

Chapter 9

HUMAN RESOURCE DEVELOPMENT

9.0 INTRODUCTION

Human Resource Development and capacity building, in the present power scenario, demands a very comprehensive and pragmatic approach to attract, utilize, develop and conserve valuable human resources. Training, re-training and career prospects are some of the important elements of human resources development.

Technically trained manpower comprising of skilled engineers, supervisors, artisans, and managers etc. is required in every sphere of the power supply industry. Growing concern over environmental degradation and depletion of the conventional energy sources has made the task of electricity generation even more challenging and therefore quality standard of the manpower is becoming increasingly essential. The technical knowledge acquired from engineering colleges, polytechnics, industrial training institutes and other technical institutions provides the basic foundation, but the same needs to be supplemented with applied engineering skills in the various spheres i.e. power generation, its transmission and distribution aspects. All these skills are to be regularly updated to cope with the rapidly advancing technologies and very often the speed of obsolescence overtakes the rate of acquisition of particular skill and knowledge.

The HRD/Training needs of Technical, Non-Technical and Supporting Staff should be addressed keeping in view the National Training Policy for the Power Sector.

9.1 REVIEW OF PROGRAMME & ACHIEVEMENTS DURING 11th PLAN

As per the report of the Working Group on Power for 11th plan, the total manpower at the end of 11th Plan was estimated at 11.63 lakhs. Overall training load during 11th Plan was estimated at 4.65 lakh man-months/year. As per CEA data, it has been estimated that only 0.33 Lakh man-months/Yr training load was achieved by 68 institutes during the year 2008-09. During the year 2010-11, the training infrastructure available has been estimated at 0.82 lakhs man-months/yr for about 70 training institutes.

Some of the major achievements pertaining to capacity building during 11th Plan are:

- (a) Distance Learning Certificate Programs on Power Distribution Management for JEs/ AEs level
- (b) Certificate of Competency in Power Distribution (CCPD)
- (c) Adoption of 69 ITIs by CPSUs/Private organizations
- (d) Training under Distribution Reforms, Upgrades and Management (DRUM)
- (e) C&D Employees Training
- (f) Franchisee Training
- (g) Training under R-APDRP etc.

9.2 ASSESSMENT OF REQUIREMENT OF MANPOWER

9.2.1 Manpower availability in 11th Plan

The original targeted Capacity addition for 11th Plan was 78,700 MW (excluding renewables) and it is now expected that during this Plan a total capacity addition of about 74,374 MW (including renewables) may take place. The additional manpower requirement for this capacity addition is estimated to be 331.90 thousands out of which 254.54 thousands will be technical and 77.37 thousands will be non-technical. The total manpower by the end of 11th Plan shall be of the order of 1163.56 thousands, out of which 881.10 thousands (75%) will be technical and 282.47 thousands (25%), non-technical. Man/MW ratio at the end of 11th Plan works out to 5.63.

9.2.2 Manpower requirement in 12th Plan

For a capacity addition of 94,215 MW(including renewable) in the 12th Plan, the additional manpower requirement shall be of the order of 407.67 thousands out of which 312.92 thousands will be technical and 94.75 thousands will be non-technical. The total manpower by the end of 12th Plan shall be 1425.79 thousands, out of which 1083.88 thousands (76%) will be technical and 341.91 thousands (24%) will be non-technical. Man/MW ratio at the end of 12th Plan works out to 4.74. Details of the manpower required during 12th Plan and likely status at the end of 12th Plan are furnished in table 9.1 and 9.2 below:

Table-9.1
Manpower Projection for 12th Plan

(In Thousands)

S No	Area	Capacity Addition (MW)	New Recruitment			Total Manpower			Total Capacity (MW)
			Tech	Non-Tech	Total	Tech	Non-Tech	Total	
1	Thermal	82211*	42.18	13.06	55.24	151.97	51.05	203.02	238744
2	Hydro	9204	12.20	3.44	15.64	59.19	21.94	81.13	52095
3	Nuclear	2800	3.07	1.31	4.38	13.03	5.84	18.87	10080
4	Power System								
	Transmission		5.98	2.09	8.07	30.83	9.95	40.78	
	Distribution		249.49	74.85	324.34	828.86	253.13	1081.98	
	Total	94215	312.92	94.75	407.67	1083.88	341.91	1425.79	300919

*Includes Capacity addition of 18,500 MW from Renewable Energy

Table 9.2
Capacity & Manpower at the end of 12th Plan

Capacity in MW and Manpower in Thousand

Sector	12th Plan					
	Capacity at the beginning of 12th Plan	Manpower at the beginning of 12th Plan	Reduced Manpower due to Retirement etc.	Capacity addition during 12th Plan	Additional Manpower reqmt during 12th Plan	Manpower at the end of 12th Plan
	C 1	C 2	C 3 = 87.5%* C 2	C 4	C 5	C 6 = C 3 + C 5
Thermal	156533	168.90	147.79	82211	55.24	203.02
Hydro	42891	74.84	65.49	9204	15.64	81.13
Nuclear	7280	16.56	14.49	2800	4.38	18.87
Sub-total	206704	260.30	227.76	94215	75.26	303.02
Transmission	-	37.38	32.71	-	8.07	40.78
Distribution	-	865.88	757.65	-	324.34	1081.98
Grand Total	206704	1163.56	1018.12	94215	407.67	1425.79

9.2.3 Manpower requirement in 13th Plan

For a capacity addition of 1,23,900 MW (including renewable) in the 13th Plan, the additional manpower requirement shall be of the order of 547.78 thousands out of which 419.04 thousands will be technical and 128.74 thousands will be non-technical. The total manpower by the end of 13th Plan shall be 1795.34 thousands, out of which 1367.43 thousands (76%) will be technical and 427.91 thousands (24%) will be non-technical. Man/MW ratio at the end of 13th Plan works out to 4.23. Details of the manpower required during 13th Plan and likely status at the end of 13th Plan are furnished in Table 9.3 and 9.4 respectively.

