serious thought may be given to increase salary levels in the power sector.

3.2 LESSONS LEARNT

During the 10th Plan, various problems and constraints were faced in timely implementation of projects. A Root cause analysis was done to identify the specific problems with a view to avoid them in future. The lessons learnt are as follows:

- It could be categorically said that though we had put an effective monitoring mechanism in place to monitor the progress of all the projects, however, the actual achievement is low on account of a host of other factors.

- At the beginning of the Tenth Plan about 20,000 MW was under execution. The actual achievement of 21,180 MW demonstrates that given the constraint of gestation period, only those capacities are likely to fructify which have been ordered and are at execution stage by the 1st year of the Plan itself. Units ordered subsequent to this, particularly in hydro segment, are sure to miss the bus. Keeping this fact in mind for the 11th Plan, apart from 50,000 MW which is under execution, attempts are being made to complete the ordering process in respect of remaining 25,000 MW by December, 2007.
- Delay in critical supplies has emerged as the single most important reason for slippages in the 10th Plan. BHEL has already been asked to augment its capacity. A system of liquidated damages (LD) for delay in execution of project may be adopted to ensure timely completion of projects.
- Availability of gas at reasonable prices has emerged another major constraint during the Tenth Plan. Gas based projects are to be kept mainly as back up project only in the 11th Plan. Committed gas supplies to existing projects is to be given top priority.
- In comparison to the size of the 11th Plan, hydro segment has been given relatively small proportion. 2500 MW is such where ordering is yet to be placed. This is required to be completed in another month's time.
- Number of States have either set target of capacity addition at zero or far more less than the expected growth in the electricity demand in the States. Against the modest target of 11,000 MW actual achievement has been only about 6,200 MW in the State Sector. States have to play pro-active role in capacity addition programme and their programme of capacity addition should reflect the target of economic growth set for the country as a whole in general and growth in state domestic products in particular.
- There is an urgent need to streamline the production of balance of plant equipment. It is observed that some of the 10th Plan Projects such as 250 MW Paras Ext, 500 MW Sipat and 500 MW Birshighpur have been commissioned during April to June 2007 (11TH Plan period) but have not been declared commercially operational so far due to non completion of balance of plant equipment. BesidesMW capacity commissioned during 10th Plan could not be put in commercial operation so far due to non-completion of Coal Handling Plant.

CHAPTER-4

11TH PLAN - KEY INPUT - REQUIREMENTS AND CONSTRAINTS

4.1 11TH PLAN CAPACITY ADDITION

The National Electricity Policy envisages “Power for all by 2012” and per capita availability of power to be increased to over 1,000 units by 2011-12. To achieve this, a total capacity addition of about 1,00,000 MW is required during 10th and 11th Plan period. Considering 21180 MW being actual achievement during X Plan, the 11th Plan target envisages to add 78,577 MW. Out of 78,577 MW, projects of 1,935 MW have already commissioned and projects of 50,910 MW (64.9% of the proposed capacity) are already under construction. For projects of 25,732 MW capacity, Letter of Award is yet to be placed. Details are furnished in the table below :-

	Hydro	Total Thermal	Thermal Break Up			Nuclear	Total
			Coal	Lignite	Gas & Liquid Fuel		
A. PROJECTS COMMISSIONED							
Central Sector	130	500	500	0	0	220	850
State Sector	225	860	750	0	110	-	1085
Private Sector	0	0	0	0	0	-	0
ALL-INDIA	355	1360	1250	0	110	220	1935
B. PROJECTS UNDER CONSTRUCTION							
Central Sector	8435	15680	14190	750	740	3160	27275
State Sector	3020	13087	11985	450	652	-	16107
Private Sector	2791	4737	2700	0	2037	-	7528
ALL-INDIA	14246	33504	28875	1200	3429	3160	50910
C. LOA TO BE PLACED							
Central Sector	1120	10620	9620	250	750	0	11740
State Sector	360	10400	10400	0	0	-	10760
Private Sector	472	2760	2760	0	0	-	3232
ALL-INDIA	1952	23780	22780	250	750	0	25732
D. TOTAL							
Central Sector	9685	26800	24310	1000	1490	3380	39865
State Sector	3605	24347	23135	450	762	-	27952
Private Sector	3263	7497	5460	0	2037	-	10760
ALL-INDIA	16553	58644	52905	1450	4289	3380	78577

Project-wise details are furnished in Appendix III

In addition to this capacity addition of 78,577MW, additional projects totaling to 8704 MW are under construction for benefit during 11th Plan

4.2 YEAR-WISE PHASING OF 11TH PLAN PROJECTS

(MW)

Sector	2007-08	2008-09	2009-10	2010-11	2011-12	Total
Hydro	2751	1305	1445	3857	7195	16553
Thermal	12704	4477	11623	14390	15450	58644
Nuclear	880	1000	1000	500	0	3380
Total	16335	6782	14068	18747	22645	78577

4.3 12TH PLAN CAPACITY ADDITION

A tentative capacity addition of 82,200 MW has been envisaged for the 12th Plan. This comprises of 30,000 MW hydro, 40,200 MW thermal and 11,000– 13,000 MW nuclear power plants. Advance action has to be taken during the 11th plan for implementation of these projects for likely benefit during the 12th Plan.

4.4 FUNDS REQUIREMENT DURING 11TH PLAN

The total fund requirement during the 11th Plan has been assessed to be Rs. 10,31,600 crores, which includes funds for Generation Projects, Transmission and Distribution including Rural Electrification, Human Resource Development (HRD), Demand Side Management, R&D, Non-Conventional Energy Sources and Merchant Plants etc as detailed below.

Total Fund Requirement

(Rs. Crore)

Particulars	State	Central	Private	Total
Generation including Nuclear	1,23,792	2,02,067	85,037	4,10,896
DDG		20,000		20,000
R & M	15,875			15,875
Transmission	65,000	75,000		1,40,000
Distribution including Rural electrification	2,87,000			2,87,000
HRD		462		462
R&D Outlay		1,214		1,214
DSM		653		653
Total Power Sector	4,91,667	2,99,396	85,037	8,76,100
NCES and Captive	22,500		93,000	1,15,500
Merchant Plants			40,000	40,000
Total Funds Requirement	5,14,167	2,99,396	2,18,037	10,31,600

4.5 REQUIREMENT OF KEY INPUT

An assessment has been made of the various key input material required for generation capacity addition during the 11th Plan. Details of the same are furnished below:

Total requirement of various materials for Capacity Addition planned during 11th Plans

(Figs in lakh tonnes)

Material	11th Plan
	78,577 MW
Cement	306.3
Structural Steel	80.4
Reinforcement Steel	51.3
CRGO Steel	10.7
Castings	0.4
Forgings for TG sets	0.4
Special Steel for Sub-Station	3.3
Steel for Conductors in Transmission system Lines	2.7
Steel for Conductors in distribution system Lines	4.5
Aluminum	16.0
Copper	8.1
Zinc	1.5
Thermal Insulation	2.5

4.6 MAJOR ISSUES AND CONSTRAINTS

Some major Issues have been identified which need to be addressed in order to ensure timely Implementation of project during 11th Plan and beyond. These are

1) Manufacturing Capability/ Availability of Main Plant and Balance Of Plant Equipment

The present domestic capacity of Boiler/ Turbine manufacture is about 6000-7000 MW which includes about 2500 MW of hydro capacity equipment. Constraints have been experienced in supply of main equipment for thermal capacity as well as in supply of balance of plant like Coal Handling plant, Water treatment plants, Ash Handling, CW Pumps etc.

The proposed capacity addition in 2011-12 is about 22,000 MW. Since bunching of orders is unavoidable it is essential to enhance the capacity of BHEL. Need is also felt to develop additional domestic players to adequately meet additional demand and promote competition.

It is also essential to develop more players in critical areas like Main Plant, HP Piping, Coal Handling, Ash Handling, CW Pumps etc. For packages like Air conditioning where vendors are supplying products/ services to other sectors in preference to power sector, need is felt to consider special incentives for attracting such vendors to power sector

BHEL has undertaken major capacity building programme to enhance the present main plant equipments manufacturing capacity of about 6000 MW/year to 10,000 MW by end of 2007, 15,000 MW by end of 2009 and 20,000 MW by 2012 (subject to approval of Board).

The number of thermal plants to be executed in 11th Plan is about 100 nos. Details of the units commissioned, under execution and units expected to be ordered are as follows:

	Nos. of Units
Commissioned	4(1360 MW)
Under Execution	95 (33,504 MW)
Expected to be ordered	54 (23,780 MW)
Total	153 (58,644 MW)

The requirement of BoPs in 11th Plan is about 100 chimneys, 80 Fuel Oil systems, 80 Coal Handling Systems, 80 Ash Handling Systems, 160 Cooling Towers, and 90 DM Plants. Number of existing domestic manufacturers of BoPs in each category is only about 3 to 5 in numbers and there is urgent need to develop more vendors for BOPs to increase competition & timely supply of equipments.

A list of existing manufacturers is enclosed at Appendix IV

2) Construction and Erection Agencies & equipment

Substantial augmentation is required in the number of construction agencies undertaking Civil & E&M works at power plants. There are limited contractors in erection of cooling towers,

Chimneys , tunneling, dam construction etc. Serious efforts are needed by major power companies to develop vendors for supply and erection of equipment and for taking up civil construction.

New technologies like RCC Dam, jet grouting and use of Geotextile/ geosynthetics in place of filter materials should be adopted in construction of Hydro Projects. Use of latest construction machinery for hydro projects like Tunnel Boring Machine (TBM), Road Headers, Raise Borers, Forepoling machines, Jet grouting Equipment, Hydro fraise equipment etc is required for fast progress in construction. Low bed wagons for transportation of transformers/generators/stator/boiler drum need to be augmented at least by 14 Nos.

Government may consider taking up construction of approach road to feasible project sites through common fund to be recovered from developers subsequently. Cooperation of State Govt. must be ensured to facilitate smooth land acquisition and implementation of R&R Plan.

