# CAPITAL INVESTMENT PLAN FOR FY 2007-11

BY

TECHNICAL SERVICES

**NORTH DELHI POWER LIMITED**
NDPL Bhawan, Hudson Lines
Kingsway Camp,
Delhi 110 009

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## CHAPTER – 1

# BACKGROUND

## 1.1 NDPL PROFILE

North Delhi Power Limited (NDPL), a joint venture between Tata Power and the Government of NCR of Delhi had taken over the distribution of electric power in the area of Delhi Vidyut Board (DVB) w.e.f. 1st July 2002. With a registered consumer base of around 9.1 lakhs and a peak load of around 1100 MW, the company's operations span across an area of 510 sq kMs. The daily average energy requirement of NDPL is about 17 MUs, with annual energy requirement of around 5700 MUs.

For administrative purpose NDPL is split into 46 zones comprising of 20,000 – 40,000 consumers each. Power is delivered to the consumer premises either by the company directly or through 24 odd Single point delivery (SPD) contractors still remaining out of the 210 SPD's inherited from DVB times. NDPL also maintains the street light in its area on behalf of Road owning/Revenue agencies. The various consumer touch points include Consumer Care Centers (12 Nos.), Zonal Centers (46 Nos.), Business District offices (12 Nos.) and Consumer Call Centers. Table 1.1 below gives the list of 12 Business District Offices.

**Table 1.1**

| S. No | Business District Offices |
|---|---|
| 1 | Bawana |
| 2 | Narela |
| 3 | Rohini |
| 4 | Mangolpuri |
| 5 | Shalimar Bagh |
| 6 | Badli |
| 7 | Shakti Nagar |
| 8 | Civil Lines |
| 9 | Model Town |
| 10 | Keshav puram |
| 11 | Moti Nagar |
| 12 | Pitam pura |

## 1.2 JOURNEY TOWARD EXCELLENCE

NDPL, in the last five years, has been the frontrunner in implementing power distribution reforms and has made persistent efforts to become a consumer centric, value driven organization. Systems such as SCADA, GIS and OTS are the cornerstone of the company's distribution automation project. To fight the menace of power theft, modern techniques like High Voltage Distribution (HVDS) System and LT Arial Bunch Conductor have been adopted. Since privatization, the AT&C losses in NDPL areas have shown a record decline. As against the committed target reduction of 17% in five years, NDPL has reduced the AT&C losses by 24.42% in 5 years (from 48.1% in Jul 02 down to 23.68% as on FY 2006-07). The introduction of breakthrough technologies, structured maintenance schedules and dynamic organization structure have ensured remarkable improvement in the power supply situation manifested by the significant improvement in Reliability Indices such as SAIDI & SAIFI. Further NDPL has embarked upon an ambitious plan to implement high-tech automated systems for its entire distribution network.

NDPL has in the last five years introduced several breakthrough concepts in Consumer Service such as Sharing of 100% consumers' billing database on website, Automatic Meter Reading; SMS based fault management system, 24x7 operational stores, Door step offering for new connection, Quarterly Independent Consumer Satisfaction Survey, Gift Electricity Scheme 'Urja', etc. NDPL believes in providing more value than just electricity and rewards its consumers for timely payment through discount coupons on popular brands such as Westside, Tata Indicom etc.

NDPL has also become the youngest company and the first power distribution utility in India to receive the prestigious CII EXIM Award for 'Strong Commitment to Excel'. It is also the only distribution utility to receive the ISO 9001, ISO 14001 and OHSAS 18001 certification. Recently, NDPL has been awarded with the Expert Choice's Award for the "Most Admired Organisation" in the Joint/Private Sector instituted by the Power Line magazine. NDPL is also the proud recipient of the ASIAN POWER AWARDS for Excellence in Service Enhancement for the year 2006.

After privatization, various technical and physical audits were conducted in all the existing 40 grid stations, 2800 distribution substations, 3383 distribution protection systems, metering systems, buildings of grid substations, distribution substations, cash collection centers, consumer collection centers etc. which indicated severe inadequacies in the system. Most of the existing infrastructure were in a highly dilapidated condition and were causing reliability and safety hazards. NDPL initiated several measures to enhance the quality of the network and took proactive measures in the growth areas which in turn improved the overall system performance. Various system studies were conducted by CEA, KEMA and Cyme and recommendations were received for establishment of new grid substations, augmentation of power transformers, renovation of existing grid & distribution substations, addition of shunt capacitors, etc. These studies and audits have been the basis of capital expenditure made in the last five years

CHAPTER – 2

# CAPITAL INVESTMENT MADE UPTO 2007

## 2.1 Capital Investment since July 2002

Capital investments were made under the following benefit centers:

1. AT&C loss reduction
2. System Reliability Improvement
3. Growth development plan for meeting the load growth
4. Creation of infrastructure facilities including administration buildings

The expenditures made from FY 2002 to FY 2007 have been summarized in Table - 2.1:

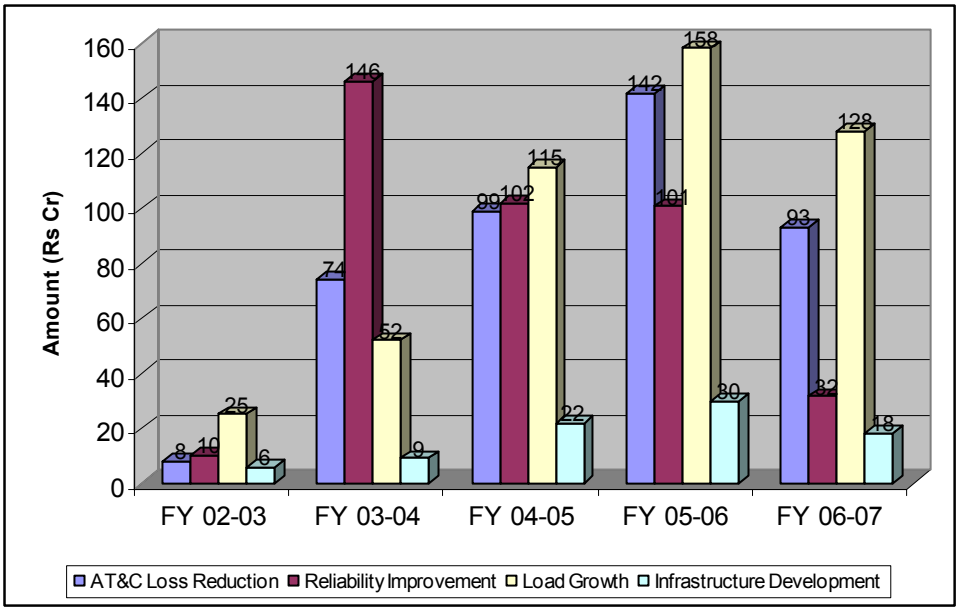
**Table – 2.1**

| CAPEX EXPENDITURE INCURRED FROM FY 2002- 07 | | | | | | | |
|---|---|---|---|---|---|---|---|
| **SN** | **Job Heads** | **2002-03*** | **2003-04** | **2004-05** | **2005-06** | **2006-07** | **TOTAL** |
| **A** | **AT&C Loss Reduction** | 8 | 74 | 99 | 142 | 93 | 416 |
| **B** | **Reliability Improvement** | 10 | 146 | 102 | 101 | 32 | 390 |
| **C** | **Load Growth** | 25 | 52 | 115 | 158 | 128 | 478 |
| **D** | **Infrastructure Development** | 6 | 9 | 22 | 30 | 18 | 85 |
| **GRAND TOTAL** | | **49.0** | **281.0** | **338.0** | **431.0** | **271** | **1369** |

- For 9 Months period
- All the figures are rounded off

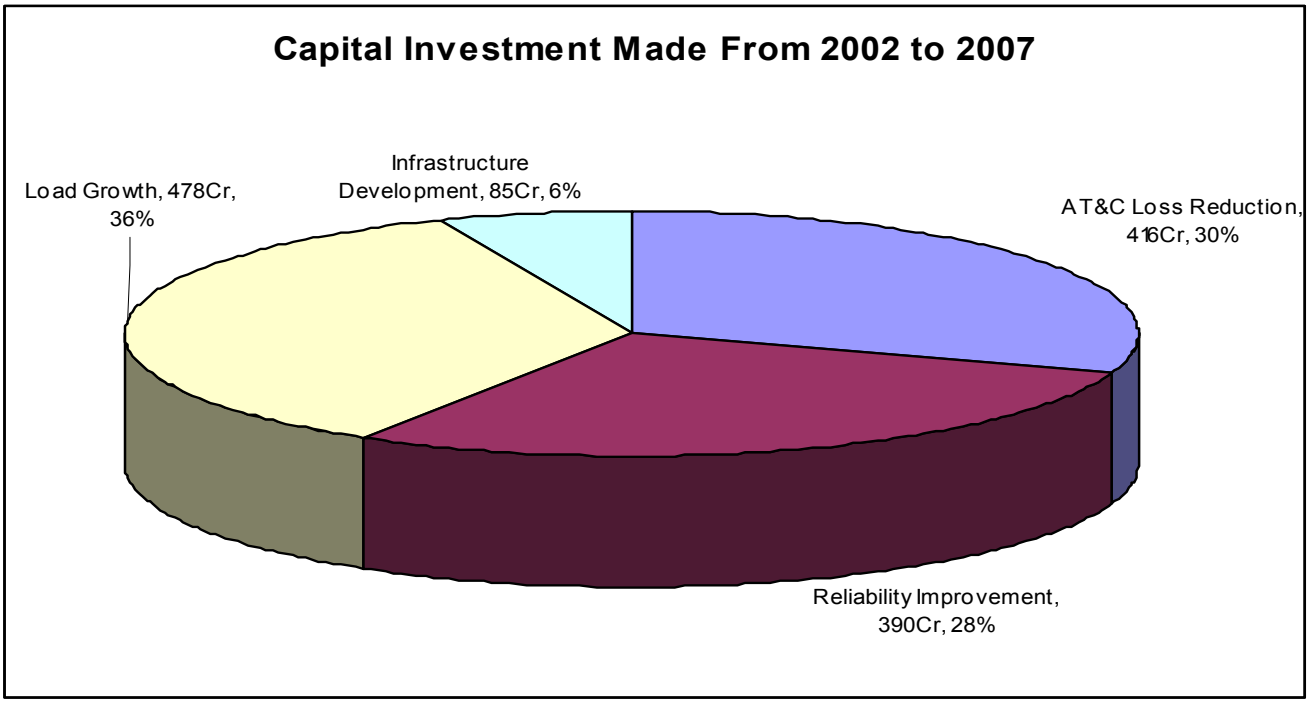
The details of year wise capital expenditure under different benefit heads from FY 2002 to 2007 is elaborated in chart – 2.1