Table-9.3
Manpower Projection for XIII Plan

(In Thousands)

S No	Area	Capacity Addition (MW)	New Recruitment			Total Manpower			Total Capacity (MW)
			Tech	Non-Tech	Total	Tech	Non-Tech	Total	
1	Thermal	93900*	48.17	14.92	63.09	181.15	59.59	240.74	332644
2	Hydro	12000	15.90	4.48	20.39	67.70	23.68	91.37	64095
3	Nuclear	18000	19.76	8.42	28.19	31.16	13.54	44.70	28080
4	Power System								
	Transmission		7.10	2.49	9.59	34.08	11.19	45.27	
	Distribution		328.10	98.43	426.53	1053.35	319.92	1373.26	
	Total	123900	419.04	128.74	547.78	1367.43	427.91	1795.34	424819

Table-9.4
Capacity & Manpower at the end of XIII Plan

Capacity in MW and Manpower in Thousand

Sector	XIII Plan					
	Capacity at the beginning of XIII Plan	Manpower at the beginning of XIII Plan	Reduced Manpower due to Retirement etc.	Capacity addition during XIII Plan	Additional Manpower reqmt during XIII Plan	Manpower at the end of XIII Plan
	C 1	C 2	C 3 = 87.5%*C 2	C 4	C 5	C 6 = C 3 + C 5
Thermal	238744	203.02	177.65	93900	63.09	240.74
Hydro	52095	81.13	70.99	12000	20.39	91.37
Nuclear	10080	18.87	16.51	18000	28.19	44.70
Sub-total	300919	303.02	265.14	123900	111.67	376.81
Transmission	-	40.78	35.68	-	9.59	45.27
Distribution	-	1081.98	946.74	-	426.53	1373.26
Grand Total	300919	1425.79	1247.56	123900	547.78	1795.34

*Includes Capacity addition of 30,500 MW from Renewable Energy

9.2.4 A summary of likely manpower at the end of 11th, 12th & 13th Plan is furnished in the following table 9.5 below:

Table 9.5
Manpower under various Plans

S No	Plan	Capacity at the beginning of Plan (MW)	Capacity addition during Plan (MW)*	Capacity at the end of Plan (MW)	Manpower at the beginning of Plan (In Thousands)	Reduced Manpower due to retirement etc. (In Thousands)	Manpower required for Capacity addition of Plan (In Thousands)	Manpower at the end of Plan (In Thousands)	Man/MW at the end of Plan
C 1	C 2	C 3	C 4	C 5 = C 3 + C 4	C 6	C 7 = 87.5%* C 6	C 8	C 9 = C 7 + C 8	C 10
1	11 th	132330	74374	206704	950.47	831.66	331.90	1163.56	5.63
2	12 th	206704	94215	300919	1163.56	1018.12	407.67	1425.79	4.74
3	13 th	300919	123900	424819	1425.79	1247.56	547.78	1795.34	4.23

* Includes Capacity addition from Renewable Energy

9.2.5 Man/MW ratio

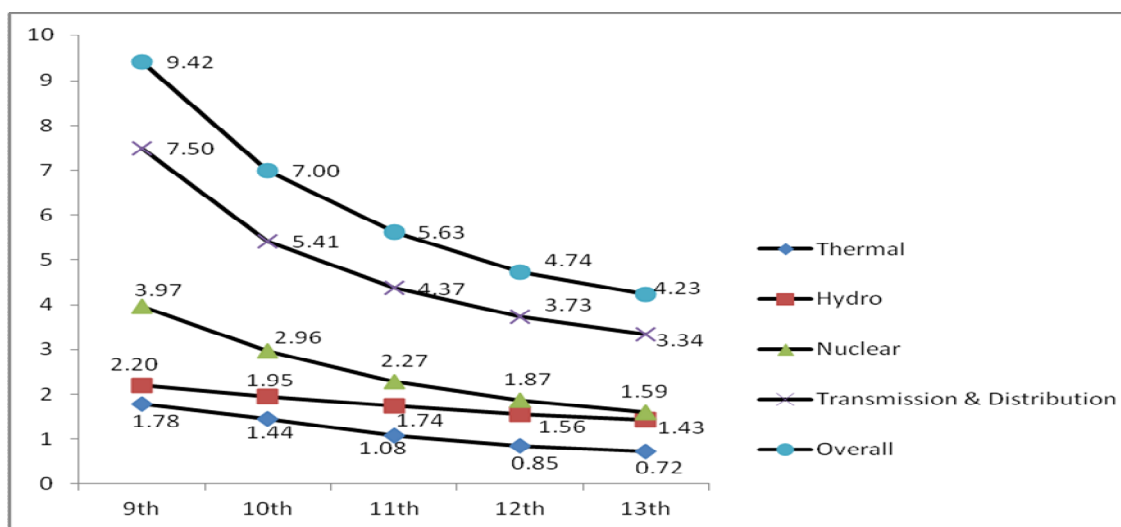
The Man/MW ratio during various plans, based on above projections of capacity addition and corresponding requirement of manpower during 11th, 12th & 13th Plan is given below:

Table-9.5
Man/MW Ratio at the end of various Plan Periods

End of Plan Period	Thermal	Hydro	Nuclear	Transmission & Distribution	Overall
9 th	1.78	2.20	3.97	7.50	9.42
10 th	1.44	1.95	2.96	5.41	7.00
11 th	1.08	1.74	2.27	4.37	5.63
12 th	0.85	1.56	1.87	3.73	4.74
13 th	0.72	1.43	1.59	3.34	4.23

The above reducing trend is depicted in the following graph:

Man/MW Ratio at the end of various Plan Periods



9.3 MANPOWER AVAILABILITY

On the basis of the total number of technical institutions operational, it can be seen that at all the three levels i.e. graduation, diploma and ITI, there are sufficient number of students passing out each year. However the skill set required for the power sector in few areas does not match the needs of the industry.

Table 9.7
Manpower Availability vs. Requirement

Colleges	Total Colleges	Annual Intake in lakhs	Total for 5 years (lakhs)	Manpower Requirement for 12 th Plan (lakhs)
Engineering	3617	11.30	56.50	0.58
Management	4058	4.15	20.75	-
Polytechnics	540	0.93	4.65	0.56
ITI	8039	11.15	55.75	1.99
Total	16254	27.53	137.65	3.13

From the above analysis it is observed that sufficient number of Engineers, Managers and Diploma holders are available. However, in respect of lower level skills like that of ITI, there are certain gaps in numbers of skills as explained below.

Our ITIs and other vocational training institutions have to be augmented for providing certain skill sets like High Pressure Welders, Fabricators, Fitters, Binders, Drillers, Plumbers, Electricians, Linemen, Heavy Machine Operators, Operators-Crane, Dozer, Dumper, Excavation, Bar Benders, Piling Rig Operators etc. who would be required in huge number for the Erection & Commissioning Activities for the Thermal, Hydro, Nuclear Plants and Transmission & Distribution areas. The quality and range of their training will keep pace with the changing needs of the economy and opportunities for self-development.

9.4 TRAINING NEED ASSESSMENT

9.4.1 Training Strategy

To fulfill the above needs, training to the power sector personnel is provided in the following categories:

i) O&M Training to all existing employees engaged in O&M of generating projects (Thermal, Hydel, Gas) and Transmission & Distribution System as per statutory requirements under the Gazette Notification of September 2010 issued by CEA ranging from 4 Weeks to 30 Weeks.

- This inter-alia includes the following:- Classroom Training
 - Simulator Training for Thermal and Hydel
 - On-Job Training

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- ii) Induction level training for new recruits for 1 month (Technical & Non-Technical) is considered a must in the power sector.
 - iii) Refresher/Advanced training of 5 Days in a year to all existing personnel of varying degrees in various specializations in line with National Training Policy for Power Sector.
 - iv) Management training of 5 Days in a year to the senior Executives/Managers in India/Abroad in line with National Training Policy for Power Sector.

The Group has come to the conclusion that the most important component of the strategy should be “Training for All” irrespective of the level in the hierarchy. At least one-week of training in a year must be provided to every individual. Five days training per annum per technical person based on National Training Policy is being implemented selectively at some utilities. This needs to be strictly implemented.

9.4.2 Training Facilities

9.4.2.1 Training Institutes Recognized by CEA

During the 10th Plan, there were, 51 training institutes recognized by CEA under various power utilities. About 20 new institutes were recognized by CEA during the 11th Plan. A total of 72 training institutes under various power utilities have been recognised by CEA.

9.4.2.2 Various Organizations which have provided training in 11th Plan in Power Sector are briefly described below:

- (i) National Power Training Institute
- (ii) Power Management Institutes (PMI) & Various training Institutes of NTPC
- (iii) Various training Institutes of NHPC, SJVNL, THDC etc.
- (iv) Various training Institutes of Power Grid
- (v) Various training Institutes of State/Private Generating Utilities
- (vi) Various training Institutes of State Transmission Utilities
- (vii) Various training Institutes of State/Private Distribution Utilities

9.4.2.3 Various Schemes under the 11th Plan towards Training were operative like Training under Distribution Reforms, Upgrades and Management (DRUM), C&D Employees Training, Franchisee Training, Training under R-APDRP etc.

Salient features/achievements of these Schemes are discussed below:

Table 9.8
Salient features of Schemes

Scheme	11 th Plan		12 th Plan		
	No. of employees trained (A/B/C/D Level wise)	Amount sanctioned	Amount disbursed	Target No. of employees to be trained	Target Amount for investment (Rs.)
DRUM	A&B 31000 C&D 3200	Rs.16.8 crore	Rs. 13.5 Crore (Amount disbursed for only 27500 Participants)	5000	Approx 2 Crore
RGGVY C&D	57446	Rs 18.75 Crs	Rs 10 Crs	75,000 (Cumulative for 11 th & 12 th Plan)	Rs 22.5Cr (Cumulative for 11 th & 12 th Plan)
RGGVY Franchisee	32,717	Rs 10 Cr	Rs 4.12 Cr	50,000 (Cumulative for 11 th & 12 th Plan)	Rs 25 Cr (Cumulative for 11 th & 12 th Plan)
R-APDRP Part C	(A&B) 650 (C&D) 16370	Rs. 200 crore	Approx Rs. 7.9 crore to be disbursed on receipt from GOI	Approx 32,000	90 crore (includes exchange programmes etc.)