3) Fuel Availability

The fuel requirement for capacity addition of 78,577 MW during 11th Plan is as below:

Fuel Requirement Estimated during 2011-12

Fuel	Requirement (2011-12)
Domestic Coal*	550 MT
Lignite	33 MT
Gas/LNG **	89 MMSCMD

*The total coal availability from domestic sources is expected to be 482 MT per annum by 2011-12. Accordingly, imported coal of the order of 40 MT, equivalent to 68 MT of Indian coal, may have to be organized. This quantity may reduce provided production of domestic coal is increased.

**89 MMSCMD of gas requirement at 90% PLF has been projected in 2011-12. At present, the availability of gas is of the order of 36 MMSCMD and therefore not sufficient to meet the requirement of even existing plants.

4) Transportation facilities for Equipment and Fuel

- Timely establishment of new rail links is needed for coal evacuation from various allotted Coal Mining Blocks. Integrated Ministerial approach for early planning from the exploration stage of coal mining blocks will be a welcome step.
- The Railways, Coal and Power Ministry may work together to draw up a well-conceived model of **Fuel Supply and Transport Agreement (FSTA)**. Govt. of India may ensure that all the concerned Ministries and agencies accept the FSTA and perform as per its provisions.

5) Transmission and Distribution Equipments

There is a need for capacity building for transmission and distribution system including supply of equipment and execution of works. Substantial augmentation is required in manufacturing capacity of transformers. Need for indigenous manufacturing capacity for 765 KV voltage level equipment, increasing test facilities, online test facilities and mobile repair facilities. Strengthening of erection and commissioning teams and development of new vendors are some major issue which also need to be addressed. There is a increase in demand of CRGO and this has resulted in sharp price increase due to demand supply gap.

In case of distribution, there is a shortage of indigenous materials and Equipment viz. meters, single phase distribution transformers and switchgears, OLTC and bushings. Franchisees need to be developed in rural areas and local community to be trained. More agencies are required for turnkey execution of projects. The installation of LT Capacitors needs to be speeded up. Manufacturers may be allowed to participate in franchising

6) Critical Key Inputs

CRGO is a critical input for power transformers. In the past non-availability of the same has led to delays in Project implementation. Hence it is necessary to encourage domestic steel producers to go for indigenous production of CRGO. While on the other hand transformer

manufacturers have to do advance planning for their material requirement and place orders sufficiently in advance, development of indigenous industry needs to be considered for the same.

CRGO being the critical input for transformers and imported item, needs to be exempt from Customs Duty to bring down the cost of transformers. This is particularly important in view of the massive distribution system augmentation planned in the 11th plan.

Though on prima facie considerations there is no likelihood of shortage of key materials for power capacity addition planned for 11th and 12th plans, detailed analysis needs to be done by Planning Commission considering requirement of all sectors of the economy.

7) Manpower development including training facilities

Commensurate with large capacity addition, it is essential to train and recruit adequate manpower for design, engineering, manufacturing, erection, commissioning as well as operation & maintenance of power plants as well as associated transmission and distribution system. A large number of supervisory and working manpower is to be augmented for undertaking construction of hydro and thermal projects during 11th Plan. Augmentation of executives through Recruitment of qualified engineers and managers is to be done from amongst those passing out from Technical and Management Institutions all over the country.

Adequate number of fresh degree & diploma engineers and ITI qualified persons are available in India. There is a need to supplement academic knowledge with practical induction level training, refresher courses, project management training.

There is a shortage of certain skilled manpower like welders, fitters, casting and forging workers etc. Each State should assess its trade-wise & location-wise requirement of skilled workers (welders, fitters, masons, carpenters, crane operators, riggers, AutoCAD trained draughtsman) and take requisite steps to meet these requirement.

CEA has taken up with all project developers and major EPC contractors to adopt ITI in the vicinity of the project to build up a skilled manpower pool for the Power Sector to be utilized by them or their contractors/ sub-contractors.

Immediate action needs to be initiated for creation of at least 10 accredited training institutions at different geographical locations for skills like HP Welding, Aluminum Welding, Crane Operator, Cable Jointing, etc.

Quick implementation of the National Training Policy's recommendation of allocation of separate funds of 1.5% of salary budget initially needs to be ensured and this is to gradually increase to 5% for meeting training needs

The total additional manpower required to ensure construction, operation and maintenance of additional targeted capacity is of the order of One million. Details of the same are as follows:

- For Additional capacity – 8,60,000
- For Accelerating construction activities – 1,40,000

For Additional capacity Construction workforce required is 4,25,000 and the O & M workforce required is 4,35,000.

Details of manpower required for additional capacity during 11th Plan are as follows:

Category	Construction	Operation & Maintenance	Total
Engineers	20,000	40,000	60,000
Supervisors	33,000	75,000	1,08,000
Skilled Workers	1,40,000	1,25,000	2,65,000
Unskilled Workers	1,48,000	75,000	2,23,000
Non-tech	84,000	1,20,000	2,04,000
Total	4,25,000	4,35,000	8,60,000

An assessment has been made of the workers required, available and the shortage during the 11th Plan. It has been noted that there is a dire shortage of various categories of skilled workers like crane operators, welders, fitters, riggers, carpenters etc.

8) Delays in clearances

All statutory clearances as per requirement of Electricity Act,2003 have to be ensured in time for early start of work. For this purpose a single nodal agency may be entrusted the task of getting all clearances.

9) Qualifying requirements of equipment

It is felt that there should be standard design for major power plant equipments for mass production of the same and to reduce the inventory level. The spares etc could be suitably located to serve more than one power plants. This would reduce the cost of spares as well ensure quick repair/overhauling to avoid long shutdown due to non availability of spare parts.

10) Testing facilities

The testing facilities in the country shall be increased to facilitate ease in testing of all type of equipment. CPRI was established to work as a nodal agency for power sector research but had a larger role assigned to it i.e. to work as a neutral testing laboratory.

It is recommended that a restructuring of CPRI is necessary if it has to play a proactive role in collaborative research in the country. For this the following are suggested:

- a) Testing has to sustain on its own and as far as possible government grant should not be utilized for meeting the requirements of maintenance/upgrading test facilities. The beneficiaries of test facility, i.e., the manufacturing units and utilities should largely bear this burden.
- b) CPRI should be corporatised to reduce its dependence on Government funding and have better operational flexibility. This would help CPRI to be competitive and self reliant. Major utilities like NTPC, PGCIL, NHPC and PFC should come forward to facilitate this.
- c) CPRI is to develop its ability to enhance industrial & system related consultancy work and get more sponsored projects for improving its financial health.

11) R & D in Power Sector

Technology advancements and research & development have so far not been properly addressed. Major organizations like NTPC, NHPC, POWERGRID, on the generation side and BHEL, ABB, SIEMENS on the manufacturing side must enhance substantially their budget allocations for research and development. The utilities should aim at least about 1% of their profit to be utilized for research and development activities and the manufacturing organizations should consider 3-4% to be provided for technology development.

Networking of R&D resources and expertise would be an important strategy aimed at getting effective results. CPRI, apart from testing, must reorient its strategy and activities towards research.

Ultra Super Critical boiler technology, IGCC technology and oxy-fuel technology are well researched abroad but have to be developed for Indian coal. NTPC, the major Indian Central Sector utility should have its R&D centre strengthened to expedite the work started during 10th plan on IGCC. It is recommended that this project may be given top priority and completed with the help of BHEL or with a private party if necessary.

There is a need to work with specialized S&T laboratories under CSIR & other space and nuclear establishments to develop material technology for advanced boilers, fuel cells, solar power, battery & super conducting material application in power sector.

An institutional change in handling R&D is required. A suggestion is to have generation, transmission & distribution R&D units to be established as separate entities in the central sector undertakings or to set up a corporate technology centre for R&D activities in various areas of power sector

R&D import should be exempted from custom duty to encourage indigenous R&D

Power sector should seriously consider attracting young talents by offering them challenging opportunities. This will be possible by encouraging R&D and offering a good package, like many MNCs are offering at present.

A High Power Committee in R&D should monitor R&D projects and regulate funds. This will avoid duplication & ensure competitive R&D.

Organizations like CPRI and NPTI should be spared from manpower optimization rules where vacant positions are surrendered. This is in view of the depleting cadre of scientists and specialists in these organizations.

CHAPTER-5

RECOMMENDATIONS AND ACTION PLAN

5.1 OUTCOME OF THE INTERNATIONAL CONCLAVE

5.1.1 MAJOR ISSUES

During the deliberations of the International Conclave it emerged that some Major Issues need to be addressed in order to ensure timely Implementation of project during 11th Plan and beyond. These Issues identified are as follows:

- Manufacturing Capability of Main Plant and Balance Of Plant Equipment to be commensurate with capacity addition.
- Adequate Construction and Erection Agencies
- Availability of Adequate Fuel and Key materials
- Adequate Transportation facilities for Equipment and Fuel
- Manpower development including training facilities commensurate with large capacity addition
- Slow process of decision making and cumbersome payment procedure adopted by Utilities

5.1.2 RECOMMENDATIONS OF THE CONCLAVE

In respect of the Issues identified above, major recommendations of the Conclave were as follows:

- For Main Plant equipment, Augmentation of existing indigenous manufacturing facilities and creation of additional capacity by new players.
- Development of ancillaries units/ vendors by BHEL commensurate with their own enhanced capacity
- Advance procurement action required for some of the critical long lead inputs namely critical castings and forgings for turbine and generators etc. Indigenous industry may be encouraged to set up capacity in these areas.

- For balance of plant need to be develop more vendors and enhance capacity of existing vendors.
- Need to review stringent qualifying requirements for vendors specified by utilities.
- For transmission equipment need to create indigenous manufacturing capacity for 765 kV transmission system equipment, on line testing facilities etc.
- It is essential to strengthen erection and commissioning teams for transmission and generation projects.
- To set up indigenous manufacturing capacity for CRGO.
- More agencies to be developed for turn key execution of distribution projects.
- Project developers and major EPC contractors to Adopt IITs near project areas and impart training to them.
- Quick implementation of recommendations of National Training Policy for allocation of funds for training .
- Payment procedure to be simplified by the utilities.
- Transportation facilities including port handling capacity facilities for equipment and fuel to be enhanced.