**Chart 2.1**




The percentage of benefit head wise overall capital expenditure made from FY 2002 to FY 2007 has been shown below:

**Chart 2.2**



## 2.2 DETAILS OF CAPITAL INVESTMENT INCURRED

For each of the above benefit centers, the prime investment heads are delineated below:

### 2.2.1 AT&C loss reduction:

Major initiatives taken by NDPL for reducing AT&C losses are mentioned below:

- Metering systems
- High Voltage Distribution Systems (HVDS)
- Replacement of LT bare conductor with LT AB Cable.
- Installation of Capacitor Banks

#### (a) Metering system

The study of energy input and energy billed from July 02 to June 03 was conducted and it was observed that against the input energy of 5391 MU energy billed was only 2847 MU. This indicated an abnormally high distribution losses and one of the ways arresting the losses was to replace the existing electro-mechanical meters, which tend to slow down with passage of time due to provision of jewel bearings for supporting the rotating disc and become sluggish with the passage of time. The measurement of energy by such meters is not reliable.

NDPL replaced the existing electro-mechanical meters with static meters which are tamper proof with almost no accuracy change with passage of time as these do not have moving parts. Further these meters are having features to record power factor, demand etc to suit the tariff awarded by DERC. The details of electrostatic meters installed are given in table below:

**Table – 2.2**

| Period | Electronic Meters Installed (Nos) |
|---|---|
| July 02-03 | 61693 |
| FY 03-04 | 245022 |
| FY 04-05 | 227126 |
| FY 05-06 | 135184 |
| FY 06-07 | 107392 |
| **TOTAL** | **776417** |

While the Electronic meters with tamper detection facilities were provided, due to several extraneous factors, the year 2005 saw vested interests raise doubts on

accuracy of Electronic meters including the matter being taken to courts. As on date, while CEA, Courts and DERC have vindicated the use of Electronic meters, there is still severe resistance to replace the balance meters. Moreover, external devices are now being sold openly to affect proper reading by Electronic meters. New challenges have adversely impacted the AT&C losses in several localities.

**(b) High Voltage Distribution Systems (HVDS)**

Under HVDS, the existing LT network in theft prone areas is replaced by HT network and new small capacity transformers are installed, which are nearer to the load centers and cover reduced no. of consumers. HVDS also enhances reliability by localizing faults and contribute to better quality of supply by eliminating the need for long low-tension lines. The system reduces systems technical losses, and has thus helped NDPL to meet the AT&C loss reduction targets.

In the first phase HVDS was planned in theft prone areas and new growth areas. All new electrifications have been installed on HVDS to the extent possible.

However, it is seen that in areas infested with anti-lawful elements, direct tappings are being taken from transformer bushing despite all technical attempts to stop the same including welding metal boxes, applying hardened putty to the terminals etc. No law & order support has been able to provide & facilitate respite and such rampant un-lawful tappings are multiplying now, in such of the select areas.

**(c) Replacement of LT bare conductor with LT AB Cable**

The replacement of LT bare conductor lines results in reduced direct hookings done on bare LT conductor lines. Although there is no reduction of any technical losses due to installation of LT AB cable lines the commercial losses get considerably reduced.

Such replacements of LT bare conductor with LT AB Cables have been done in the theft prone areas where direct hooking of bare LT lines were observed.

While this has brought about an overall positive impact, there are, however, areas where such cables have been destroyed and tappings restored.

**(d) Installation of Capacitor Banks**

The system average power factor for NDPL was in the range of 0.89 which needed to be improved for two reasons:

- Improved power factor would reduce the current flow through overloaded NDPL network.
- Improved power factor would reduce the bill for reactive energy imported from the grid.

NDPL in its Capex Plan for 2003-08 had projected capacity addition of 172 MVAR of shunt capacitors, which included 20 MVAR per year for the load augmentation of 50 MW assumed per year for the projection period.

**LT Capacitors:**

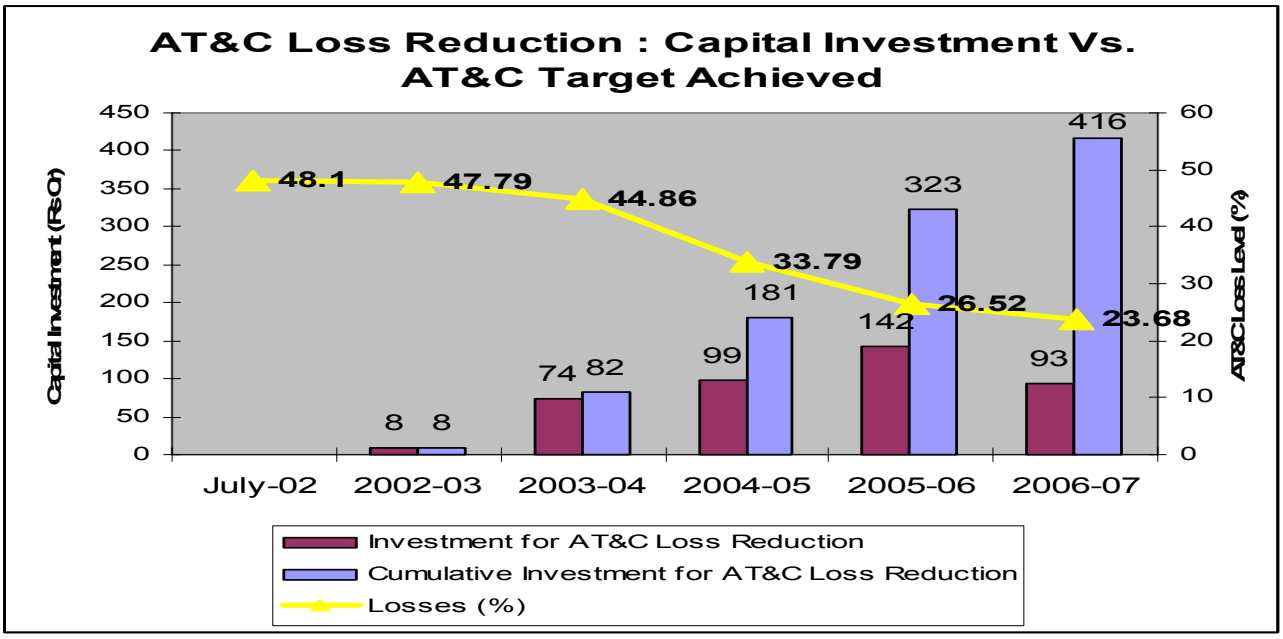
A total of 128 capacitor banks of 320 kVAR and 257 capacitors banks of 220 kVAR have been installed since July 2002.

**HT Capacitors:**

NDPL has installed 34 new 11 kV capacitor banks of 7.2 MVAR at new as well as existing grid sub-stations.

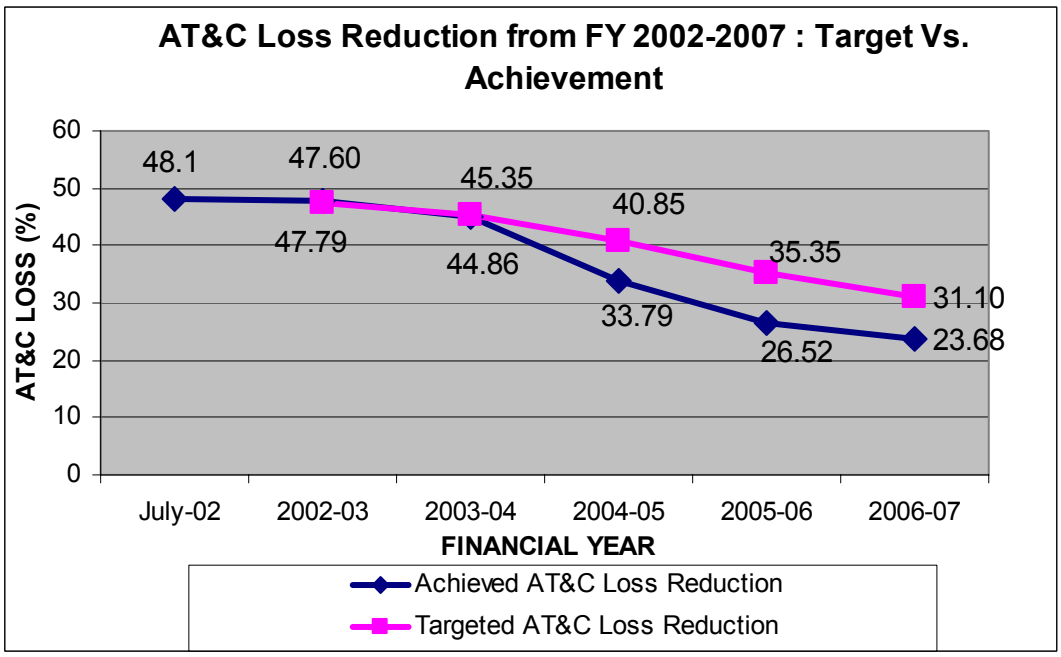
The cumulative expenditure made for AT&C loss reduction Vs actual reduction in AT&C losses is shown below:

**Chart – 2.3**




NDPL was mandated to reduce AT&C losses from over 48 % (considering the bid value) at the time of takeover to the targeted value of 31% in five years. Through its persistent efforts NDPL has surpassed all records and as against a committed target reduction of 17% in 5 years, NDPL has reduced AT&C losses by about 24.42% (considering the bid value) in these 5 years. A comparison of the targeted value as against achieved Loss reduction figures is mentioned below:

**Chart – 2.4**




### 2.2.2 System Reliability Improvement

Reliability and Quality of supply has been another important factor on which NDPL has primarily focused in the last five years. Extensive studies have been carried out in consultation with KEMA and using special analysis tools like Cyme, PSAF etc to understand the reliability needs of the system. The concept of N-1 reliability has been implemented at 33kV and 66 kV level which is now planned to be implemented at 11kV level also in near future. Many types of equipment which existed in highly depleted condition and were assessed to be non-repairable have been replaced by new state-of-art equipments. The old existing equipments were obsolete and used to break down frequently resulting in long outage durations. The new equipments are SCADA compatible and can facilitate remote operations for future requirements.