Short-term programs with multiple program themes Course Curriculum centrally developed under DRUM were delivered through institutional spread of 20 Training Institutions

Structured Training for C&D Level Distribution employees and Franchise development programs were initiated under RGGVY.

9.4.3 Review of Training in 11th Plan

Salient achievements of some of the Organizations during 11th Plan are described below:

9.4.3.1 National Power Training Institute

National Power Training Institute (NPTI), under the Ministry of Power, Govt. of India is a National Apex body for Training and Human Resources Development in Power Sector.

NPTI has trained over 1,80,000 Power Professionals in regular Programs over the last 4 decades. NPTI operates on an all India basis with manpower strength of 379 including 107 officers through its nine Institutes in different zones of the country.

9.4.3.2 Manpower Training and Academic Programs

NPTI conducts following industry interfaced academic programs:-

- Two-Year MBA in Power Management approved by AICTE
- Four-Year B.Tech./B.E Degree in Power Engineering approved by AICTE
- One-Year Post Graduate Diploma Course in Thermal Power Plant Engineering
- One-Year Post Diploma Course in Thermal Power Plant Engineering
- One-Year Post Graduate Diploma in GIS and Remote Sensing (RS)
- Nine Months Post Graduate Diploma Course in Hydro Power Plant Engg.
- Six Months O&M of Transmission and Distribution System for Engineers

9.4.3.3 Power Training Simulators

NPTI has one 500 MW Thermal Training Simulator, Two Nos of 210 MW Thermal training Simulators, one 430 MW (2x143 MW Gas Turbine and 1 x 144 MW Steam Turbine) Combined Cycle Gas Turbine Simulator, one No of Hydel Simulator and one No of Load Dispatch Simulator.

9.4.3.4 Power Management Institute (PMI) & other training institutes of NTPC

The Power Management Institute (PMI), NTPC's apex training and development centre has been imparting training in the fields of management development, construction and O&M of power plants and information technology. NTPC has 11 No of training institutes at its Project Sites spread all across the country. NTPC has a Training Infrastructure to provide Training of 18,856 Man-Months per Year.

9.4.3.5 Training Institutes of NHPC

NHPC has Training Institutes at its Project Sites with a training infrastructure to provide training of 720 Man-Months per Year.

9.4.3.6 Training Institutes of PowerGrid

PowerGrid has Training Institutes at its Regional locations/Project Sites. They have a training infrastructure to provide training of 1917 Man-Months per Year.

9.4.3.7 Neyveli Lignite Corporation

Neyveli Lignite Corporation has a Training Institute at Neyveli. They have a Training Infrastructure to provide Training of 2407 Man-Months per Year.

9.4.3.8 Other Training Institutes

Names of some other leading Training Institutes which are providing training in Power Sector are indicated below:

- (a) Reliance Energy Management Institute, Mumbai
- (b) Jindal Institute of Power Technology, Raigarh, Chattisgarh
- (c) Evonik (Steag), Noida
- (d) Gujarat Energy Training & Research Institute, Vadodara

9.4.9 Distance Learning Certificate Programs on Power Distribution Management for JEs/AEs level

Advanced Certificate in Power Distribution Management (ACPDM) - Course was developed by IGNOU in association with NPTI and delivered by IGNOU through multiple regional centres spread across the country. The course is meant for Graduate Engineers/Diploma holders, or Science/Commerce/Art Graduates or Equivalent with two years experience in Power Utilities or the Electricity Sector.

9.4.10 Certificate of Competency in Power Distribution (CCPD)

The course is meant for Technicians/Equivalent Trade or manpower working in Power Sector (sponsored candidates) or General Candidates or Private electricians at least 8th Pass (non-sponsored). The course started in August, 2009 and is presently being conducted at Durgapur, Nagpur & Guwahati Institutes of NPTI.

9.4.11 Adoption of ITIs

During the Power Sector conclave held during July 2007, following recommendations were concluded:

- (a) Adoption of ITIs by Power Industry
- (b) Integration of ITIs by power industry to enhance the basic skills of workforce

Table 9.9
Status of ITIs adopted by CPSUs

S No	CPSUs	ITI adopted by aid from CPSU		Being adopted		New ITI's being set up through CPSU	Total
		Existing	New	Existing	New		
1	DVC	5	4				9
2	NEEPCO	2					2
3	NHPC	11					11
4	NTPC	17				8	25
5	PGCIL	4					4
6	SJVNL	2					2
7	THDC	2					2
8	NHDC	1					1
Total		44	4	0	0	8	56

Table 9.10
Status of ITIs adopted by Private developers

S No	Project Developer	ITIs adopted
1	Tata Power	4
2	Jindal Power	5
3	Reliance Energy	2
4	O&M solutions	1
Total		12

9.5 CAPACITY BUILDING DURING 12TH PLAN

Training may be given to personnel in the power sector as detailed below:

9.5.1 O&M Training

As per CEA's Gazette Notification of September 2010 issued by CEA, Engineers, Supervisors and Technicians engaged for O&M of Power Projects (Thermal, Hydel, Gas) and T&D have to mandatorily undergo training ranging from 4 weeks to 30 weeks.