Concluding the discussions it was decided that a Task Force comprising MoP, CEA & CII shall be formed to co-ordinate with industries regarding the various inputs required by the Power Sector. CEA & CII will prepare a White Paper on the Areas of Concern for timely commissioning of the Units. CII will then organize dialogue with specific industry groups and interested entrepreneurs.

5.2 WHITE PAPER - ACTION PLAN

The White Paper highlights the review of the 10th Plan, lessons learnt from the constraints experienced during the 10th Plan and the tentative capacity addition programme for the 11th plan. Based upon the experiences and constraints during the 10th Plan, the Action Plan is as follows :-

i) **Regional Conferences** :

The Task force shall deliberate upon the major issues identified above. It shall also assess the requirement of equipment and material and corresponding industries manufacturing these, as well as the shortfall expected, with a view to formulate a strategy to meet the shortfall. To

facilitate this, various Sub Groups shall be formed for each equipment category and industrial cluster. Regional Conferences shall be organized firstly to intimate to the Power Utilities and the Industries about the Action Plan. Thereafter Regional Meetings shall be held from time to time wherein detailed deliberations shall be held to review and discuss the progress of the various Sub-groups.

ii) Formation of Sub-Groups

With a view to meet the requirement of equipment and material during the 11th plan various Issue/equipment specific sub-groups may be formed. Each Sub-Group shall have the representation of the relevant User utility as well as the major manufacturer industries. The broad organization of the Sub-Groups shall be as follows with one Sub-group for each Issue/category of equipment :-

Policy Matters & Procedures:

Main Plant & Equipment

Balance of Plant:

- Coal & Ash Handling
- Water Treatment
- Cooling Towers and Chimney
- Pumps
- Electrical Equipment

Transmission & Distribution Works:

- Towers
- Cables
- Equipment i.e. Transformer, Switchgear
- IT Based Systems

Construction Equipment:

Construction Agencies

Manpower

Testing Facilities

Fuel

- Washeries for Coal

Transportation Facilities & Logistics

- Movement of Heavy Equipment to Project site

The Task Force shall formulate the Terms of Reference of each Sub-group and stipulate the time frame within which they have to submit their Report to the Task Force

(iii) **Strategy for each Sub-group**

Each Sub-group shall assess the requirement of equipment and material during the 11th Plan for projects giving benefit during 11th Plan as well as the requirement for advance action for 12th Plan projects. An assessment shall be made of the indigenous manufacturing capacity, production plans of the industries and the development of new vendors in each area.

Various Issues pertaining to Policy matters and procedures also need to be addressed.

Appendix-I

SUMMARY OF CAPACITY ADDITION DURING 10th PLAN (41110 MW)

		HYDRO	THERMAL	NUCLEAR	TOTAL
A	SECTOR WISE				
	CENTRAL	8742	12790	1300	22832
	STATE	4481	6676	0	11157
	PRIVATE	1170	5951	0	7121
	TOTAL	14393	25417	1300	41110
B	REGION WISE				
	NORTHERN	7274	5046	0	12320
	WESTERN	3752	6604	1080	11436
	SOUTHERN	1158	5998	220	7376
	EASTERN	1860	7075	0	8935
	NORTH EASTERN	349	669	0	1018
	A & N Islands	0	25	0	25
	TOTAL	14393	25417	1300	41110
C	STATUS WISE				
	SANCTIONED ON GOING	8088	7634	1300	17022
	CEA CLEARED	3504	9327	0	12831
	STATE CLEARED	130	648	0	778
	NEW SCHEMES	2671	7808	0	10479
	TOTAL	14393	25417	1300	41110

LIST OF POWER PROJECTS FOR BENEFITS DURING 10TH PLAN (41,110 MW)
(Central, State & Private Sector)

Plant Name	Status	Fuel Type	Sector	Capacity MW	02-03	03-04	04-05	05-06	06-07	Benefits 10th Plan
NORTHERN REGION										
CENTRAL SECTOR										
NHPC										
CHAMERA II	SOG	HYDRO	C	300			300			300
DULHASTI	SOG	HYDRO	C	390		390				390
DHAULI GANGA	SOG	HYDRO	C	280			280			280
SEWA II	CEA	HYDRO	C	120					120	120
SUB-TOTAL (NHPC)				1090	0	390	580	0	120	1090
NJPC										
NATHPA JHAKRI	SOG	HYDRO	C	1500		1500				1500
RAMPUR	NEW	HYDRO	C	400					400	400
SUB-TOTAL (NJPC)				1900	0	1500	0	0	400	1900
NTPC										
RIHAND II	SOG	COAL	C	1000				500	500	1000
UNCHAHAHAR III	NEW	COAL	C	210					210	210
DADRI II	NEW	COAL	C	490					490	490
SUB-TOTAL (NTPC)				1700				500	1200	1700
THDC										
TEHRI I	SOG	HYDRO	C	1000	250	750				1000
KOTESHWAR	SOG	HYDRO	C	400				400		400
TEHRI PSS	NEW	PSTOR	C	1000				500	500	1000
SUB-TOTAL (THDC)				2400	250	750	0	900	500	2400
NLC										
BARSINGSAR	NEW	LIGNITE	C	500					250	250
TOTAL NR (CENTRAL SECTOR)				7590	250	2640	580	1400	2470	7340
STATE SECTOR										
DELHI										
PRAGATI (GT2 +ST)	SOG	GAS	S	225.78	225.78					225.78
SUB TOTAL (DELHI)				225.78	225.78	0	0	0	0	225.78
HARYANA										
PANIPAT U 7&8	CEA	COAL	S	500				500		500
SUB TOTAL (HARYANA)				500	0	0	0	500	0	500

Appendix-II

Plant Name	Status	Fuel Type	Sector	Capacity MW	02-03	03-04	04-05	05-06	06-07	Benefits 10th Plan
HP										
LARGI	CEA	HYDRO	S	126			126			126
KASHANG -I	NEW	HYDRO	S	66					66	66
SUB TOTAL (HP)				192	0	0	126	0	66	192
J&K										
BAGHALIHAR	CEA	HYDRO	S	450					450	450
SUB TOTAL (J & K)				450	0	0	0	0	450	450
PUNJAB										
GHTPP-II	SOG	COAL	S	500					500	500
SHAHPURKANDI	SOG	HYDRO	S	168					168	168
SUB TOTAL (PUNJAB)				668	0	0	0	0	668	668
RAJASTHAN										
RAMGARH-2	CEA	GAS	S	75.32	75.32					75.32
MATAHANIA CCPP	CEA	LNG	S	140			140			140
KOTA TPS ST IV	CEA	COAL	S	195		195				195
SURATGARH III	CEA	COAL	S	250		250				250
SUB TOTAL (RAJASTHAN)				660.32	75.32	445	140	0		660.32
UP										
PARICHA EXTN	NEW	COAL	S	420					210	210
ANPARA C	NEW	COAL	S	1000					500	500
SUB TOTAL (UP)				1420	0	0	0	0	710	710
UTTARANCHAL										
MANERIBHALI II	CEA	HYDRO	S	304					304	304
SUB TOTAL (UTTARANCHAL)				304	0	0	0	0	304	304
TOTAL NR (STATE SECTOR)				4420.1	301.1	445	266	500	2198	3710.1
PRIVATE SECTOR										
PUNJAB										
GOINDWAL SAHIB	SC	COAL	P	500					500	500
SUB TOTAL (PUNJAB)				500	0	0	0	0	500	500
HP										
BASPA	CEA	HYDRO	P	300		300				300
DHAMVARI SUNDA	CEA	HYDRO	P	70					70	70
SUB TOTAL (HP) P				370	0	300	0	0	70	370
UTTARANCHAL										
VISHNU PRAYAG	CEA	HYDRO	P	400					400	400
SUB TOTAL (UTTARANCHAL) P				400	0	0	0	0	400	400
TOTAL NR PRIVATE SECTOR				1270	0	300	0	0	970	1270
TOTAL (NORTHERN REGION)				13280.1	551.1	3385	846	1900	5638	12320.1

Appendix-II

Plant Name	Status	Fuel Type	Sector	Capacity MW	02-03	03-04	04-05	05-06	06-07	Benefits 10th Plan
WESTERN REGION										
CENTRAL SECTOR										
NPC										
TARAPUR U3&4	SOG	NUCLEAR	C	1080				540	540	1080
NTPC										
SIPAT I	CEA	COAL	C	1980				660	660	1320
SIPAT II	CEA	COAL	C	660					660	660
VINDHYACHAL III	CEA	COAL	C	1000					500	500
SUB TOTAL (NTPC)				3640				660	1820	2480
NHPC										
BAV-II	NEW	HYDRO	C	37					37	37
SUB TOTAL (NHPC)				37	0	0	0	0	37	37
NHDC										
OMKARESHWAR	CEA	HYDRO	JV	520					520	520
INDIRA SAGAR	SOG	HYDRO	JV	1000		125	750	125		1000
SUB TOTAL (NHDC)				1520	0	125	750	125	520	1520
SUB TOTAL WR (CENTRAL SECTOR)				6277	0	125	750	1325	2917	5117
STATE SECTOR										
GUJARAT										
SAR.SAROVAR-2	SOG	HYDRO	S	1450		250	400	600	200	1450
AKRIMOTA	CEA	LIGNITE	S	250	125	125				250
KLTPS EXTN(Panan)	NEW	LIGNITE	S	75					75	75
DHUVRAN	CEA	GAS	S	106.62			106.62			106.62
SUB TOTAL (GUJARAT)				1881.62	125	375	506.62	600	275	1881.62
MAHARASHTRA										
GHATGHAR	SOG	PSTOR	S	250			250			250
PARLI TPP EX. ST-I	SOG	COAL	S	250			250			250
SUB TOTAL (MAHARASHTRA)				500	0	0	500	0	0	500
MP										
BIRSINGPUR EXT	NEW	COAL	S	500					500	500
BANSAGAR II	SOG	HYDRO	S	30	15					15
BANSAGAR III	SOG	HYDRO	S	20	20					20
MARIKHEDA	SC	HYDRO	S	40			40			40
BANSAGAR IV	SOG	HYDRO	S	20				20		20
SUB TOTAL (MP)				610	35	0	40	20	500	595
CHHATTISGARH										
KORBA EAST EXT.	NEW	COAL	S	420					420	420
SUB TOTAL(CHHATTISGARH)				420					420	420
SUB TOTAL WR (STATE SECTOR)				3411.62	160	375	1046.62	620	1195	3396.62