Major initiatives taken by NDPL for improving reliability are mentioned below:

- Automation – SCADA, GIS Implementation
- AMR Installation
- RMU installation by replacement of old HT panels.
- Replacement of Sick Cables
- Other System Improvement Works

**(a) Automation – SCADA, GIS Implementation:**

**Grid Substation Automation:**

45 grids of NDPL are automated with latest technology for remote connectivity to SCADA center. 35 out of these grids are remotely monitored. Grid station automation include change of 66/33 KV /11 control and relay panel replacement with new panels fitted with state of Art IEDs and data concentrator. These stations are equipped with devices to make all control, monitoring and protection signal available at remote control center for efficient control and monitoring of Electrical network

**(i) Communication Backbone establishment:**

All the 50 Grids and major commercial offices are connected through a strong optical fiber backbone with capacity of 2.4 Gbps in core ring and 644 Mbps in sub rings. The Communication backbone is used for both operational (SCADA) and enterprise requirement like SAP, GIS etc and other data requirement such

as internet, mail, video conferencing etc. This backbone has availability of more than 99.9%. Last mile connectivity to all zones is extended through RF and optical fiber with min. bandwidth of 2 Mbps.

**(ii) SCADA system**:

NDPL has completed the process of establishing of SCADA system and it is functioning from March 2007. It has enabled NDPL to control all connected grids from a SCADA Master Control Center at Pitampura - III. SCADA system is designed with the concept of main control center and backup control center is part of disaster management.

**(iii) Geographical Information System (GIS)**:

NDPL has Established GIS system for complete NDPL area. All Assets such as transformers, Buildings, Poles, Cables etc have been mapped in the software. More then 8,00,000 consumers are also mapped on the system. The GIS system has been operational for the last one year.

**(b) Automatic Meter Reading (AMR):**

NDPL has also established the first of its kind Automatic Meter Reading (AMR) system for all of its high end consumers. This system has completely eliminated manual intervention in the process of meter reading to the final printing of the bill. NDPL has established about 23,000 AMR modems which are read remotely through a common meter reading software for high revenue consumer. The software which was developed by NDPL has capability to read meters of any make and it is first of its kind in India. The system has been in operation from last two year.

**(c) RMU installation by replacement of old HT panels.**

NDPL has done the technical audits of all the grids and distribution sub-stations. Based on the findings of the technical audit it was decided to replace the old 11 kV switchgear with state of art SF6 panels. All these panels are SCADA compatible. NDPL has so far replaced more than 2000 no. of old 11 kV RMUs with SF6 RMUs.

### (d) Replacement of Sick Cables

Old 11kV underground cables with history of frequent and a number of faults have been replaced to ensure reliable and continuous power supply. NDPL has so far replaced more than 250 kM of underground cable network.

### (e) Other System Improvement Works

Other works such as installation/replacement of Autoreclosers, LT ACB, old 11kV switchgears have been carried out to improve system reliability

The targeted figures for CAIDI, SAIFI and Reliability Index as against the achieved, as a result of the measures stated above, are depicted below:

**Chart – 2.5**

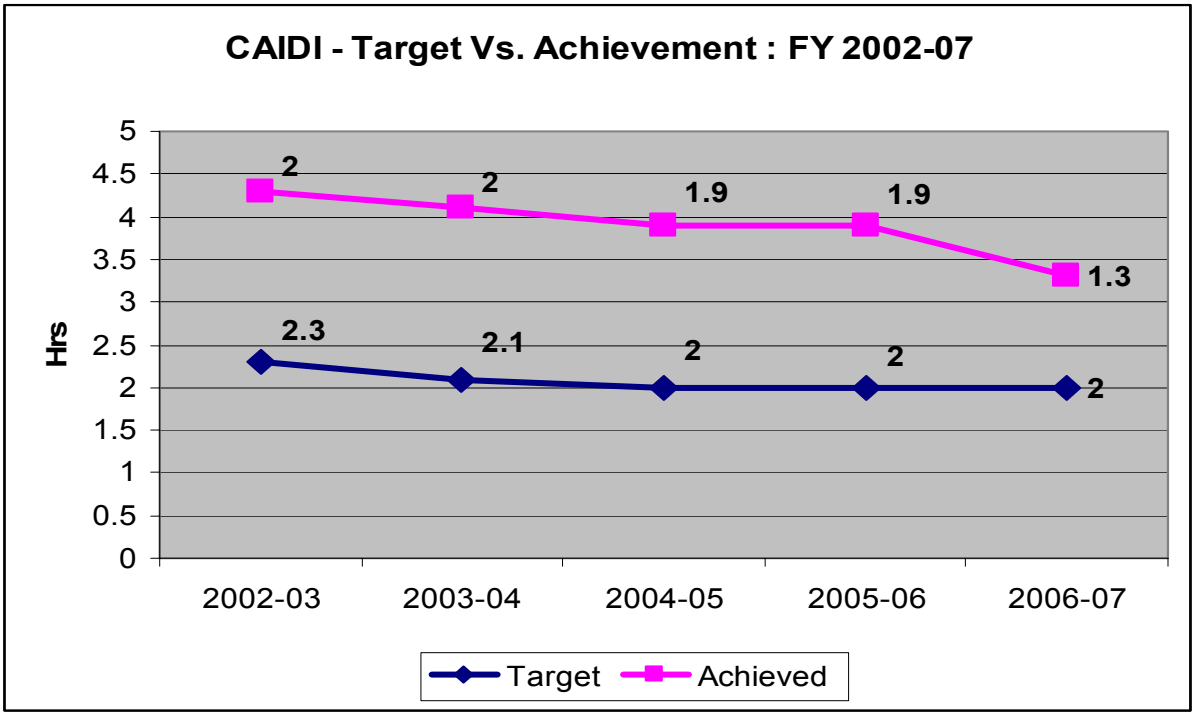



**Chart – 2.6**

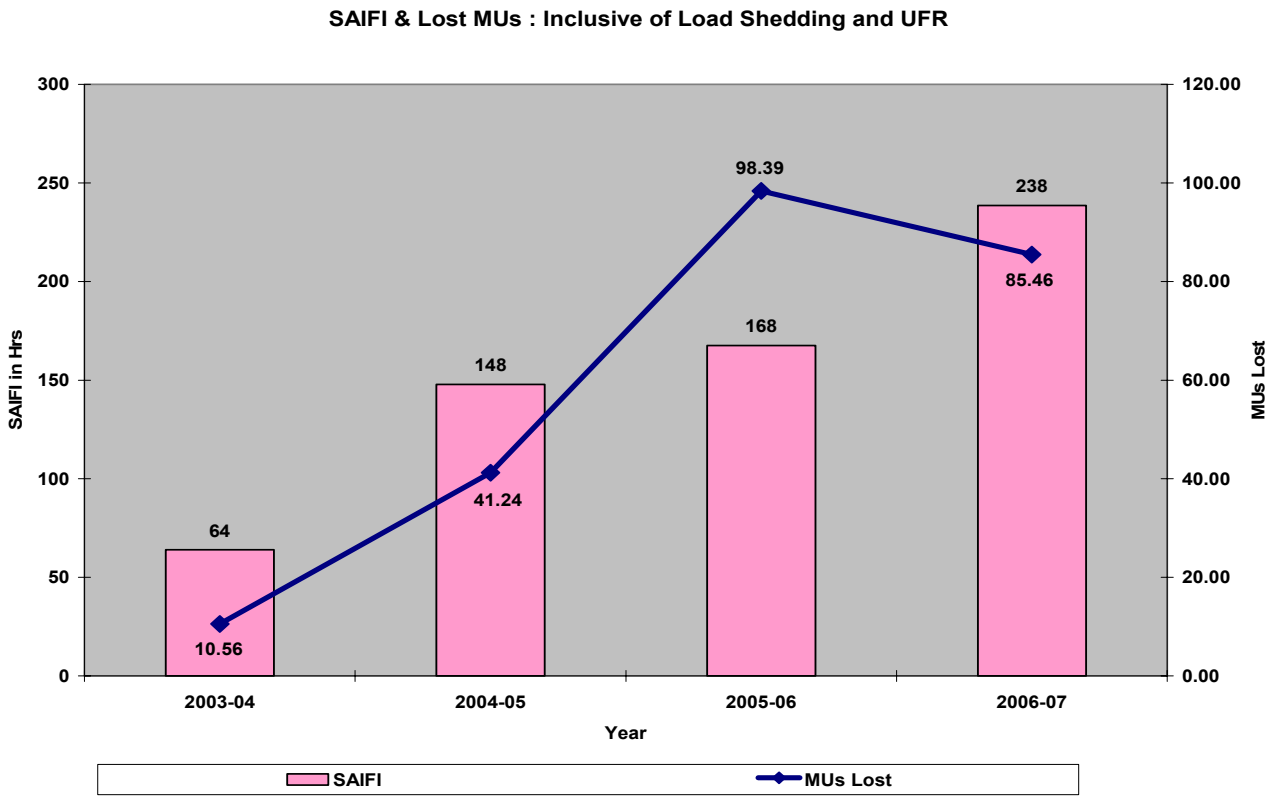
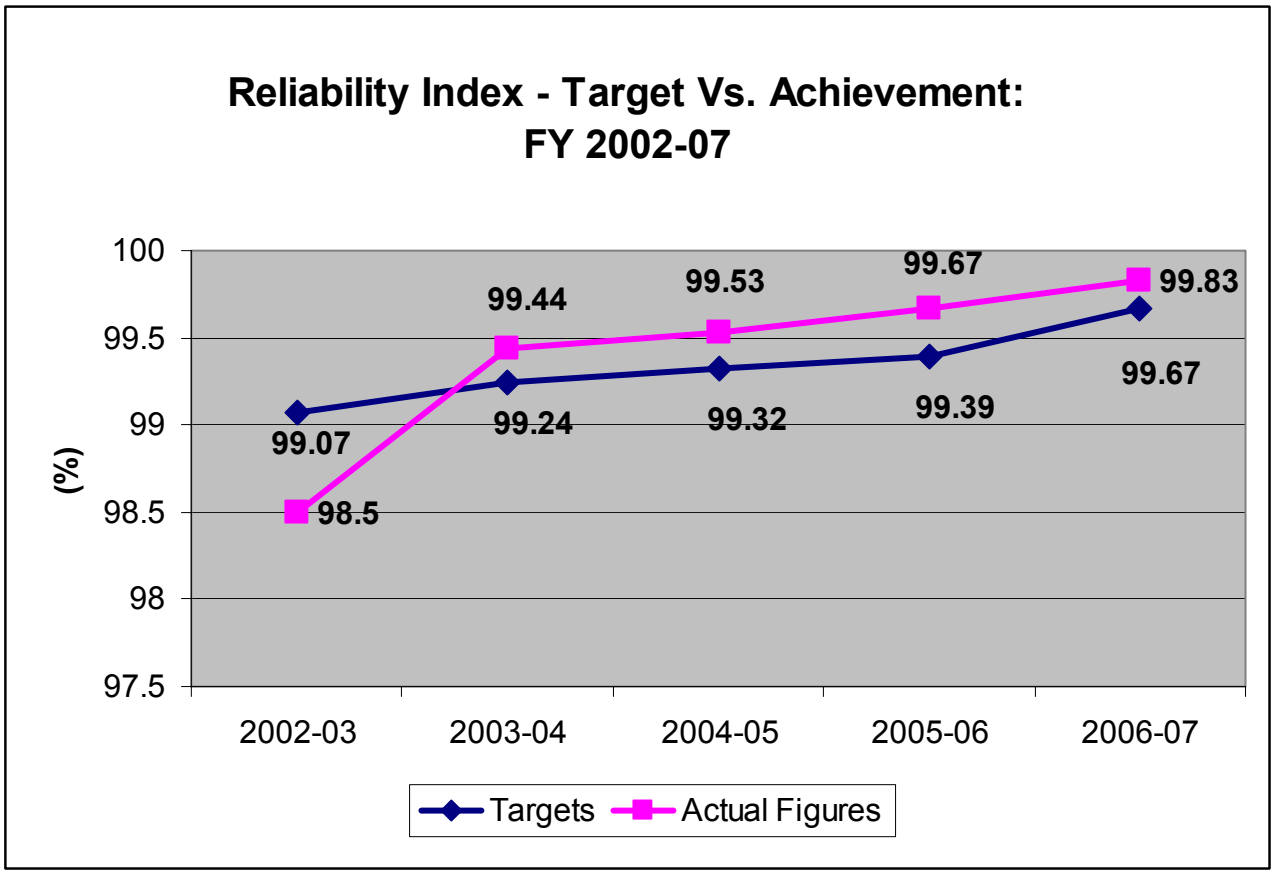



**Chart – 2.7**




## 2.2.3. **Load Growth**

NDPL since take over has added the following new grids:

**Table - 2.3**

| List of New Grids | |
|---|---|
| **33/11 kV** | |
| 1 | Rama Road |
| 2 | Civil Lines |
| 3 | Sudarshan Park |
| 4 | Pandav Nagar |
| 5 | Tripolia |
| 6 | Wazirabad |
| 7 | Payal |
| 8 | DIFR |
| **66/11 kV** | |
| 1 | A 7 Narela |
| 2 | Bawana 6 |
| 3 | Bawana 7 |
| 4 | DSIDC II |
| 5 | Bawana CWW |
| 6 | Rohini 22 |

In addition capacity of number of grids has been augmented to meet the growing demand.

NDPL has also made the following additions to its network:

**Table – 2.4**

| Addition of sub-transmission and distribution lines from 2002-2007 | | | |
|---|---|---|---|
| **S.N.** | **Item** | **FY 2002** | **FY 2007** |
| 1 | 33 kV and 66 kV OH/UG Lines (kM) | 332.5 | 549.2 |
| 2 | 11 kV OH/UG Lines(kM) | 2245 | 3191 |
| 3 | LT Lines (kM) | 4172 | 5574.7 |
| **Addition of Transformation Capacity From 2002-2007** | | | |
| 1 | Power Transformer (MVA) | 1651 | 2770 |
| 2 | Distribution Transformers (MVA) | 1703 | 2988 |

CHAPTER – 3

# POWER SCENARIO IN DELHI

## 3.1 ENERGY REQUIREMENT AND PEAK DEMAND

Delhi comes under the northern regional grid and the energy requirement in Northern Region during 2004-05 was 482.46 MU per day as against 446.23 MU per day during 2003-04 (i.e. an increase of 8.12%), whereas the peak demand during the same period has increased by 11.39%. Table – 3.1 shows the requirement of energy, and peak demand in the year 2003-04 and 2006-07.

**Table – 3.1**

**Energy requirement (MU) in Northern Region**

| States | Energy Requirement (MU) | | | | |
|---|---|---|---|---|---|
| | 2003-04 | 2004-05 | 2005-06 | 2006-07 | Growth % |
| Chandigarh | 1088 | 1157 | 1260 | 1323 | 21.6 |
| Delhi | 20440 | 21157 | 21602 | 22060 | 7.9 |
| Haryana | 20743 | 21801 | 23791 | 25860 | 24.67 |
| H.P | 3439 | 4000 | 4302 | 5068 | 47.4 |
| J&K | 7105 | 8138 | 9065 | 11573 | 62.9 |
| Punjab | 31420 | 33393 | 35682 | 38029 | 21.0 |
| Rajasthan | 26611 | 29207 | 32052 | 32787 | 23.2 |
| U.P | 46552 | 52017 | 55682 | 56621 | 21.62 |
| Uttranchal | 4197 | 4625 | 5155 | 5873 | 40.0 |
| **Northern Region** | **161595** | **175495** | **188591** | **199194** | **23.26** |

**Peak Demand (MW) in Northern Region**

| States | Peak Demand (MW) | | | | |
|---|---|---|---|---|---|
| | 2003-04 | 2004-05 | 2005-06 | 2006-07 | Growth % |
| Chandigarh | 188 | 224 | 240 | 234 | 24.5 |
| Delhi | 3389 | 3558 | 3722 | 3736 | 10.2 |
| Haryana | 3465 | 4037 | 4333 | 4201 | 21.2 |
| H.P | 670 | 678 | 788 | 873 | 30.3 |
| J&K | 1268 | 1316 | 1450 | 1309 | 3.2 |
| Punjab | 5922 | 7122 | 7731 | 6558 | 10.7 |
| Rajasthan | 4134 | 4786 | 5588 | 4946 | 19.6 |
| U.P | 7218 | 7877 | 8175 | 7531 | 4.4 |
| Uttranchal | 777 | 846 | 991 | 991 | 27.5 |
| **Northern Region** | **27031** | **30444** | **33018** | **30379** | **12.4** |

It may be noted that almost in the entire region, the peak demand is growing at a higher pace as compared to the energy requirement. Besides other reasons, this phenomenon can be attributed to growing urbanization, changes in life style and efficiency improvement (in terms of reduction in losses) in the distribution system. Specifically in case of Delhi, the reduction in losses has led to suppressed increase in energy requirement, whereas the higher penetration of electronic appliances (due to growing urbanization) have led to higher increase in the peak demand during the past few years. It can be substantiated from the Table – 3.2 which summarizes the energy and peak requirement in Delhi.

**Table – 3.2**

| Demand Supply situation in Delhi | | |
|---|---|---|
| **FY** | **Peak Demand Met (MW)** | **Energy Requirement Met (MU)** |
| 2000-01 | 2670 | 17582 |
| 2001-02 | 2879 | 18741 |
| 2002-03 | 3101 | 19567 |
| 2003-04 | 3289 | 20160 |
| 2004-05 | 3490 | 20952 |
| 2005-06 | 3600 | 21281 |
| 2006-07 | 3736 | 21943 |
| **CAGR** | **5.76%** | **3.76%** |

The energy demand in Delhi has been rising over the past decade. The peak demand has shown a CAGR of 5.76% and the Energy Requirement has shown a CAGR of almost 4% over the years as indicated in Table 3.2

## 3.2 POWER SCENARIO FOR NDPL AREA

Similar trend has been observed in the NDPL area. The peak demand in NDPL area is growing consistently over the past few years. For instance, peak demand in NDPL area has increased from 957 MW to 1000 MW during the period FY06 to FY07

It may also be highlighted that whereas the energy requirement is showing a suppressed increase, the total billed consumption has increased by a CAGR of 13.88% during the past five years in the NDPL area. The Table – 3.3 shows the billed consumption (in MUs) to different consumer categories in NDPL system from 2002-03 to 2006-07. As seen in the Table – 3.3, the billed consumption has increased at the rate of 11.5 % in domestic category, 17.13 % in non domestic category, 19.03 % in industry and 26.49 % in other consumer categories.