9.5.2 On-job Training Facility

On the job training is also now mandatory for all trainees who are being given training in O&M of Generation Projects (Thermal, Hydel, Gas) and Transmission & Distribution. This training varies from 2 weeks to 16 weeks.

Notification from MoP/CEA is proposed so that Trainees being given Training by NPTI can be given On-Job training as per the Gazette notification issued by CEA.

9.5.2.1 Induction Training

All technical personnel at the time of induction should be given at least 1 month induction training.

9.5.2.2 Refresher/Advanced Training

Refresher/Advanced Training must be arranged for each individual on promotion, which calls for performing new/different roles and working conditions.

A mix of Technical, Commercial and Management capabilities of 1 week is proposed.

9.5.3 Management Training

Continuous development of Executives/Managers, especially at the transition period of their career and in the context of constantly changing business environment is of utmost importance. Executives in Finance and Management with non-technical background should

also be provided technical orientation through suitable training programs. For this a training of 1 week is proposed.

9.5.4 Simulator Training

As per the Notification, Simulator training of 2 weeks is a must for Operation and Maintenance personnel of Thermal and Hydro plants. This is included in O&M training above. For safe and efficient functioning of manual and automatic equipment, personnel have to be trained on Simulators.

9.5.5 Training in Renewable Sources of Energy

Since the nature of energy system itself is likely to change in the future, it is essential that renewable energy be integrated into traditional engineering curriculum.

Apart from above, it is proposed that specialized training of at least 1-2 months should be given in various renewable energy technologies like solar, wind, bio-mass, small hydel etc.

9.5.6 Training in Demand Side Management, Energy Efficiency and Energy Conservation

Training for Energy Managers and Energy Auditors, Top Level Industry personnel, Operators, Farmers, Drivers, General Public & Youth should also be provided in respect of DSM, Energy conservation & Energy efficiency. Energy conservation should also be a part of course curriculum for students.

9.5.7 Power System Operators Training & Certification

System Operators & Engineers should be given regular refresher training and the new entrants should be given exhaustive training of 3 months. This training shall be required to be given to about 250 – 300 trainees every year during the 12th Plan.

9.5.8 Capacity Building under R-APDRP

It is envisaged that around 50,000 employees of various state power distribution utilities will be trained under Part C of R-APDRP scheme with focus on enhancing skills at various levels for efficient management and operation. A provision of Rs. 200 crore has been kept in R-APDRP for capacity building, franchise development and training. It is recommended by the Sub-Group that training infrastructure development of distribution sector at an estimated investment of Rs 2700 crore may be allocated under this scheme for training during the 12th Plan.

9.5.9 National Training Program for Electricity Distribution Franchisee and C&D Employees under RGGVY

It is recommended to continue the training of skill development for existing and potential Franchisees and also to C&D Employees of Power distribution Utilities under RGGVY in 12th Plan as well.

9.5.10 HRD and Technical Competence Building due to Technology Advancement and R &D

In order to match the growth rate, technology advancement and R&D needs both skilled manpower as well as highly qualified research personnel are required to sustain a steady growth in technology development. Thus, emphasis needs to be laid upon skill development of such Manpower.

9.5.11 Introduction of Training on Attitudinal Changes / Behavioural Sciences

It is recommended that training on Attitudinal Changes / Behavioural Sciences may be introduced in the curriculum of induction level training as well as retraining programs. After undergoing such training, the personnel develop a sense of belongingness to the organization.

In addition to technical Skills, Power Professionals need to have soft skills like Communication Skills, Time Management, Team Work, Technical Writing, Ethics etc.

9.5.12 Training in Information Technology

Information technology has pervaded all spheres of life. Adequate training according to the job requirement should be provided in the field of information technology. Use of IT should be promoted and maximum number of personnel should be made computer literate.

9.5.13 Opportunities for Higher Studies

Subsequent to the introduction of advanced technology and its widespread use in power sector, Utilities should facilitate its employees by way of up gradation of their qualifications for both technical & non-technical personnel for developing expertise in their area of functioning.

9.5.14 Training of Non-Technical Officers and Staff

It has been noticed that in the technology centered organizations like Power Utilities, the training of Non-technical officers and staff is often neglected/ignored. Training of non-technical officers and staff should be done on regular intervals in the functional skills/Management areas in association with the concerned Institutes as per needs.

9.5.15 HRD and Capacity Building for Power Generating Stations

It is proposed to have a capacity building program for the Executives, Engineers, and Operators of Thermal Power Stations in both State and Central Sectors in the areas of Energy Management and Energy Audit during 12th and 13th Plans.

9.5.16 Training for Nuclear Power Personnel

Due to stringent safety requirements and other national and international regulations, every person working in Nuclear Power Sector is exposed to very specialized training. To meet the multi-disciplinary needs, the Department of Atomic Energy (DAE) has built in-house training facilities both for professionals and non-professionals.

9.5.17 Training Abroad

Live liaison should be made with the concerned authorities to depute the eligible personnel for training in the developed countries to keep them updated with the latest global developments.

9.5.18 Hot Line Maintenance Training

There is a great demand from various Utilities for Hot Line maintenance Training. There is an urgent need for augmentation of Training Capacity as this type of Training is presently being imparted by only one institute.