Appendix-II

Plant Name	Status	Fuel Type	Sector	Capacity MW	02-03	03-04	04-05	05-06	06-07	Benefits 10th Plan
PRIVATE SECTOR										
GUJARAT										
JAMNAGAR	CEA	REFRES	P	500			500			500
SUB TOTAL (GUJARAT) P				500	0	0	500	0	0	500
MP										
MAHESHWAR	CEA	HYDRO	P	400				240	160	400
BINA	CEA	COAL	P	578			578			578
SUB TOTAL (MP) P				978	0	0	578	240	160	978
MAHARASHTRA										
DABHOL II	SOG	LNG	P	1444	1444					1444
SUB TOTAL WR (PRIVATE SECTOR)				2922	1444	0	1078	240	160	2922
TOTAL (WESTERN REGION)				12610.6	1604	500	2874.62	2185	4272	11435.62
SOUTHERN REGION										
CENTRAL SECTOR										
NLC										
NEYVELI EXT	SOG	LIGNITE	C	420	420					420
NEYVELI II EXP	CEA	LIGNITE	C	500					500	500
SUB TOTAL (NLC)				920	420	0	0	0	500	920
NPC										
KAIGA U3	SOG	NUCLEAR	C	220					220	220
NTPC										
SIMHADRI	SOG	COAL	C	1000	500					500
RAMAGUNDAM III	SOG	COAL	C	500				500		500
SUB TOTAL (NTPC)				1500	500	0	0	500	0	1000
SUB TOTAL SR (CENTRAL SECTOR)				2640	920	0	0	500	720	2140
STATE SECTOR										
AP										
RAYALSEMA-II	SOG	COAL	S	420					420	420
SRISAILAM LBPH	SOG	HYDRO	S	450	300	150				450
JURALA PRIYA	CEA	HYDRO	S	235					78.2	78.2
SUB TOTAL (AP)				1105	300	150	0	0	498.2	948.2
KARNATAKA										
RAICHUR U7	CEA	COAL	S	210	210					210
ALMATI DAM	CEA	HYDRO	S	290			165	125		290
BELLARY	NEW	COAL	S	500					500	500
SUB TOTAL (KARNATAKA)				1000	210	0	165	125	500	1000

Appendix-II

Plant Name	Status	Fuel Type	Sector	Capacity MW	02-03	03-04	04-05	05-06	06-07	Benefits 10th Plan
KERALA										
KUTTIYADI AUG.	NEW	HYDRO	S	100			100			100
SUB TOTAL (KERALA)				100	0	0	100	0	0	100
TAMILNADU										
PYKARA ULTIMATE	SOG	HYDRO	S	150		150				150
PERUNGULAM (VALUTHUR)	CEA	GAS	S	94	94					94
BHAWANI KATHALAI 1&2	SC	HYDRO	S	90			90			90
KUTRALAM GAS	NEW	GAS	S	100					100	100
SUB TOTAL (TAMILNADU)				434	94	150	90	0	100	434
PONDICHERRY										
KARAIKAL CCGT	NEW	GAS	S	100				100		100
SUB TOTAL SR (STATE SECTOR)				2739	604	300	355	225	1098.2	2582.2
PRIVATE SECTOR										
AP										
PEDDAPURAM CCGT	SOG	GAS	P	220	78					78
VEMAGIRI-I	CEA	GAS	P	370			370			370
GAUTAMI	NEW	GAS	P	464		464				464
RAMGUNDAM BPL	CEA	COAL	P	520				520		520
JEGRUPADU-EXT 1	NEW	GAS	P	230			230			230
KONASEEMA	NEW	GAS	P	445			445			445
SUB TOTAL (AP) P				2249	78	464	1045	520	0	2107
KARNATAKA										
HASSAN	NEW	LNG	P	189		189				189
KANIMINKE CCPP	CEA	NAPHTH A	P	108					108	108
SUB TOTAL (KARNATAKA) P				297	0	189	0	0	108	297
TAMILNADU										
NEYVELI ZERO	SOG	LIGNITE	P	250	250					250
SUB TOTAL (TAMILNADU) P				250	250	0	0	0	0	250
SUB TOTAL SR (PRIVATE SECTOR)				2796	328	653	1045	520	108	2654
TOTAL (SOUTHERN REGION)				8175	1852	953	1400	1245	1926.2	7376.2
EASTERN REGION										
CENTRAL SECTOR										
DVC										
MEZIA-U4	CEA	COAL	C	210			210			210
MEZIA-U5	NEW	COAL	C	250			250			250
MAITHON-RBC	NEW	COAL	JV	1000				500	500	1000
CHANDRAPURA U7&8	NEW	COAL	C	500				500		500
SUB TOTAL (DVC)				1960	0	0	460	1000	500	1960

Appendix-II

Plant Name	Status	Fuel Type	Sector	Capacity MW	02-03	03-04	04-05	05-06	06-07	Benefits 10th Plan
NHPC										
TEESTA V	SOG	HYDRO	C	510					510	510
PURLIA PSS	NEW	PSTOR	JV	900					900	900
TEESTA LOW DAM III	CEA	HYDRO	C	132					132	132
TEESTA LOW DAM IV	NEW	HYDRO	C	168					168	168
SUB TOTAL (NHPC)				1710	0	0	0	0	1710	1710
NTPC										
TALCHER-II	SOG	COAL	C	2000		500	500	1000		2000
NORTH K PURA	NEW	COAL	C	1980					660	660
KAHALGAON II	CEA	COAL	C	1320					660	660
BARH	CEA	COAL	C	1980					660	660
SUB TOTAL (NTPC)				7280	0	500	500	1000	1980	3980
SUB TOTAL ER (CENTRAL SECTOR)				10950	0	500	960	2000	4190	7650
STATE SECTOR										
JHARKHAND										
TENUGHAT EXT	NEW	COAL	S	630					210	210
SUB TOTAL (JHAR)				630	0	0	0	0	210	210
ORISSA										
BALIMELA II	CEA	HYDRO	S	150					150	150
SUB TOTAL (ORISSA)				150	0	0	0	0	150	150
WEST BENGAL										
SAGARDIGHI-I	NEW	COAL	S	500					250	250
BAKRESHWAR 4,5	CEA	COAL	S	420				420		420
SUB TOTAL (WB)				920	0	0	0	420	250	670
SUB TOTAL ER (STATE SECTOR)				1700	0	0	0	420	610	1030
PRIVATE SECTOR										
BIHAR										
BIHTA TPS	NEW	COAL	P	135					135	135
SUB TOTAL (BIHAR) P				135	0	0	0	0	135	135
JHARKHAND										
JOJOBERA	NEW	COAL	P	120					120	120
SUB TOTAL (JHAR) P				120	0	0	0	0	120	120
SUB TOTAL ER (PRIVATE SECTOR)				255	0	0	0	0	255	255
TOTAL (EASTERN REGION)				12905	0	500	960	2420	5055	8935

Appendix-II

Plant Name	Status	Fuel Type	Sector	Capacity MW	02-03	03-04	04-05	05-06	06-07	Benefits 10th Plan
NORTH EASTERN REGION										
NEEPCO										
TUIRIAL	SOG	HYDRO	C	60					60	60
KOPIII II	SOG	HYDRO	C	25		25				25
TRIPURA GAS	CEA	GAS	C	500					500	500
SUB TOTAL (NEEPCO)				585	0	25	0	0	560	585
SUB TOTAL NER (CENTRAL SECTOR)				585	0	25	0	0	560	585
STATE SECTOR										
ASSAM										
KARBI LANGPI	SOG	HYDRO	S	100		100				100
LAKWA WH	SC	GAS	S	38					38	38
SUB TOTAL (ASSAM)				138	0	100	0	0	38	138
MEGHALAYA										
MYNTDU(LISKA)	CEA	HYDRO	S	84					84	84
BYRNIHAT	SC	HFO	S	24		24				24
MENDIPATHAR	SC	HFO	S	24		24				24
SUB TOTAL (MEGHALAYA)				132	0	48	0	0	84	132
MIZORAM										
BAIRABI (THERMAL)	SC	HFO	S	22.92		22.92				22.92
BAIRABI HYDRO	CEA	HYDRO	S	80		80				80
SUB TOTAL (MIZORAM)				102.92	0	102.92	0	0	0	102.92
TRIPURA										
BARMURA GT	SC	GAS	S	21	21					21
ROKHIAU7	SOG	GAS	S	21	21					21
SUB TOTAL (TRIPURA)				42	42					42
MANIPUR										
MANIPUR DG	SC	DIESEL	S	18	18					18
SUB TOTAL NER (STATE SECTOR)				432.92	60	250.92	0	0	122	432.92
TOTAL (NORTH EASTERN REGION)				1017.92	60	275.92	0	0	682	1017.92
A&N ISLAND										
BAMBOO FLAT	SOG	DIESEL	P	20	20					20
RANGIT BAY	SOG	DIESEL	S	5					5	5
SUB TOTAL (A&N)				25	20	0	0	0	5	25
TOTAL (ALL INDIA)				48013.6	4087.1	5613.92	6080.62	7750	17578.2	41109.84

SOG - Sanctioned on Going C - Central Sector
CEA - Cleared by CEA S - State Sector
SC - State Cleared P - Private Sector
NEW - Yet to be cleared JV - Joint Venture