**Table – 3.3**

| Consumer category-wise billed consumption | | | | | | |
|---|---|---|---|---|---|---|
| **Consumer Category** | **2002-03** | **2003-04** | **2004-05** | **2005-06** | **2006-07** | **CAGR** |
| Domestic | 1316 | 1504 | 1543 | 1725 | 1824 | 11.50% |
| Non-Domestic | 519 | 642 | 687 | 778 | 834 | 17.13% |
| Industry | 851 | 858 | 1188 | 1409 | 1435 | 19.03% |
| Other | 127 | 192 | 249 | 242 | 257 | 26.49% |
| **Total** | **2813** | **3196** | **3667** | **4154** | **4350** | **13.88%** |

CHAPTER – 4

# CAPEX PROPOSED FOR FY 2007-11

## 4.1 Power Scenario in near future:

The Master Plan for Delhi-2021, envisages a higher population growth in next 15 years through migration and natural growth in new areas like Bawana, Narela, Rohini etc. It has been highlighted in the plan that in order to cater to these new consumers; infrastructure has to be developed in a long term perspective. There has been increase in natural growth and decrease in immigration of population from 1981-2001. It is projected that future increase/growth will be both because of relocation/migration and natural growth. It is also envisaged that the land use pattern will continue to change in future which will have some impact on industrial and commercial activity. However, it needs to be highlighted that this phenomenon was prevalent in the past and to an extent gets captured in the Delhi growth rates on average. The projected energy profile of NDPL for the Control Period 2007-08 to 2010-11 is given in Table – 4.1.

**Table – 4.1**

| Energy Profile | | | | | | |
|---|---|---|---|---|---|---|
| **S. No.** | **Year** | **Energy Input (Mus)** | **Energy consumption (Mus)** | **AT&C Losses (%)** | **Peak Demand (MW)** | **Average Requirement (MW)** |
| 1 | 2007-08 | 6410 | 4936 | 23.00 | 1150 | 795 |
| 2 | 2008-08 | 6758 | 5339 | 21.00 | 1227 | 838 |
| 3 | 2009-10 | 7133 | 5778 | 19.00 | 1319 | 885 |
| 4 | 2010-11 | 7588 | 6222 | 18.00 | 1418 | 941 |

NDPL has formulated the targets for AT&C loss reduction based on the recommendation of the APDRP Committee's, headed by Mr. P Abraham. While NDPL would undertake every effort to achieve the laid targets, the following factors may create hindrance with regard to the same:

The following factors make it difficult to achieve the aforesaid losses:

- The technical losses as on date stand at nearly 13%.
- External devices are now openly available in the market to tamper with the reading of electronic meters. Also, severe resistance is being faced from public

regarding replacement of old electro mechanical meters. Meter tampering and erroneous reading through old electro mechanical meters contributes aound 5% of AT&C losses.

- Direct hooking in slum areas account for nearly 5% of AT&C losses.
- Nearly 2% AT&C loss is on account of street light energy charges not being paid by the local agency.

The above forecasts as listed in Table 4.1 have been prepared based on Auto-regression methodology whereby correlation of the factors like past growth trend in terms of electricity, macro-economic indices/factors, population and industrial growth with the demand for electrical energy is done to determine the future energy demand.

However, it may be noted that the forecast does not take into account any special project or event that the city may see in the near future leading to a rapid/ abnormal acceleration of industrial and commercial activity in the licensed area or accelerated expansion of the residential sector. Also, the forecast has been made for "unrestricted" energy and load demand. The actual energy supply and peak demand "met" may be lower due to supply restrictions that necessitate load curtailment. Effect of factors such as open access, captive generation, etc., have not been considered in the forecasts. Graphical representation of estimated inputs vs consumption for the period 2007-11 is depicted in Chart 4.1

**Chart – 4.1**

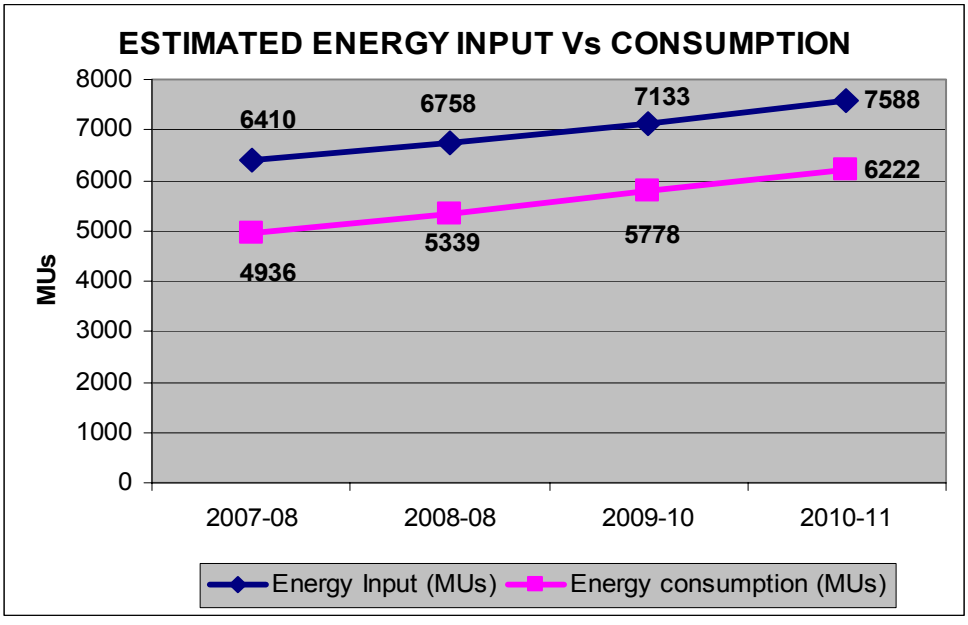
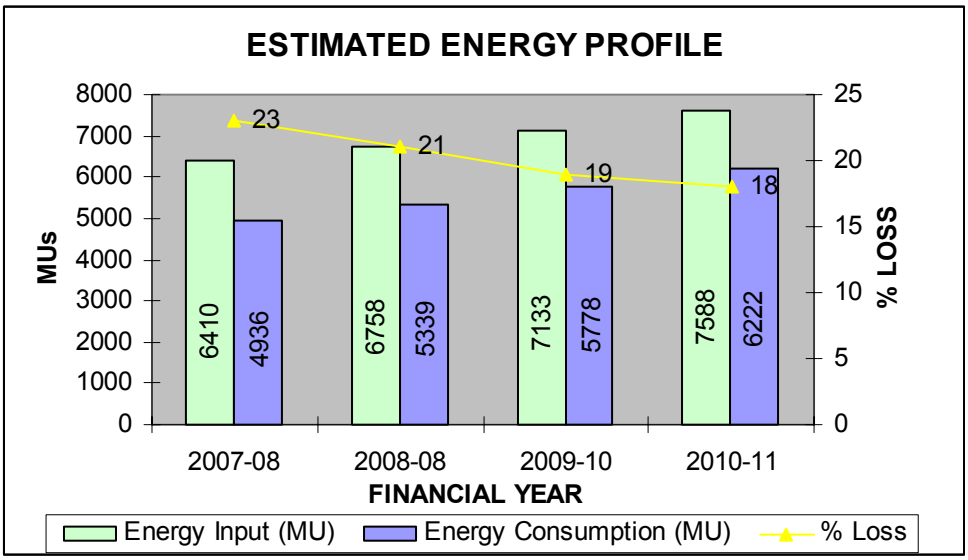


Chart – 4.2 shows estimated AT&C Losses in percentage against estimated energy input and consumption for the period of 2007 to 2011.

**Chart – 4.2**




To achieve the above targeted AT&C loss reduction, NDPL has carried out a detailed analysis of capital investment required for next four years. The analysis is based on various technical and physical audits carried out both by outsourced agencies and NDPL staff followed by discussions at various levels and review by senior management.

NDPL Capex Plan, which is explained later in the chapter, is worked out after amalgamating the requirement at various levels. The total capital investment required at NDPL for the control period 2007-11 is estimated at Rs. 850 Cr.

The deployment of capital investment is proposed under the following benefit centers:

1. Growth Development Plan to meet the load growth
2. AT&C loss reduction
3. System Reliability Improvement
4. Creation of infrastructure facilities & administrative buildings

For each of the above benefit centers, the investment has been broken into the following sub-centers:

1. **Growth Development Plan to meet the load growth**
    a. New grid sub-station
    b. Augmentation of existing grids

2. **AT&C loss reduction**
    a. Metering System
    b. High Voltage Distribution System
    c. LT Aerial Bunched Conductor

3. **System Reliability Improvement**
    a. 11 kV switchgear and Control Panel
    b. SCADA and distribution automation
    c. HT Lines and Cables

4. **Creation of Infrastructure Facilities & Administrative Buildings.**
    a. Administrative Buildings
    b. Consumer Care Centers and Cash Collection Centers
    c. Miscellaneous items like tools, communication equipment, testing lab etc.