9.5.19 Vocational Training for Youths & Project Affected Persons (PAPs) near Project sites

Training institutes of projects should impart vocational training to youths and Project Affected Persons (PAPs) of neighborhood to make them employable.

9.5.20 Training through Distance learning education & Web based Training

Since it may not be possible for all the Persons engaged in Construction and O&M of Power Projects, knowledge upgradation & training is suggested through correspondence and also by way of Web based Training.

Other measures for development of Human Resource are as follows:

(a) Adoption of ITIs

Already many CPSUs have adopted ITIs. It is proposed that more ITIs should be adopted by CPSUs.

(b) Need for written Training Policy by every Utility

Every Central Sector, State Sector & Private Sector utility should have a written Training Policy indicating how the Organisation proposes to meet its Training needs.

(c) Provision for Training budget

In line with the National Training Policy for the Power Sector, every organization should have a training budget starting from 1.5% to 5% of annual salary budget.

9.6 TRAINING INFRASTRUCTURE REQUIREMENTS VIS-À-VIS AVAILABILITY DURING 12TH PLAN.

Overall training load during 12th Plan is estimated as 2473.41 thousand man-weeks/year. The available training infrastructure is 1945.69 thousand man-weeks/year. Thus, there is a deficit of training infrastructure for 527.72 thousand man-weeks/year.

Training Load

Training requirement for 12th and 13th Plans have been worked out with the following assumptions:

- i) O&M Training to all existing employees engaged in O&M of generating projects (Thermal, Hydel, Gas) and Transmission & Distribution System as per statutory requirements under the Gazette Notification September 2010 issued by CEA ranging from 4 Weeks to 30 Weeks.

This inter-alia includes the following:

- Classroom Training
- Simulator Training for Thermal and Hydel
- On-Job Training

- ii) Induction training of one month to all freshly recruited technical and non-technical persons.
- iii) Minimum one-week training (Refresher/Managerial) every year for all technical and non-technical personnel in line with National Training Policy for Power Sector.

The requirement of Training has been summarized in following tables.

Table 9.11
Classroom Training Infrastructure Requirement vs Availability for 12th Plan
(For O&M of Generating Projects and T&D system as per CEA norms)

S No	Area	(Infrastructure in Thousand-Man-Weeks/Year)			
		Training Load/ Classroom Infrastructure required	Classroom Infrastructure available	Surplus (+) Deficit (-)	Cost (Rs Crs)
TECHNICAL					
1	Thermal (O&M)	316.86	255.64	-61.22	470.93
	Engineers	175.07	133.66	-41.42	318.58
	Operators	25.53	34.35	8.82	-67.83
	Technicians	116.26	87.64	-28.62	220.18
2	Hydro (O&M)	109.50	31.72	-77.79	598.35
	Engineers	82.87	18.43	-64.44	495.67
	Operators	5.92	2.75	-3.17	24.39
	Technicians	20.72	10.54	-10.18	78.29
3	Power System				
	Transmission	38.72	45.13	6.41	-49.34
	Engineers	18.56	11.14	-7.42	57.07

(Infrastructure in Thousand-Man-Weeks/Year)					
S No	Area	Training Load/ Classroom Infrastructure required	Classroom Infrastructure available	Surplus (+) Deficit (-)	Cost (Rs Crs)
	Operators	16.83	6.15	-10.68	82.16
	Technicians	3.33	27.84	24.51	-188.57
	Distribution	369.67	20.71	-348.96	2684.34
	Engineers	71.28	4.04	-67.24	517.25
	Operators	66.31	5.19	-61.12	470.17
	Technicians	232.08	11.48	-220.60	1696.91
	Total	834.75	353.20	-481.56	3704.27

Table 9.12
Simulator Training Infrastructure Requirement vs Availability
(Thermal & Hydro Simulators as per CEA Norms) for 12th Plan

S No	Area	Simulator Training required (Thousand-Man-Weeks/Year)	Simulator Infrastructure available (Thousand-Man- Weeks/Year)	Surplus (+) Deficit (-) (Thousand-Man- Weeks/Year)	Cost (Rs Crs)
1	Thermal	33.43	4.58	-28.86	245.95
2	Hydro	17.76	0.45	-17.31	157.34
	Total	51.19	5.03	-46.17	403.29

Table 9.13
Total Cost for adding Classroom Infrastructure & Simulators

S No	Particulars	Cost (Rs Crs)
1	Cost for adding Classroom Infrastructure	3704.27
2	Cost for adding Simulators	403.29
	Total	4107.56

Table 9.14
Summary of additional Training Infrastructure Cost for meeting CEA Norms (In Rs Cr)

S No	Particulars	Thermal	Hydro	Transmission	Distribution	Total
1	Trg to Engineers	318.58	495.67	57.07	517.25	1388.57
2	Trg to Operators	-67.83	24.39	82.16	470.17	508.89
3	Trg to Technicians	220.18	78.29	-188.57	1696.91	1806.82
	Sub-Total (A)	470.93	598.35	-49.34	2684.34	3704.27
4	Simulator Trg (B)	245.95	157.34	-	-	403.29
	TOTAL (A+B)	716.88	755.69	-49.34	2684.34	4107.56

Table 9.15
Total Training Infrastructure Requirements vis-à-vis Availability & Annual Training Fees Cost