Appendix III

**SUMMARY OF CAPACITY ADDITION PROPOSED DURING 11TH PLAN
(BASED ON 21,180 MW ADDITIONS IN 10TH PLAN)**

31.07.07

	HYDRO	TOTAL THERMAL	THERMAL BREAKUP			NUCLEAR	TOTAL
			COAL	LIGNITE	GAS		
A. PROJECTS COMMISSIONED							
CENTRAL SECTOR	65	500	500	0	0	220	785
STATE SECTOR	225	860	750	0	110	0	1085
PRIVATE SECTOR	0	0	0	0	0	0	0
ALL-INDIA	290	1360	1250	0	110	220	1870
B. PROJECTS UNDER CONSTRUCTION							
CENTRAL SECTOR	8500	15680	14190	750	740	3160	27340
STATE SECTOR	3020	13087	11985	450	652	0	16107
PRIVATE SECTOR	2791	4737	2700	0	2037	0	7528
ALL-INDIA	14311	33504	28875	1200	3429	3160	50975
B. COMMITTED PROJECTS (ORDERS YET TO BE PLACED)							
CENTRAL SECTOR	1120	10620	9620	250	750	0	11740
STATE SECTOR	360	10400	10400	0	0	0	10760
PRIVATE SECTOR	472	2760	2760	0	0	0	3232
ALL-INDIA	1952	23780	22780	250	750	0	25732
TOTAL FEASIBLE AT PRESENT							
CENTRAL SECTOR	9685	26800	24310	1000	1490	3380	39865
STATE SECTOR	3605	24347	23135	450	762	0	27952
PRIVATE SECTOR	3263	7497	5460	0	2037	0	10760
ALL-INDIA	16553	58644	52905	1450	4289	3380	78577
REGION WISE SUMMARY							
NORTHERN	8769	13150	12305	625	220	440	22359
WESTERN	1170	18383	15800	325	2258	0	19553
SOUTHERN	1217	10361	8860	500	1001	2940	14518
EASTERN	2673	15190	15190	0	0	0	17863
NORTH EASTERN	2724	1560	750	0	810	0	4284
TOTAL 11TH PLAN	16553	58644	52905	1450	4289	3380	78577

Note: Omkarehwar U 2 , 65 MW has since been commissioned on 09.08.07

Appendix III

LIST OF PROJECTS PROPOSED FOR LIKELY BENEFITS DURING 11TH PLAN

Sl. No.	PLANT NAME	STATE	AGENCY	SECTOR	CATEGORY	ULTIMATE CAPACITY (MW)	TYPE	BENEFITS 11 TH PLAN (2007-12)	LIKELY YEAR OF BENEFIT
NORTHERN REGION									
A	CENTRAL SECTOR								
	NHPC								
1	PARBATI – II	HP	NHPC	C	UC	800	HYDRO	800	2010-11
2	CHAMERA-III	HP	NHPC	C	UC	231	HYDRO	231	2010-11
3	PARBATI – III	HP	NHPC	C	UC	520	HYDRO	520	2010-11
4	SEWA-II	J&K	NHPC	C	UC	120	HYDRO	120	2009-10
5	URI-II	J&K	NHPC	C	UC	240	HYDRO	240	2010-11
6	VYASI	UKND	NHPC	C	LOA	120	HYDRO	120	2011-12
	SUB TOTAL (NHPC)							2031	
	NLC								
1	BARSINGSAR LIG	RAJ	NLC	C	UC	250	LIGNITE	250	2008-09
2	BARSINGSAR EXT	RAJ	NLC	C	LOA	250	LIGNITE	250	2010-11
	SUB TOTAL (NLC)							500	
	NPC								
1	RAPP U5,6	RAJ	NPC	C	UC	440	NUCLEAR	440	2007-08
	SUB TOTAL (NPC)							440	
	NTPC								
1	KOL DAM	HP	NTPC	C	UC	800	HYDRO	800	2009-10
2	LOHARI NAGPALA	UKND	NTPC	C	UC	600	HYDRO	600	2011-12
3	TAPOVAN VISHNUGARH	UKND	NTPC	C	UC	520	HYDRO	520	2011-12
4	DADRI EXT U-5,6	UP	NTPC	C	UC	980	COAL	980	2009-10
5	BADARPUR-X U-1&2	DELHI	NTPC	C	LOA	980	COAL	980	2010-11
6	TPS for DELHI/JHAJJAR	HAR	NTPC	C	UC	1500	COAL	1500	2010-11
	SUB TOTAL (NTPC)							5380	
	SJVNL								
1	RAMPUR	HP	SJVNL	C	UC	412	HYDRO	412	2011-12
	SUB TOTAL (SJVNL)							412	
	THDC								
1	KOTESHWAR	UKND	THDC	C	UC	400	HYDRO	400	2010-11
2	TEHRI PSS	UKND	THDC	C	LOA	1000	HYDRO	1000	2011-12
	TOTAL (THDC)							1400	
	SUB TOTAL CENTRAL SECTOR							10163	

Sl. No.	PLANT NAME	STATE	AGENCY	SECTOR	CATEGORY	ULTIMATE CAPACITY (MW)	TYPE	BENEFITS 11TH PLAN (2007-12)	LIKELY YEAR OF BENEFIT
B	STATE & PRIVATE SECTOR								
	HARYANA								
1	YAMUNA NAGAR	HAR	HPGCL	S	UC	600	COAL	600	2007-08
2	HISSAR TPS	HAR	HPGCL	S	UC	1200	COAL	1200	2009-10
	SUB TOTAL (HARYANA)-state sector							1800	
	HIMACHAL PRADESH								
1	UHL – III	HP	HPJVNL	S	UC	100	HYDRO	100	2010-11
2	SAWARA KUDDU	HP	PVC	S	UC	110	HYDRO	110	2011-12
	SUB TOTAL (HP)-state sector							210	
3	BUDHIL	HP	LANCO IPP	P	UC	70	HYDRO	70	2009-10
4	ALLAIN DUHANGAN	HP	RSWML	P	UC	192	HYDRO	192	2008-09
5	MALANA II	HP	EVREST PC	P	UC	100	HYDRO	100	2009-10
6	KARCHAM WANGTOO	HP	JPKHCL	P	UC	1000	HYDRO	1000	2011-12
7	LAMBADUG	HP	IPP	P	LOA	25	HYDRO	25	2010-11
8	SORANG	HP	SORAND PC	P	LOA	100	HYDRO	100	2011-12
9	TIDONG-I	HP	PCP/IPP	P	LOA	100	HYDRO	100	2010-11
10	TANGU ROMAI	HP	PCP/IPP	P	LOA	50	HYDRO	50	2010-11
	SUB TOTAL (HP)-private sector							1637	
	SUB TOTAL (HP)							1847	
	JAMMU&KASHMIR								
1	BAGLIHAR-I	J&K	JKPDC	S	UC	450	HYDRO	450	2008-09
	SUB TOTAL (J&K) state sector							450	
	PUNJAB								
1	GH TPP-II	PUN	PSEB	S	UC	500	COAL	500	2007-08
2	TALWANDI SABO	PUN	PSEB	S	LOA	1500	COAL	500	2011-12
	SUB TOTAL (PUN)-state sector							1000	
3	UBDC- III	PUN	MALANA POWER	P	LOA	75	HYDRO	75	2009-10
4	GOINDWAL SAHIB	PUN	GVK	P	LOA	600	COAL	600	2011-12
	SUB TOTAL (PUN)-private sector							675	
	SUB TOTAL (PUNJAB)							1675	

Sl. No.	PLANT NAME	STATE	AGENCY	SECTOR	CATEGORY	ULTIMATE CAPACITY (MW)	TYPE	BENEFITS 11TH PLAN (2007-12)	LIKELY YEAR OF BENEFIT
RAJASTHAN									
1	CHABRA TPS	RAJ	RRVUNL	S	UC	500	COAL	500	2008-09
2	KOTA U7	RAJ	RRVUNL	S	UC	195	COAL	195	2008-09
3	SURATGARH EXT	RAJ	RRVUNL	S	UC	250	COAL	250	2008-09
4	KALISINDH TPS	RAJ	RRVUNL	S	LOA	1000	COAL	500	2011-12
5	DHOLPUR GT2	RAJ	RRVUNL	S	COMND	110	GAS/LNG	110	2007-08
6	DHOLPUR ST	RAJ	RRVUNL	S	UC	110	GAS/LNG	110	2007-08
7	GIRAL U-2	RAJ	RRVUNL	S	UC	125	LIGNITE	125	2008-09
SUB TOTAL (RAJASTHAN) state sector								1790	
UTTAR PRADESH									
1	PARICHA EXT	UP	UPRVUNL	S	UC	500	COAL	500	2009-10
2	HARDUAGANJ	UP	UPRVUNL	S	UC	500	COAL	500	2009-10
3	ANPARA-D	UP	UPRVUNL	S	LOA	1000	COAL	1000	2011-12
4	OBRA REP	UP	UPRVUNL	S	LOA	1000	COAL	500	2011-12
SUB TOTAL (UP)-state sector								2500	
5	ANPARA-C	UP	LANCO	P	LOA	1000	COAL	1000	2010-12
6	BARA	UP	IPP	P	LOA	1000	COAL	500	2011-12
SUB TOTAL (UP)-private sector								1500	
SUB TOTAL (UP)								4000	
UTTARAKHAND									
1	MANERI BHALI	UKND	UJVNL	S	UC	304	HYDRO	304	2007-08
SUB TOTAL (UKND)-state sector								304	
2	SRINAGAR	UKND	GVK	P	UC	330	HYDRO	330	2011-12
SUB TOTAL (UKND)-private sector								330	
SUB TOTAL (UTTARAKHAND)								634	
SUB TOTAL (CENTRAL SECTOR)								10163	
SUB TOTAL (STATE SECTOR)								8054	
SUB TOTAL (PRIVATE SECTOR)								4142	
TOTAL (NORTHERN REGION)								22359	