In order to have better appreciation of capital investment, the Plan has been summarized in the following sections under the heads:

- Target Area wise Distribution of Capex.
- Geographical Distribution Wise Capex

## 4.2 Target Area wise Distribution of Capex:

For improving the performance of NDPL in terms of meeting the load growth, reduction of AT&C losses and reliability of supply, a detailed Capital Investment Plan has been worked out for the Control Period FY 07-11. The Capex Plan proposes an investment of Rs. 850 Crores. The deployment of Capex is proposed under the following four benefit centers:

| | | |
|---|---|---|
| Load Growth | : | Rs. 440 Crores |
| AT&C Loss reduction | : | Rs. 215 Crores |
| Reliability | : | Rs. 112 Crores |
| Administration and Infrastructure | : | Rs. 83 Crores |

52 % of the Capex has been reserved for deposit works and load growth. The losses have been reduced to nearly 23% during the last 5 years. NDPL is of the opinion that there is scope for reducing losses further, but reducing losses below 22% would be nightmarish for the reasons mentioned earlier. Therefore, 25 % of Capex has been allotted for AT&C loss reduction.

The investment plan during the period FY 2007-08 to 2010 – 11 totaling to Rs.850 Crores is as follows:

| Capital Investment Planning for FY 2007-2011 | | | | | | | | Cumulative Capital Expenditure |
|---|---|---|---|---|---|---|---|---|
| SN | Benefit Head | Target | 2007-08 | 2008-09 | 2009-10 | 2010-11 | TOTAL | FY 2002-07 |
| | | | Estimates | | | | | Actual |
| A. | NON DEPOSIT JOBS | | | | | | | |
| 1 | AT&C Loss Reduction | AT&C Loss (%) | 23.00 | 21.00 | 19.00 | 18.00 | | |
| | | **Amount (Rs. Cr)** | **74.45** | **60.0** | **46.0** | **35.0** | **215.4** | **416.0** |
| 2 | Reliability Improvement | Reliability Index (%) | 99.88 | 99.9 | 99.92 | 99.94 | | |
| | | CAIDI (Hrs) | 2.00 | 1.83 | 1.75 | 1.67 | | |
| | | SAIDI (Hrs) | 8.00 | 7.30 | 6.10 | 5.00 | | |
| | | SAIFI | 4.00 | 4.00 | 3.50 | 3.00 | | |
| | | **Amount (Rs. Cr)** | **41.54** | **24.0** | **24.0** | **22.0** | **111.5** | **390.0** |
| 3 | Load Growth | Energy Input (MUs) | 6410 | 6758 | 7133 | 7588 | | |
| | | Peak Demand (MW) | 1150 | 1227 | 1319 | 1418 | | |
| | | **Amount (Rs. Cr)** | **25.0** | **30.0** | **30.0** | **35.0** | **120.0** | **478.0** |
| 4 | Admin. Infrastructure | **Amount (Rs. Cr)** | **32.0** | **24.0** | **19.0** | **8.0** | **83.0** | **85.0** |
| | **Total Amount for Non Deposit Jobs (Rs. Cr) (A)** | | **173.0** | **138.0** | **119.0** | **100.0** | **530.0** | **--** |
| B. | DEPOSIT JOBS (No Funding From NDPL is Required) | | | | | | | |
| 1 | Deposit Works (B) | **Amount (Rs. Cr)** | **160.0** | **50.0** | **50.0** | **60.0** | **320.0** | **Not Bifurcated but included in Load Growth Head A3** |
| | **Total Amount for All Jobs (Rs. Cr) (A+B)** | | **333.0** | **188.0** | **169.0** | **160.0** | **850.0** | **1369.0** |

## Annexure - I
## CAPITAL INVESTMENT PLANNING FOR FY 2007-11

| A | BUDGET FOR NON DEPOSIT WORKS | | | | | |
|---|---|---|---|---|---|---|
| **1** | **AT&C Loss Reduction Schemes** | **2007-08** | **2008-09** | **2009-10** | **2010-11** | **Total** |
| 1.1 | Meter Replacement | 29.43 | 15.00 | 10.00 | 10.00 | |
| 1.2 | HVDS Work | 15.00 | 10.00 | 10.00 | 10.00 | |
| 1.3 | Replacement of LT Bare conductor to LT ABC | 20.00 | 20.00 | 16.00 | 10.00 | |
| 1.4 | LT ABC for Franchisee/ SPD | 10.00 | 15.00 | 10.00 | 5.00 | |
| **Subtotal for AT&C Loss Reduction** | | **74.4** | **60.00** | **46.00** | **35.00** | **215.4** |
| **2.0** | **Reliability Improvement Schemes** | | | | | |
| 2.1 | Auto Reclosures & Sectionalizer | 5.52 | 2.00 | 2.00 | 1.00 | |
| 2.2 | Automation Implementation | 12.00 | 5.00 | 5.00 | 5.00 | |
| 2.3 | Last Mile Connectivity including miscellaneous works | 5.00 | 5.00 | 5.00 | 5.00 | |
| 2.4 | Life Extension Program | 1.00 | 2.00 | 2.00 | 1.00 | |
| 2.5 | 11 kV system Augmentation works | 10.00 | 10.00 | 10.00 | 10.00 | |
| 2.6 | 11 kV Sick Cable Replacement | 6.00 | | | | |
| 2.7 | Testing/Meter reading Instruments | 2.02 | | | | |
| **Subtotal for Reliability Improvement** | | **41.5** | **24.00** | **24.00** | **22.00** | **111.5** |
| **3.0** | **Load Growth Schemes** | | | | | |
| 3.1 | **EHV Works** | | | | | |
| 3.1.1 | New Grid Substations | 25.00 | 30.00 | 30.00 | 35.00 | |
| 3.1.2 | 33 & 66 kV Lines & Cables | | | | | |
| 3.1.3 | Addition/Augmentation of Bays/Transformers | | | | | |
| 3.1.4 | EHV System Improvement | | | | | |
| **Subtotal for Load Growth** | | **25.00** | **30.00** | **30.00** | **35.00** | **120.0** |
| **4.0** | **Infrastructure Development Schemes** | | | | | |
| 4.1 | Civil Infrastructure Projects | 14.00 | 10.00 | 8.00 | 3.00 | |
| 4.2 | Information Technology | 14.00 | 8.00 | 6.00 | 3.00 | |
| 4.3 | Administration support (Fourniture, Vehicles, A.Cs etc.,) | 4.00 | 6.00 | 5.00 | 2.00 | |
| **Subtotal for Infrastructure Development** | | **32.00** | **24.00** | **19.00** | **8.00** | **83.0** |
| **Total for Non Deposit Works (A)** | | **173.0** | **138.00** | **119.00** | **100.00** | **530.0** |
| **B** | **BUDGET FOR DEPOSIT WORKS** | | | | | |
| 1.0 | New Meters | 30.00 | 10.00 | 10.00 | 10.00 | |
| 2.0 | Electrical Works | 30.00 | 30.00 | 30.00 | 30.00 | |
| 3.0 | HVDS Load Growth | 10.00 | 5.00 | 5.00 | 10.00 | |
| 4.0 | LT ABC Load Growth | 8.00 | 5.00 | 5.00 | 10.00 | |
| 5.0 | Electrification of Ghevra Sevada | 82.00 | | | | |
| **Total for Deposit Works (B)** | | **160.0** | **50.0** | **50.0** | **60.0** | **320.0** |
| **TOTAL BUDGET (A+B)** | | **333.0** | **188.0** | **169.0** | **160.0** | **850.0** |
| **Projected Payback Period (Yr.)** | | **5.64** | **5.67** | **6.38** | **6.23** | |

### 4.2.1 Capex for Load Growth

The growth in NDPL area is expected to be higher than other areas in Delhi. A cumulative average growth rate of 7% has been assumed for NDPL area. In terms of peak load growth, an average of 65 MW growth every year has been considered. Based on the System Planning Studies being carried out by Central Electricity Authority for the XI Plan. The new grids have been planned by NDPL are depicted in Table – 4.2

**Table – 4.2**

| LIST OF PROPOSED NEW GRIDS | | | | |
|---|---|---|---|---|
| **SN** | **Year** | **Grid** | **Deposit*** | **Non-deposit** |
| 1 | 2007-08 | Rohini 28 | Deposit | |
| 2 | | Rohini District Center 1 | Deposit | |
| 3 | | Bawana DSIDC II | Deposit | |
| 4 | | Ghevra Sevada | Deposit | |
| 5 | | Delhi University | Deposit | |
| 6 | 2008-09 | Rohini District Center 2 | Deposit | |
| 7 | | Sultanpuri | | Non-deposit |
| 8 | | Burari | | Non-deposit |
| 9 | | Gopalpur | | Non-deposit |
| 10 | | Jagatpur | | Non-deposit |
| 11 | | Bawana DSIDC I | Deposit | |
| **SN** | | **Grid** | **Deposit** | **Non-deposit** |
| 13 | | Bhalswa | | Non-deposit |
| 14 | 2009-10 | Rohini 26 | Deposit | |
| 15 | | Pitampura H4/H5 | | Non-deposit |
| 16 | | Bawana DSIDC 8 | Deposit | |
| 17 | | Bawana DSIDC 9 | Deposit | |
| 18 | | Dhirpur | | Non-deposit |
| 19 | | Narela IFC | Deposit | |
| 20 | 2010-11 | Karala | | Non-deposit |
| 21 | | Rajasthan Udyog Nagar | | Non-deposit |
| 22 | | SMB Poorvi grid | | Non-deposit |
| 23 | | Wazirpur (IA) | | Non-deposit |

* Subject to DERC guidelines.