S No	Particulars	Annual Requirement (Thousands-Man-Weeks/Year)	Availability (Thousands-Man-Weeks/Year)	Deficit (Thousands-Man-Weeks/Year)	Annual recurring Cost towards Training Fees (Rs Crs)
A	TECHNICAL PERSONNEL				
1	Estimated Overall Training Load for 12th Plan				
a	O&M Training as per CEA norms	1862.12	1334.40	-527.72	1862.12
b	Induction Training @ 4 weeks/Yr	250.33	250.33	0.00	250.33
c	Refresher Training @1 week/Yr	173.42	173.42	0.00	173.42
d	Management Training (In India/Abroad) @ 1Week/Yr	43.36	43.36	0.00	43.36
	Sub-total A	2329.23	1801.51	-527.72	2329.23
B	NON-TECHNICAL PERSONNEL				
a	Induction Training @ 4 weeks/Yr	75.80	75.80	0.00	75.80
b	Refresher Training @1 week/Yr	54.71	54.71	0.00	54.71
c	Management Training (In India/Abroad) @ 1Week/Yr	13.68	13.68	0.00	13.68
	Sub-total B	144.18	144.18	0.00	144.18
	Total (A + B)	2473.41	1945.69	-527.72	2473.41

9.7 FUNDING

9.7.1 Funding for Classroom Training Infrastructure for Engineers, Supervisors and Operators

The infrastructure requirement for class-room training for engineers, supervisors and operators has been calculated as 834.75 thousand-man-weeks per year. The infrastructure available for class-room training for engineers, supervisors and operators has been estimated as 353.20 thousand-man-weeks per year. Therefore, there is a deficit of 481.56 thousand-man-weeks per year of class room infrastructure.

The cost of setting up a new institute, which can accommodate 100 trainees or augmenting an existing Institute is Rs. 40 crore approximately excluding cost of land. This would provide training equivalent to 5.2 thousand man-weeks per year. The new infrastructure to be created shall broadly include the following:

- i) Construction of Building which shall include Class-rooms, Office Chambers of Faculty, Conference Rooms, various Labs, Computer Labs, Audio-visual equipments, Library, etc.
- ii) Construction of Hostels for accommodating trainees.
- iii) Staff Quarters, Guest Houses etc.

Therefore to create the infrastructure required to cater to the training load deficit of 481.56 thousand man weeks per year during 12th Plan, an investment of Rs. 3704.27 crore shall be required, which is equivalent to setting up of 92 new Institutes or augmenting existing Institutes.

9.7.2 Funding for Thermal Simulator Infrastructure

As per the Gazette Notification, September 2010 of CEA, Persons working in the O&M of Thermal Power Plants have to undergo 2 weeks Simulator training. The infrastructure available for Simulator training has been calculated based on the existing Simulators available in the country, which is 4.58 thousand-man-weeks per year. The infrastructure requirement has been calculated as 33.43 thousand-man-weeks per year. Therefore, there is a deficit of 28.86 thousand-man-weeks per year of Simulator infrastructure.

The cost of setting up a new Simulator is Rs. 6.00 crore approximately. Considering a batch size of 16 and total number of 22 batches in a year, one training simulator can provide 0.704 thousand-man-weeks in a year. Therefore to create the Simulator infrastructure required for deficit training requirement of 28.86 thousand-man-weeks per year during the 12th Plan, the Simulator infrastructure cost has been calculated as 245.95 crore. Thus 41 Simulators are required to meet the training requirement.

9.7.3 Funding for Hydro Simulator Infrastructure

As per the Gazette Notification, September 2010 of CEA, persons working in the O&M of Hydel Power Plants have to undergo 2 weeks Simulator training. The infrastructure available for Simulator training has been calculated based on the existing Simulators available in the country, which is 0.45 thousand-man-weeks per year. The infrastructure requirement has been calculated as 17.76 thousand-man-weeks per year. Therefore, there is a deficit of 17.31 thousand-man-weeks per year of Simulator infrastructure.

The cost of setting up a new Simulator is Rs. 4.00 crore approximately. Considering a batch size of 10 and total number of 22 batches in a year, one training simulator can provide 0.44 thousand-man-weeks in a year. Therefore, to create the Simulator infrastructure required for deficit training requirement of 17.31 thousand-man-weeks per year during the 12th plan, the Simulator infrastructure cost has been calculated as Rs. 157.34 crore. Thus 39 Simulators are required to meet the training requirement.

9.7.4 Additional Sanction and Appointment of Trainers and Administrative/Support staff

For every 15 trainees, 1 faculty and 2 administrative/support staff are required to carry out the training activities. Therefore, additional manpower has to be sanctioned and appointed to run the new training institutes and meet the training requirements of the power sector. Total deficit of Training needs for O & M of Generation, Transmission & Distribution Projects during the 12th Plan is estimated at 527.72 Thousands-man-weeks/yr. This inter-alia implies that additional manpower of 2028 which shall consist of 669 number of trainers and 1359 numbers of administrative/support staff shall be required. Assuming an average annual salary of one person as Rs. 8 lakhs, approx. annual salary bill shall be. Rs. 162.24 crore.

9.7.5 Funding for Training

Funding has been estimated based on the infrastructure cost of establishing new Institutes.

Training load for every year is estimated to be 2473.41 thousand-man-weeks. Assuming training fee and lodging & boarding charges of Rs. 10,000/- per trainee per week, the total annual expenses for the training works out to approx. Rs. 2473.41 crore.