Sl. No.	PLANT NAME	STATE	AGENCY	SECTOR	CATEGORY	ULTIMATE CAPACITY (MW)	TYPE	BENEFITS 11TH PLAN (2007-12)	LIKELY YEAR OF BENEFIT
WESTERN REGION									
A	CENTRAL SECTOR								
	NHDC								
1	OMKARESHWAR U 1	MP	NHDC	C	COMND	65	HYDRO	65	2007-08
2	OMKARESHWAR U 2-8	MP	NHDC	C	UC	455	HYDRO	455	2007-08
	SUB TOTAL (NHDC)							520	
	NTPC								
1	SIPAT-II U 4	CHG	NTPC	C	COMND	500	COAL	500	2007-08
2	SIPAT-II U 5	CHG	NTPC	C	UC	500	COAL	500	2007-08
3	RATNAGIRI (DHABOL) JV	MAH	NTPC	C	UC	740	GAS/LNG	740	2007-08
4	SIPAT I	CHG	NTPC	C	UC	1980	COAL	1980	2007-09
5	BHILAI JV	CHG	NTPC	C	UC	500	COAL	500	2007-08
6	KORBA III U7	CHG	NTPC	C	UC	500	COAL	500	2009-10
7	MAUDA	MAH	NTPC	C	LOA	1000	COAL	1000	2011-12
	SUB TOTAL (NTPC)							5720	
	SUB TOTAL (CENTRAL SECTOR)							6240	
B	STATE & PRIVATE SECTOR								
	CHHATTISGARH								
1	KORBA EAST EXT U2	CHG	CSEB	S	UC	250	COAL	250	2007-08
2	KORBA WEST EXT	CHG	CSEB	S	LOA	600	COAL	600	2009-10
	SUB TOTAL-state sector							850	
3	RAIGARH PH I & II	CHG	JIN POWER	P	UC	1000	COAL	1000	2007-08
4	PATHADI (LANCO) U1	CHG	LANCO-IPP	P	UC	300	COAL	300	2008-09
5	PATHADI (LANCO) U2	CHG	LANCO-IPP	P	UC	300	COAL	300	2009-10
	SUB TOTAL-private sector							1600	
	SUB TOTAL (CHG)							2450	
	GUJARAT								
1	UKAI EXT	GUJ	GSECL	S	LOA	500	COAL	500	2011-12
2	SIKKA EXT	GUJ	GSECL	S	UC	500	COASTAL	500	2009-11
3	DHUVRAN	GUJ	GSECL	S	UC	219	GAS/LNG	40	2007-08
4	UTRAN*	GUJ	GSECL	S	UC	350	GAS/LNG	350	2009-10
5	SURAT LIGNITE EXT	GUJ	GIPCL	S	UC	250	LIGNITE	250	2008-09
6	KUTCH LIGNITE TPS	GUJ	GSECL	S	UC	75	LIGNITE	75	2007-08
	SUB TOTAL-state sector							1715	

Sl. No.	PLANT NAME	STATE	AGENCY	SECTOR	CATEGORY	ULTIMATE CAPACITY (MW)	TYPE	BENEFITS 11TH PLAN (2007-12)	LIKELY YEAR OF BENEFIT
7	SUGEN TORRENT	GUJ	TORRENT	P	UC	1128	GAS/LNG	1128	2007-08
SUB TOTAL-private sector								1128	
SUB TOTAL (GUJARAT)								2843	
MAHARASHTRA									
1	GHATGHAR PSS	MAH	GOMID	S	UC	250	HYDRO	250	2007-08
2	PARLI EXT U-2	MAH	MAHA GEN	S	UC	250	COAL	250	2009-10
3	PARAS EXT U-1	MAH	MSPGCL	S	COMND	250	COAL	250	2007-08
3	PARAS EXT U-2	MAH	MSPGCL	S	UC	250	COAL	250	2009-10
4	KHAPER KHEDA EX	MAH	MAHA GEN	S	UC	500	COAL	500	2009-10
5	BHUSAWAL	MAH	MAHA GEN	S	UC	1000	COAL	1000	2010-11
6	KORADI REP& OTHERS	MAH	MAHA GEN	S	LOA	585	COAL	500	2010-11
7	KORADI EXT	MAH	MAHA GEN	S	LOA	1000	COAL	1000	2011-12
8	CHANDRAPUR	MAH	MAHA GEN	S	LOA	500	COAL	500	2010-11
SUB TOTAL -state sector								4500	
9	TROMBAY TPS	MAH	TATAPOWER	P	UC	250	COAL	250	2008-09
SUB TOTAL -private sector								250	
SUB TOTAL (MAHARASHTRA)								4750	
MADHYA PRADESH									
1	BIRSINGPUR EXT	MP	MPPGCL	S	COMND	500	COAL	500	2007-08
2	AMARKANTAK	MP	MPGENCO	S	UC	210	COAL	210	2007-08
3	MALWA	MP	MPGENCO	S	LOA	1000	COAL	1000	2011-12
4	SATPURA EXT	MP	MPGENCO	S	LOA	500	COAL	500	2011-12
SUB TOTAL-state sector								2210	
5	MAHESHWAR	MP	IPP	P	UC	400	HYDRO	400	2010-11
6	ULTRA MEGA SASAN	MP	LANCO	P	LOA	3960	COAL	660	2011-12
SUB TOTAL-private sector								1060	
SUB TOTAL (MP)								3270	
SUB TOTAL (CENTRAL SECTOR)								6240	
SUB TOTAL (STATE SECTOR)								9275	
SUB TOTAL (PRIVATE SECTOR)								4038	
TOTAL (WESTERN REGION)								19553	
* LOA placed for 374 MW									

Sl. No.	PLANT NAME	STATE	AGENCY	SECTOR	CATEGORY	ULTIMATE CAPACITY (MW)	TYPE	BENEFITS 11TH PLAN (2007-12)	LIKELY YEAR OF BENEFIT
SOUTHERN REGION									
A	CENTRAL SECTOR								
	NLC								
1	TUTICORIN JV	TN	NLC	C	LOA	1000	COASTAL	1000	2010-12
2	NEYVELI - II LIG	TN	NLC	C	UC	500	LIGNITE	500	2008-09
	SUB TOTAL (NLC)							1500	
	NPC								
1	KUDANKULAM U 1,2	TN	NPC	C	UC	2000	NUCLEAR	2000	2008-10
2	PFBR(Kalapakkam)	TN	NPC	C	UC	500	NUCLEAR	500	2010-11
3	KAIGA U 3	KAR	NPC	C	COMND	220	NUCLEAR	220	2007-08
4	KAIGA U 4	KAR	NPC	C	UC	220	NUCLEAR	220	2007-08
	SUB TOTAL (NPC)							2940	
	NTPC								
1	SIMHADRI-EXT	AP	NTPC	C	UC	1000	COASTAL	1000	2010-11
2	ENNORE-JV	TN	NTPC	C	LOA	1000	COASTAL	1000	2010-12
	SUB TOTAL (NTPC)							2000	
	SUB TOTAL (CENTRAL SECTOR)							6440	
B	STATE & PRIVATE SECTOR								
	TAMIL NADU								
1	NORTH CHENNAI EXT	TN	TNEB	S	LOA	500	COAL	500	2010-11
2	METTUR EXT	TN	TNEB	S	LOA	500	COAL	500	2010-11
3	VALUTHUR EXT	TN	TNEB	S	UC	92	GAS/LNG	92	2007-08
4	BHAWANI BARRAGE II & III	TN	TNEB	S	UC	60	HYDRO	60	2009-10
	SUB TOTAL –state sector							1152	
	SUB TOTAL (TN)							1152	
	KERALA								
1	ATHIRAPALLI	KERL	KSEB	S	UC	163	HYDRO	163	2011-12
2	KUTIYADI EXT.	KERL	KSEB	S	UC	100	HYDRO	100	2008-09
3	PALLIVASAL	KERL	KSEB	S	UC	60	HYDRO	60	2010-11
4	MANKULAM	KERL	KSEB	S	LOA	40	HYDRO	40	2010-11
5	THOTTIAR	KERL	KSEB	S	LOA	40	HYDRO	40	2010-11
	SUB TOTAL –state sector							403	
	SUB TOTAL (KERALA)							403	

Sl. No.	PLANT NAME	STATE	AGENCY	SECTOR	CATEGORY	ULTIMATE CAPACITY (MW)	TYPE	BENEFITS 11TH PLAN (2007-12)	LIKELY YEAR OF BENEFIT
	KARNATAKA								
1	VARAHI EXT	KAR	KPCL	S	UC	230	HYDRO	230	2008-09
2	BELLARY U 1	KAR	KPCL	S	UC	500	COAL	500	2007-08
3	BELLARY U 2	KAR	KPCL	S	UC	500	COAL	500	2010-11
4	RAICHUR U 8	KAR	KPCL	S	UC	250	COAL	250	2009-10
	SUB TOTAL –state sector							1480	
5	TORANGALLU	KAR	JINDAL	P	UC	600	COAL	600	2009-10
	SUB TOTAL –private sector							600	
	SUB TOTAL (KARNATAKA)							2080	
	ANDHRA PRADESH								
1	JURALA PRIYADARSHNI	AP	APGENCO	S	UC	234	HYDRO	234	2007-09
2	NAGARJUNA SAGAR TR	AP	APGENCO	S	UC	50	HYDRO	50	2009-10
3	LOWER JURALA	AP	APGENCO	S	LOA	240	HYDRO	240	2011-12
4	RAYALSEEMA U4	AP	APGENCO	S	UC	210	COAL	210	2007-08
5	KAKATIYA (BHOPALAPALLY)	AP	APGENCO	S	UC	500	COAL	500	2009-10
6	VIJAYWADA TPP	AP	APGENCO	S	UC	500	COAL	500	2008-09
7	KOTHAGUDEM ST-V	AP	APGENCO	S	UC	500	COAL	500	2009-10
8	KAKATIYA EXT	AP	APGENCO	S	LOA	500	COAL	500	2011-12
9	KRISHNAPATNAM	AP	APGENCO	S	LOA	1600	COASTAL	800	2011-12
	SUB TOTAL –state sector							3534	
10	KONASEEMA	AP	OAKWELL	P	UC	445	GAS/LNG	445	2007-08
11	GAUTAMI	AP	GAUTAMI POW	P	UC	464	GAS/LNG	464	2007-08
	SUB TOTAL –private sector							909	
	SUB TOTAL (AP)							4443	
	SUB TOTAL (CENTRAL SECTOR)							6440	
	SUB TOTAL (STATE SECTOR)							6569	
	SUB TOTAL (PRIVATE SECTOR)							1509	
	TOTAL (SOUTHERN REGION)							14518	