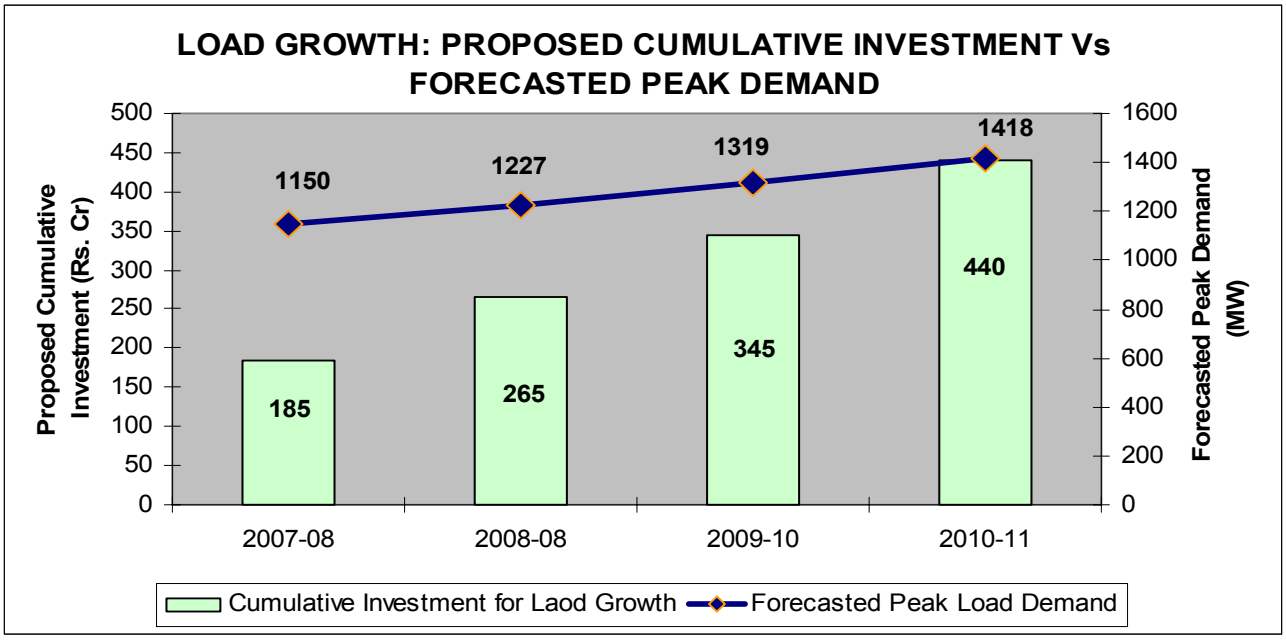
Table – 4.3 gives the District wise Capex allocation to meet the fund requirement for the new grids mentioned above and for other deposit works.

## Table – 4.3

| CAPEX 2007-11 for Load Growth | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Circle** | **S. No.** | **District** | **2007-08** | **2008-09** | **2009-10** | **2010-11** | **Total** |
| Sub Urban Circle | 1 | Bawana | 42.21 | 18.25 | 18.25 | 21.68 | **100.39** |
| | 2 | Narela | 11.46 | 4.96 | 4.96 | 5.89 | **27.27** |
| Metro Circle | 3 | Rohini | 32.83 | 14.20 | 14.20 | 16.86 | **78.08** |
| | 4 | Mangolpuri | 5.21 | 2.25 | 2.25 | 2.68 | **12.39** |
| Urban Circle | 5 | Shalimar Bagh | 18.76 | 8.11 | 8.11 | 9.63 | **44.62** |
| | 6 | Badli | 5.21 | 2.25 | 2.25 | 2.68 | **12.39** |
| Town Circle | 7 | Shakti Nagar | 9.90 | 4.28 | 4.28 | 5.08 | **23.55** |
| | 8 | Civil Lines | 15.63 | 6.76 | 6.76 | 8.03 | **37.18** |
| | 9 | Model Town | 14.07 | 6.08 | 6.08 | 7.23 | **33.46** |
| City Circle | 10 | Keshav puram | 9.90 | 4.28 | 4.28 | 5.08 | **23.55** |
| | 11 | Moti Nagar | 5.21 | 2.25 | 2.25 | 2.68 | **12.39** |
| | 12 | Pitam pura | 14.59 | 6.31 | 6.31 | 7.49 | **34.70** |
| **Total** | | | **185.00** | **80.00** | **80.00** | **95.00** | **440.00** |

Proposed year wise investment for Load Growth (Cumulative) and corresponding forecasted Peak Demand is depicted in Chart – 4.3

## Chart – 4.3



### 4.2.2 Capex for AT&C Loss reduction

During the control period FY 07-11 NDPL is targeting a loss reduction of 5% (23% to 18%). To achieve this target an investment of Rs. 216 Crores has been proposed.

Zone wise allocation of Capex based on the AT&C loss levels and amount of revenue loss is given in Table 4.4.

**Table 4.4**

| Zone wise Capex for AT&C loss reduction | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **S.No** | **Zone No.** | **Zone name** | **District** | **07-08** | **08-09** | **09-10** | **10-11** | **Total** |
| 1 | 519 | Poothkalan | Mangolpuri | 4.09 | 3.30 | 2.53 | 1.93 | 11.85 |
| 2 | 518 | Sultanpuri | Mangolpuri | 4.09 | 3.30 | 2.53 | 1.93 | 11.85 |
| 3 | 515 | Mangolpuri | Mangolpuri | 4.09 | 3.30 | 2.53 | 1.93 | 11.85 |
| 4 | 502 | WPI A Blk | Keshavpuram | 4.09 | 3.30 | 2.53 | 1.93 | 11.85 |
| 5 | 1304 | Pusa | Moti Nagar | 4.09 | 3.30 | 2.53 | 1.93 | 11.85 |
| 6 | 511 | Ali Pur | Narela | 3.07 | 2.48 | 1.90 | 1.44 | 8.89 |
| 7 | 1302 | Naraina | Moti Nagar | 3.07 | 2.48 | 1.90 | 1.44 | 8.89 |
| 8 | 509 | WPIA Blk | Keshavpuram | 3.07 | 2.48 | 1.90 | 1.44 | 8.89 |
| 9 | 513 | Karala | Bawana | 3.07 | 2.48 | 1.90 | 1.44 | 8.89 |
| 10 | 414 | Burari | Shalimar Bagh | 2.05 | 1.65 | 1.27 | 0.96 | 5.92 |
| 11 | 402 | Gujrawalan Town | Model Town | 2.05 | 1.65 | 1.27 | 0.96 | 5.92 |
| 12 | 505 | Jahangir Puri | Shalimar Bagh | 2.05 | 1.65 | 1.27 | 0.96 | 5.92 |
| 13 | 517 | Bhaktawar Pur | Narela | 2.05 | 1.65 | 1.27 | 0.96 | 5.92 |
| 14 | 522 | DSIDC | Narela | 1.95 | 1.58 | 1.21 | 0.92 | 5.66 |
| 15 | 422 | Shahzada Bagh | Shakti Nagar | 1.95 | 1.58 | 1.21 | 0.92 | 5.66 |
| 16 | 514 | Narela | Narela | 1.95 | 1.58 | 1.21 | 0.92 | 5.66 |
| 17 | 551 | Avantika | Rohini | 1.95 | 1.58 | 1.21 | 0.92 | 5.66 |
| 18 | 417 | Kamla Nagar | Civil Lines | 1.95 | 1.58 | 1.21 | 0.92 | 5.66 |
| 19 | 516 | Prahladpur | Badli | 1.95 | 1.58 | 1.21 | 0.92 | 5.66 |
| 20 | 504 | Saraswati Vihar | Pitampura | 1.95 | 1.58 | 1.21 | 0.92 | 5.66 |
| 21 | 1303 | Lakkad Mandi | Moti Nagar | 1.95 | 1.58 | 1.21 | 0.92 | 5.66 |
| 22 | 520 | Jai Mata Market | Keshavpuram | 1.12 | 0.90 | 0.69 | 0.53 | 3.23 |
| 23 | 506 | Shalimar Bagh | Shalimar Bagh | 1.12 | 0.90 | 0.69 | 0.53 | 3.23 |
| 24 | 510 | Rani Bagh | Pitampura | 1.12 | 0.90 | 0.69 | 0.53 | 3.23 |
| 25 | 531 | Haiderpur | Shalimar Bagh | 1.12 | 0.90 | 0.69 | 0.53 | 3.23 |
| 26 | 521 | Pooth Khurd | Bawana | 1.12 | 0.90 | 0.69 | 0.53 | 3.23 |
| 27 | 507 | Samaya Pur | Badli | 1.12 | 0.90 | 0.69 | 0.53 | 3.23 |
| 28 | 416 | Vijay Nagar | Civil Lines | 0.89 | 0.72 | 0.55 | 0.42 | 2.59 |
| 29 | 1301 | Rama Road | Moti Nagar | 0.89 | 0.72 | 0.55 | 0.42 | 2.59 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 30 | 530 | Lok Vihar | Pitampura | 0.89 | 0.72 | 0.55 | 0.42 | 2.59 |
| 31 | 412 | Model Town | Model Town | 0.89 | 0.72 | 0.55 | 0.42 | 2.59 |
| 32 | 503 | Bhalswa | Shalimar Bagh | 0.89 | 0.72 | 0.55 | 0.42 | 2.59 |
| 33 | 418 | Timarpur | Civil Lines | 0.60 | 0.48 | 0.37 | 0.28 | 1.72 |
| 34 | 561 | Rithala | Rohini | 0.60 | 0.48 | 0.37 | 0.28 | 1.72 |
| 35 | 421 | Vivaka Nand Puri | Shakti Nagar | 0.60 | 0.48 | 0.37 | 0.28 | 1.72 |
| 36 | 413 | Mukherjee Nagar | Model Town | 0.60 | 0.48 | 0.37 | 0.28 | 1.72 |
| 37 | 512 | Bawana | Bawana | 0.60 | 0.48 | 0.37 | 0.28 | 1.72 |
| 38 | 415 | Adarsh Nagar | Model Town | 0.62 | 0.50 | 0.38 | 0.29 | 1.80 |
| 39 | 425 | Shastri Nagar | Shakti Nagar | 0.62 | 0.50 | 0.38 | 0.29 | 1.80 |
| 40 | 501 | Keshav Puram | Keshavpuram | 0.62 | 0.50 | 0.38 | 0.29 | 1.80 |
| 41 | 411 | Civil Lines | Civil Lines | 0.62 | 0.50 | 0.38 | 0.29 | 1.80 |
| 42 | 423 | Tibya College | Shakti Nagar | 0.62 | 0.50 | 0.38 | 0.29 | 1.80 |
| 43 | 581 | Badli Residential | Badli | 0.62 | 0.50 | 0.38 | 0.29 | 1.80 |
| 44 | 508 | Pitampura | Pitampura | | | | | |
| 45 | 571 | Rohini | Rohini | | | | | |
| 46 | 424 | Shakti Nagar | Shakti Nagar | | | | | |
| **Total** | | | | **74.43** | **60.00** | **46.00** | **35.00** | **215.4** |