Following is the summary of the capital expenditure and annual recurring expenditure:

Table 9.16
Summary of Capital & Annual recurring expenditure

Item	Funds required in 12th Plan in Rs. crore for establishment of new Training Infrastructure (A)	Annual Training Cost in Rs. crore towards Cost of Training Fees (B)
Classroom Infrastructure for Engineers	1388.57	
Classroom Infrastructure for Supervisors	508.89	
Classroom Trg. Infrastructure for Technicians	1806.82	
Sub-total for class rooms Training Infrastructure	3704.27	
Thermal Simulator Infrastructure	245.95	
Hydro Simulator Infrastructure	157.34	
Subsidy towards training fee		2473.41
Total	4107.56	2473.41

9.7.6 Justification for Funding

Capacity addition in power sector is a highly capital intensive investment. The delivered cost of 1 MW of power works out to approximately Rs. 12 Crore per MW as per the following broad break-up:

Generation capacity addition cost for 1 MW = Rs. 6-8 crores

Establishment of T&D infrastructure for 1 MW = Rs. 6 crores

In the 12th Plan, a capacity addition of about 75,000 MW is planned. Thus, capacity addition of about 75,000 MW shall cost about Rs. 11 lakh crores including T&D system.

In the financial year 2010-11, generation in the country was 811.148 BU. Assuming that the expenditure on training improves a PLF of 1% per annum and reduces AT&C losses by 1%, the additional energy available shall be 2% of 811.148 BU, which works out to 16.223 BU. Assuming that the average cost of supply is Rs. 4.67 per unit, additional 2% power available shall be worth Rs. 7576.14 crores.

It is to mention that presently the average PLF of Central Sector Power Plants is 83.1% and that of State Sector Power Plants is 63.93% and some of the power plants are even operating at PLF greater than 90%. Thus, there is ample scope of improvement of PLF.

Further presently average annual AT&C losses are around 28%, while the ideal figure should be about 10 - 15%. Thus, there is also ample scope of reduction of AT&C losses.

While PLF increase of 1% and AT&C loss reduction of 1% has been assumed, a possibility exists that actual improvement may be much more also.

1 MW of a power project at 80% PLF can generate an annual energy of 7.008 MU. Thus, extra power availability of about 2% amounting to 16,223 MU is equivalent to 2315 MW of capacity addition, investment of which shall cost Rs. 27,780 crores @ Rs. 12 crore per MW.

From the above, it can be seen that the investment of Rs. 4108 crores made for creating additional training infrastructure is paying for itself and leads to an avoided capacity addition of 2315 MW costing Rs. 27,780 crores. Thus, investment in training infrastructure is justified.

The investment in training infrastructure is leading to extra power availability costing Rs. 7576.14 crores while annual recurring expenditure towards cost of Training fees is Rs. 2473.41 crores. Thus annual recurring expenditure towards cost of Training fees is justified.

Extra investment in training will lead to extra power availability as explained above leading to increase in productivity and GDP of the country.

Thus, above investment in creating additional training infrastructure and annual recurring expenditure towards cost of Training fees is justified.

Table 9.17
Justification for Funding for creating Training Infrastructure assets

Particulars	Quantum	Unit
MU generated by a 1 MW Power Project at 80% PLF per Year	7.008	MU
MU Generated in the Country during FY 2010-11	811148	MU
2% Additional energy available in MU by expenditure on Training (1% by improvement in PLF & 1% by reduction in AT&C loss)	16223	MU
Equivalent avoided Capacity addition in MW for 16223 MU	2315	MW
Avoided cost of Capacity addition in Rs Crs @ Rs 12Crs/MW	27780	Rs Crs
Investment proposed in creating Additional Training Infrastructure (Rs Crs)	4108	Rs Crs
Savings	23672	Rs Crs

Table 9.18**Justification for incurring annual recurring expenditure towards cost of Training fees**

Particulars	Amount	Unit
Annual Training Cost/Yr	2473.41	Rs Crs
2% Additional energy available in MU by expenditure on Training (1% by improvement in PLF & 1% by reduction in AT&C loss)	7576.14	Rs Crs
Annual Saving	5102.73	Rs Crs

Above analysis shows that expenditure for creating Training Infrastructure assets and incurring annual recurring expenditure towards cost of Training fees is justified.

9.8 RECOMMENDATIONS

It is proposed that all Central Sector Utilities, all state Sector Utilities and all IPPs should create sufficient Training Infrastructure for providing O&M training as per the norms stipulated in notification of September 2010 issued by CEA. Additional training Infrastructure should also be created by Organizations like NPTI & Training Institutes of other Utilities and they should also augment their existing Training Institutes for meeting the increased training requirements of the Power Sector. It is also proposed that all existing nine Institutes of NPTI should be augmented for which estimated cost for augmentation per Institute is Rs. 50.00 crore and for nine institutes it works out to Rs. 450 crore, for which necessary Plan funding may be provided by Ministry of Power.

The following options are available for meeting the funding arrangements.

- i) As per National Training Policy each organization should allocate training budget between 1.5% to 5% of annual salary budget.
- ii) Each utility engaged in generation and transmission could set aside 0.25% of profit annually for meeting the training expenses.
- iii) Training infrastructure for distribution could be funded through R-APDRP.
- iv) Funds could be sought under the National Skill Development Program of Ministry of Human Resource Development for meeting the Training requirements.