Sl. No.	PLANT NAME	STATE	AGENCY	SECTOR	CATEGORY	ULTIMATE CAPACITY (MW)	TYPE	BENEFITS 11TH PLAN (2007-12)	LIKELY YEAR OF BENEFIT
EASTERN REGION									
A	CENTRAL SECTOR								
	DVC								
1	MEJIA U-6	WB	DVC	C	UC	250	COAL	250	2007-08
2	CHANDRAPUR	JHAR	DVC	C	UC	500	COAL	500	2007-08
3	MEJIA PH II (DELHI)	WB	DVC	C	UC	1000	COAL	1000	2009-10
4	BOKARO EXP	JHAR	DVC	C	LOA	500	COAL	500	2010-11
5	KODERMA U1&2 (DELHI)	JHAR	DVC	C	UC	1000	COAL	1000	2010-11
6	DURGAPUR STEEL	WB	DVC	C	UC	1000	COAL	1000	2010-11
7	MAITHAN RBC	JHAR	DVC	C	LOA	1000	COAL	1000	2010-12
	SUB TOTAL (DVC)							5250	
	NHPC								
1	TEESTA V	SIKKIM	NHPC	C	UC	510	HYDRO	510	2007-08
2	TEESTA LOW DAM-III	WB	NHPC	C	UC	132	HYDRO	132	2008-09
3	TEESTA LOW DAM-IV	WB	NHPC	C	UC	160	HYDRO	160	2010-11
	SUB TOTAL (NHPC)							802	
	NTPC								
1	KAHALGAON II U6,7	BIH	NTPC	C	UC	1000	COAL	1000	2007-08
2	BARH-I	BIH	NTPC	C	UC	1980	COAL	1980	2009-11
3	FARAKKA STAGE-III	WB	NTPC	C	UC	500	COAL	500	2010-11
4	BARH II	BIH	NTPC	C	LOA	1320	COAL	1320	2011-12
5	NABINAGAR	BIH	NTPC	C	LOA	1000	COAL	750	2010-12
6	NORTH K PURA	JHAR	NTPC	C	LOA	1320	COAL	1320	2011-12
	SUB TOTAL (NTPC)							6870	
	SUB TOTAL (CENTRAL SECTOR)							12922	
B	STATE & PRIVATE SECTOR								
	ORISSA								
1	BALIMELA ST-II	ORRISA	OHPC	S	UC	150	HYDRO	150	2007-08
	SUB TOTAL -state sector							150	
	SUB TOTAL (ORRISA)							150	
	SIKKIM								
1	CHUJACHEN	SIKKIM	GATI	P	UC	99	HYDRO	99	2009-10
2	SADAMANDER	SIKKIM	GATI	P	LOA	71	HYDRO	71	2009-10
3	BHASMHEY	SIKKIM	GATI	P	LOA	51	HYDRO	51	2010-11
4	TEESTA III	SIKKIM	TEESTA URJA	P	UC	1200	HYDRO	600	2011-12
	SUB TOTAL -private sector							821	
	SUB TOTAL (SIKKIM)							821	

Sl. No.	PLANT NAME	STATE	AGENCY	SECTOR	CATEGORY	ULTIMATE CAPACITY (MW)	TYPE	BENEFITS 11TH PLAN (2007-12)	LIKELY YEAR OF BENEFIT
WEST BENGAL									
1	PURLIA PSS U4	WB	WBSEB	S	COMND	225	HYDRO	225	2007-08
2	PURLIA PSS U1,2,3	WB	WBSEB	S	UC	675	HYDRO	675	2007-08
3	DURGAPUR EXT	WB	DPL	S	UC	300	COAL	300	2007-08
4	SAGARDIGHI U 1,2	WB	WBPDCL	S	UC	600	COAL	600	2007-08
5	SANTHALDIH U5	WB	WBPDCL	S	UC	250	COAL	250	2007-08
6	SANTHALDIH U6	WB	WBPDCL	S	UC	250	COAL	250	2009-10
7	BAKRESHWAR U 4,5	WB	WBPDCL	S	UC	420	COAL	420	2007-08
8	SAGARDIGHI EXT	WB	WBPDCL	S	LOA	1000	COAL	1000	2010-12
SUB TOTAL -state sector								3720	
9	BUDGE-BUDGE EXT	WB	CESC	P	UC	250	COAL	250	2009-10
SUB TOTAL -private sector								250	
SUB TOTAL (WB)								3970	
SUB TOTAL (CENTRAL SECTOR)								12922	
SUB TOTAL (STATE SECTOR)								3870	
SUB TOTAL (PRIVATE SECTOR)								1071	
TOTAL (EASTERN REGION)								17863	
NORTH EASTERN REGION									
A	CENTRAL SECTOR								
	NEEPCO								
1	KAMENG	AR.PR.	NEEPCO	C	UC	600	HYDRO	600	2010-11
	TOTAL (NEEPCO)							600	
	NHPC								
1	SUBANSIRI LOWER	AR.PR.	NHPC	C	UC	2000	HYDRO	2000	2011-12
	SUB TOTAL (NHPC)							2000	
	NTPC								
1	BONGAIGAON	ASSAM	NTPC	C	LOA	750	COAL	750	2010-12
	SUB TOTAL (NTPC)							750	
	ONGC								
1	TRIPURA GAS ILFS	TRI	ONGC	C	LOA	750	GAS/LNG	750	2009-10
	SUB TOTAL (ONGC)							750	
SUB TOTAL (CENTRAL SECTOR)								4100	

Sl. No.	PLANT NAME	STATE	AGENCY	SECTOR	CATEGORY	ULTIMATE CAPACITY (MW)	TYPE	BENEFITS 11TH PLAN (2007-12)	LIKELY YEAR OF BENEFIT
B	STATE & PRIVATE SECTOR								
	ASSAM								
1	LAKWA WH	ASM	ASGENC O	S	UC	37.2	GAS/LN G	37	2008-09
	SUB TOTAL (ASSAM)							37	
	MEGHALYA								
1	MYNTDU St-I	MEGH	MeSEB	S	UC	84	HYDRO	84	2008-09
2	NEW UMTRU	MEGH	MeSEB	S	LOA	40	HYDRO	40	2010-11
	SUB TOTAL (MEGHALYA)							124	
	NAGALAND								
1	DIMAPUR DG	NAGAL AND	ELECT.D EPT.	S	UC	23	DIESEL/ HFO	23	2009-10
	SUB TOTAL (NAGALAND)							23	
	SUB TOTAL (STATE SECTOR)							184	
	SUB TOTAL (CENTRAL SECTOR)							4100	
	SUB TOTAL (STATE SECTOR)							184	
	SUB TOTAL (PRIVATE SECTOR)							0	
	TOTAL (NORTH-EASTERN REGION)							4284	
	ALL-INDIA SUMMARY								
	CENTRAL SECTOR							39865	
	STATE SECTOR							27952	
	PRIVATE SECTOR							10760	
	TOTAL (ALL-INDIA)							78577	
C: Central Sector; S: State Sector; P: Private Sector; COMND: Projects Commissioned; UC:Under Construction; LOA: Letter of Award to be placed.									

APPENDIX IV

LIST OF MANUFACTURERS/ SUPPLIERS/ VENDOR FOR THERMAL POWER PLANT EQUIPMENT

A. Main Plant Equipment

1. M/s. Bharat Heavy Electricals Ltd.
BHEL House, Siri Fort, New Delhi – 110049.
Phone : 011-26001178 Fax: 26001172
2. M/s. Doosan Heavy Industries Ltd.,
1303-22, Seocho-Dong,
Seochho-Gu
Seoul – 137920, Korea
Phone 8225136970 Fax: 8225136688
3. M/s. ALSTOM Power Boilers Ltd.
Cdhandiwala Estate, Maa Anand Mayee Marg,
Kalkaji, New Delhi – 110019
Phone : 011-51811100 Fax: 011-51811108
4. M/s. SKODA (India) Pvt. Ltd.
601, Akashdeep, Barakhambha Road,
New Delhi – 110001
Phone : 011-23314133-31 Fax: 011-23714746
5. M/s. Siemens Ltd.,
Plot No.6-A, Sector-18,
Maruti Industrial Area (HUDA)
Gurgaon – 122015
Phone : 0124-2846000 Fax:0124-2846141
6. M/s. GEA Energy System (India) Ltd.
443, Anna Salai,
Teynampet, Chennai-6000018
Phone: 044-24354105 Fax: 044-24320359
7. M/s. Shanghai Electric (Group) Corporation (SEC)
3669 Jindu road, Shanghai,
China

B Auxiliary Plant Equipment**a) Coal handling plant**

1. M/s. TRF Ltd.,
11, Station Road,
Burmamines, Jamshedpur-831007
Phone: 2271286-293 Fax: 2227105
2. M/s. Elecon Engg. Co. Ltd.,
Anand Sojitra Rdfoad,
Vallabh Vidya Nagar – 388120, Gujarat
Phone : 237016-17 Fax: 236457
3. M/s. Thyssenkrupp India Ltd.,
Pimpri, Pune – 411018, Maharashtra (India)
Phone : 27425350
4. M/s. L&T Ltd.
Mount Poonamallee Road,
Manapakam, Post Bag No. 979,
Chennai – 600 089.
5. M.s Mcnally Bharat Engg. Co. Ltd.,
P.O. Kumardhubi,
Distt Dhanbad, Bihar – 600040
Phone : 06540-293010,11 Fax: 06540-293024/292197
6. M/s. Tecpro Systems (P) Ltd.,
202-204, Pacific Square, Sector-15,
Part-II, Gurgaon (Haryana),
Phone : 0124-4343100 Fax: 0124-4343243

b) Ash Handling Plant

1. M/s. Indure Pvt. Ltd.,
Indure House, Greater Kailash Part-II,
New Delhi – 110048
2. M/s Driplex Water Engineering,
1, Panchsheel Community Centre,
New Delhi – 110017
Phone : 011-26499698,99 Fax: 011-26496421.

3. M/s. Macawber Beekay Pvt. Ltd.,
Beekay House, L-8 Green Park Extension,
New Delhi – 110016
Phone : 011-26193396, 26163447 Fax: 011-26192566
4. M/s. Energo Engineering Projects Ltd.,
A-57/4, Okhla Industrial Area, Phase-II, New Delhi – 110020
Phone : 011-26385323/28/29/38
Fax: 011-26385333

C) Water Treatment Systems

1. M/s. Thermax Ltd.,
Sai Chambers, 15 Mumbai Pune Road,
Wakdewadi, Pune-411 003
Phone : 020-5811010
Fax: 020-5910235/36
2. M/d. Driplex Water Engineering,
1, Panchsheel Community Centre,
New Delhi – 110017
Phone : 011-26499698, 99
Fax: 011-26496421
3. M/s. VA TECH WABAG LTD.
11, Murray's Gate Road,
Alwarpet, Chennai - 600018
Phone : 044-52232306
Fax: 044-52232324
4. M/s. Doshi Ion Exchange,
24-25-26, Phase-II, G.I.D.C. Estate,
Vatva, Ahemedabad – 382 445,
Phone (+91-079)2589 1916, 25831156
Fax: (079) 25833302.
5. Nuchem Whir India,
20/6, Mathura Road, Faridabad,
Haryana – 121006,
Phone – 95129-5061042, 5061043
6. Ion Exchange India Ltd.
Tiecicon House, Dr E. Moses Road,
Mahalakshmi, Mumbai – 400011
Tel No.:022-24939520/23
Fax: 022-24938737

7 Degremont India Ltd.
1, Sri Aurobindo Marg, Hauz Khas,
New Delhi – 110016.
Fax : 6866040.

8 Gannon Duncerely & Co. Ltd.
Bombay Mutual Annexe, R.S. Marg, Beh. City Bank Fort,
Mumbai – 400001
Tel: 022-22660519
Fax : 022 – 22641287.

d) Chlorination Plant

1. Perfect Chloro Systems,
A-24, SIDCO Industrial Estate,
Villivakkam, Chennai – 600 049
Phone – 044-26173445/ 26173045, 9840029244
Fax: 044-26173455/26257749
2. Industrial Devices (I) Pvt. Ltd.,
158, DSIDC Complex, Okhla Industrial Area,
Phase-1, New Delhi - 110020
Phone : 26813019, 26812574
Fax : 26812321
3. Penvault India Ltd.
221, MIDC, TTC, Thane Belapur Road,
Mumbari – 400 706,
Phone 022-27632503, 27632529
Fax : 022 - 27632560
4. BANCO
P-1, Cama Industrial Estate, Walbhat Road,
Goregaon (E), Mumbai – 400003
Phone 022-28735386
Fax : 022-28732182

e) Mill Rejects Systems

1. M/s. Indure Pvt. Ltd.,
Indure House, Greater Kailash Part-II,
New Delhi – 110048
2. M/s. Macawber Beekay Pvt. Ltd.,
Beekay House, L-8 Green Park Extension
New Delhi – 110016.
Phone : 011-26193396, 26163447 Fax: 011-26192566.

f) Fuel Oil

1. Raunaq International Ltd.
20 km Mathura Road,
Post Office Amar Nagar,
Sarai Khawaja,
Faridabad – 121003
Phone: +91-129-2250406 – 416
Fax: +91-129-2250423
2. M/s. Techno Fab
Plot No.5, Sector 27C,
Mathura Road, Faridabad 121003, Haryana
Phone : 0129-2272020, 2275310, 2275381.
3. M/s. TECHNOELECTRIC
Ideal Plaza South Block,
Room No. S-307, S-309,
11/1, Sarat Bose Road,
Kolkata – 700020
Phone : 033-22801646/47,
Fax: 033-22831885
4. UNITECH MACHINES LIMITED, OSHU HOUSE
344/3, Lado Sarai, New Delhi – 110030 India.
Tel No. : +91-11-29523542, 29521019
Fax: 91-11-29503505, 29522569
Email : marketing@unitechmachines.com
Website : www.unitechmachines.com

g) Fire Detection and Protection Systems

1. STEELAGE Industries Ltd.,
A Member Company of Gunnebo Group, Sweden,
156, Dr. Mascarenhas Road,
Mazagaon, MUMBAI – 400 010 India
Tel No: 91-22-23707000
Fax : 91-22-23739305
2. VIJAY INDUSTRIES AND PROJECTS LTD.
EL-205, TTC Industrial Area Mhape, Navi Mumbai 400 701
Tel No (022) 2761 8555 Fax: (022) 2761 8444;
E-mail: vijay.info@vijayin.com Website: www.vijayin.com

3. M/s. New Fire Engineers Pvt. Ltd.,
110-A/2, Krishna Nagar,
Safdarjung Enclave,
New Delhi – 110029
Tel No.011-51694741
Fax No.: 011-51694742
Email : newfiredelhi@vsnl.net

4. UNITECH MACHINES LIMITED, OSHU HOUSE
344/3, Lado Sarai, New Delhi – 110030 India.
Tel No. : +91-11-29523542, 29521019
Fax: 91-11-29503505, 29522569
Email : marketing@unitechmachines.com
Website : www.unitechmachines.com

5. Agnice Fire Protection Ltd.,
No.6, Vedachala Nagar Main Road,
Kodambakkam,
Chennai – 600 024,
Email: teejan@omantel.net.om
Manappat@omantel.net.om
Fax: 0484 391716
Phone : 044 24845647/24845648

6. TYCO FIRE & SECURITY SERVICES
418/4, 80 FT. Peripheral Road, Koramangala, 4th Block,
Bangalore – 560034,
Phone : 080 ddd- 5508860
Fax : 080-25531081.

h) HVAC

1. Voltas Limited,
A-43, Mohan Cooperative Industrial Estate,
Mathura Road, New Delhi – 110044,
Phone : 011-66505651
Fax: 011-26950022

2. M/s. Bluestar Limited,
Block – 2A, DLF Corporate Park,
DLF Qutub Enclave, Phase-II
Gurgaon – 122002(Haryana)

Phone : 0124-5094114

Fax 0124-5094007

i) Horizontal and Vertical pumps

1. M/s Worthington Pumps India Ltd

8.A.J.C. Bose Road, Kolkata – 7000017

Phone : 033-2474521, 4536 Fax : 033 – 2473171

M/s Kirloskar Bothers Ltd

i) Udyog Bhawan, Tilak Road, Pune (India)-411002,

Phone : 020 – 24440770 Fax 020-24270879

ii) “Chintan”, 408/15, Kukund Nagar, Pune 411017,

Phone 020-244 40770 Fax : 020 – 24270879

2. M/s Jyoti Ltd

Nanubhai Amin Marg, Industrial Area, PO Chemical Industries,

Vadodara – 390003 Phone : 0265 – 2280633 Fax: 0265 – 2281871

3. M/s Bharat Heavy Electricals Ltd

BHEL House, Siri Fort, New Delhi – 49

Phone 011-26001178 Fax 01126001172

4. Mather & Platt (I) Ltd

805-806, Ansal Bhawan, 16, Kasturba Gandhi Marg, New Delhi – 1

Phone 51520514, 23766009

Fax 23766011

j) Cooling Tower

1. M/s Gammon India Ltd

Gammon House,

Veer Savarkar marg, Prabhadevi, Mumbai – 400025

Phone 022 – 24301084

2. M/s Paharpur Cooking Towers Ltd

Paharpur House, 8/1/B, Dianond Harbour Road, Kilkata,

W.Bengal 7000029, Phone 033 24792050 Fax 033 – 24792188

3. NBCC LTD,

NBCC Bhawan, Lodhi Road, New Delhi – 3

Phone 24367314-15 Fax : 01124366995

4. M/s BDT Ltd

2-E/28, First Floor, Jhandewalan Extension, New Delhi 110055

Phone 011-23535785-95 Fax 011 23535787

5. M/s GEA Cooling Towers Tech(India) Pvt Ltd
Anna Salai 443, Teynampet, Chennai 600018
Phone 044-24326171 Fax 044 24338404

k) Electrical Equipment

1. Electrical Control & Switchgears, D-6, Sector – VIII, NOIDA 201301
2. CGL. Switchgear Division, Vandana Building, 11, Tolstoy Marg, New Delhi
3. Control & Switchgear (Sw.gear Div), 222 Okhla Industrial Estate, New Delhi
4. ABB, Motors Division, 32, Indistruail Area NIT, Faridabad
5. Alstom India Ltd, Chandiwala Estate, Maa Anand Mai Marg, Kalkaji, New Delhi 19
6. Larsen & Toubro Ltd, L&T House, Ballard Estate, Mumbai 400001
7. Siemens Ltd, 4A, Ring Road, IP Estates, New Delhi
8. Control & Switchgear Co. Ltd (Busduct Division), C-59, Ph-II, Noida (UP) – 201305
9. M/s Power Gear Ltd, Plot No. 15 & 16, 3rd Phase, Peenya Industrial Area, Bangalore – 560058
10. M/s Spaceage Switchgear Ltd, 68 IDC, Mehrauli Road, Gurgaon (Haryana)
11. M/s Bharat Heavy Electricals Ltd
BHEL House, Siri Fort, New Delhi – 49
12. M/s Kanohar Electricals Ltd, Rithani, Delhi Road, Meerut 250103
13. M/s Andrew Yule & Co. Ltd, 8, Dr. Rajendra Prasad Sarani, Kolkata 700001
Electrical Division (Trans. & Switchgear Unit), S/346, Old Mahabalipuram Road,
Perungudi, Chennai 600 096
14. M/s EMCO Ltd, 106, Industrial Area, Sion (East), Mumbai – 400 022
15. M/s Universal Cables Ltd, UCO Bank Bldg, 4th Floor, Parliament Street, N Delhi 1,
Phone 23714851
16. M/s Cable Corp. Of India Ltd, Milap Niketan, 2nd Floor, 8A, Bahadurshah Zafar marg,
New Delhi 110002, Ph. 26080984

17. M/s Industrial Cables Ltd, Jeevan Tara Bldg, Gate No. 3, Ground Floor, Parliament Street, N Delhi 1 Phone 223347025-29

18. M/s Delton Cables Ltd, Delton House, 4801, Bharat Ram Road, 24, Darya Ganj, New Delhi 2, Phone 23289955

19. M/s NICCO Corp Ltd, M-8, 11-A, Hemkunt Chambers, 89, Nehru Place 19, Phone 2214718, 411509010, 9811500946

I) Control & Instrumentation

1. M/s BHEL (Electronic Division), P.B.2606, Mysore Road, Bangalore-560026

2. M/s Instrumentation Ltd, Kota Rajasthan

3. M/s Siemens India Ltd, Mumbai

4. M/s Honeywell Automation Ltd, 56-57, Hadapsar Industrial Estate, Pune 411013