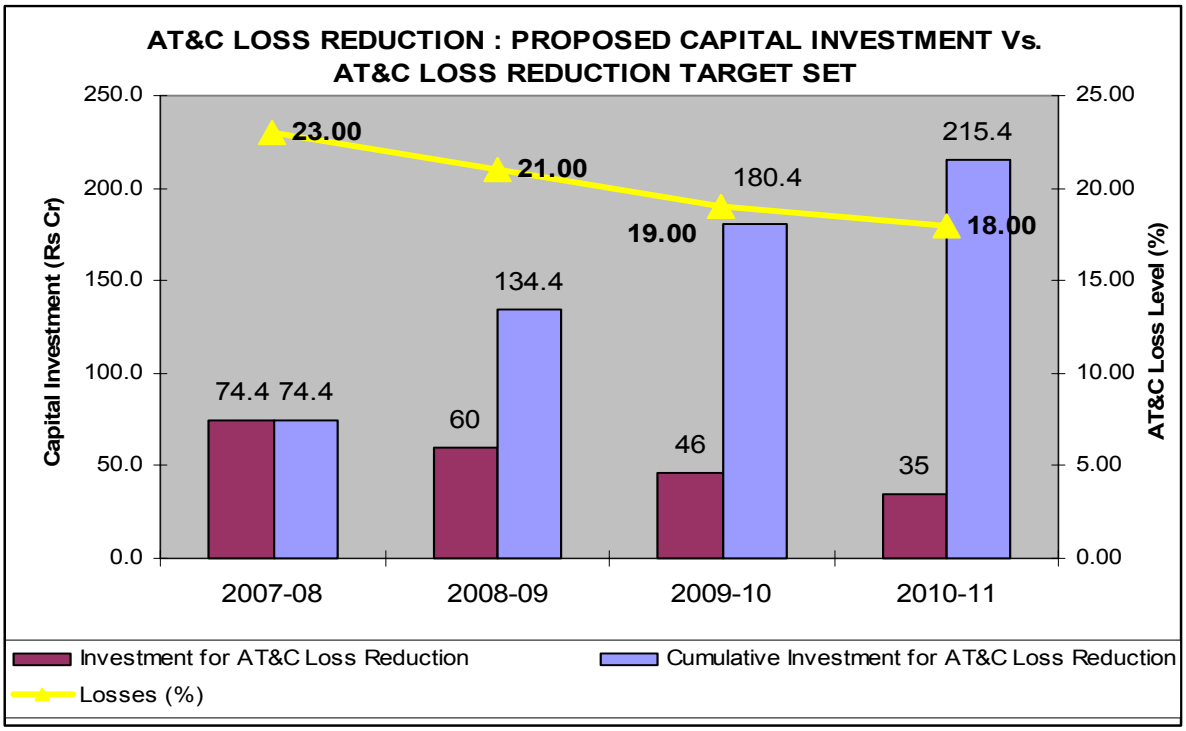
District wise allocation is given in Table 4.5.

**Table – 4.5**

| District wise CAPEX for AT&C | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Circle** | **S. No.** | **District** | **2007-08** | **2008-09** | **2009-10** | **2010-11** | **Total** |
| Sub Urban Circle | 1 | Bawana | 4.78 | 3.86 | 2.96 | 2.25 | **13.84** |
| | 2 | Narela | 9.02 | 7.28 | 5.58 | 4.24 | **26.12** |
| Metro Circle | 3 | Rohini | 2.55 | 2.06 | 1.58 | 1.20 | **7.38** |
| | 4 | Mangolpuri | 12.28 | 9.90 | 7.59 | 5.78 | **35.55** |
| Urban Circle | 5 | Shalimar Bagh | 7.22 | 5.82 | 4.46 | 3.40 | **20.90** |
| | 6 | Badli | 3.69 | 2.98 | 2.28 | 1.74 | **10.68** |
| Town Circle | 7 | Shakti Nagar | 3.79 | 3.06 | 2.34 | 1.78 | **10.97** |
| | 8 | Civil Lines | 4.06 | 3.28 | 2.51 | 1.91 | **11.76** |
| | 9 | Model Town | 4.16 | 3.35 | 2.57 | 1.95 | **12.03** |
| City Circle | 10 | Keshav puram | 8.90 | 7.18 | 5.50 | 4.19 | **25.76** |
| | 11 | Moti Nagar | 10.01 | 8.07 | 6.19 | 4.71 | **28.98** |
| | 12 | Pitam pura | 3.96 | 3.20 | 2.45 | 1.86 | **11.47** |
| **Total** | | | **74.43** | **60.00** | **46.00** | **35.00** | **215.4** |

Proposed year wise investment for AT&C Loss Reduction (Cumulative) and corresponding targeted AT&C Loss Reduction is depicted in Chart – 4.4.

**Chart – 4.4**




### 4.2.3 Capex for Reliability Improvement

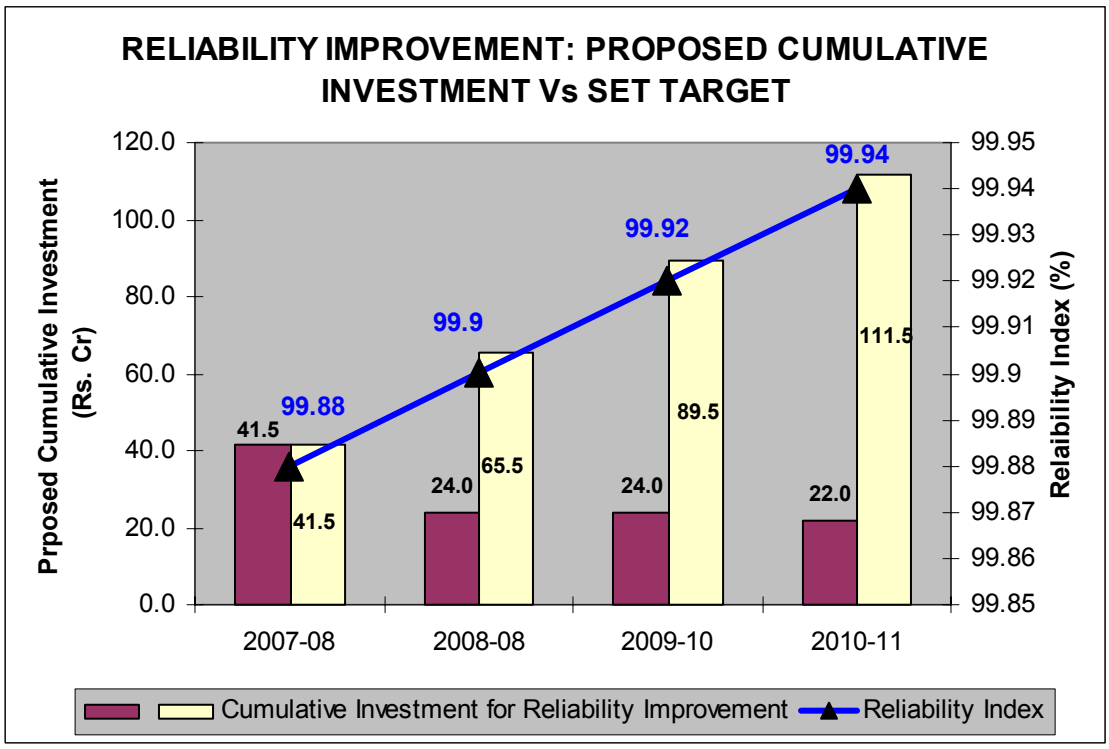
Capital Investment for Reliability Improvement is proposed on the basis of Equipment Failure Indices for the districts and shown in Table – 4.6

| CAPEX for Reliability Improvement | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Circle** | **S. No.** | **District** | **2007-08** | **2008-09** | **2009-10** | **2010-11** | **Total** |
| Sub Urban Circle | 1 | Bawana | 9.97 | 5.76 | 5.76 | 5.28 | **26.8** |
| | 2 | Narela | 7.48 | 4.32 | 4.32 | 3.96 | **20.1** |
| Metro Circle | 3 | Rohini | 7.48 | 4.32 | 4.32 | 3.96 | **20.1** |
| | 4 | Mangolpuri | 3.12 | 1.80 | 1.80 | 1.65 | **8.4** |
| Urban Circle | 5 | Shalimar Bagh | 3.12 | 1.80 | 1.80 | 1.65 | **8.4** |
| | 6 | Badli | 3.12 | 1.80 | 1.80 | 1.65 | **8.4** |
| Town Circle | 7 | Shakti Nagar | 3.12 | 1.80 | 1.80 | 1.65 | **8.4** |
| | 8 | Civil Lines | 0.83 | 0.48 | 0.48 | 0.44 | **2.2** |
| | 9 | Model Town | 0.83 | 0.48 | 0.48 | 0.44 | **2.2** |
| City Circle | 10 | Keshav puram | 0.83 | 0.48 | 0.48 | 0.44 | **2.2** |
| | 11 | Moti Nagar | 0.83 | 0.48 | 0.48 | 0.44 | **2.2** |
| | 12 | Pitam pura | 0.83 | 0.48 | 0.48 | 0.44 | **2.2** |
| **Total** | | | **41.54** | **24.00** | **24.00** | **22.00** | **111.5** |

**Table – 4.6**

Proposed year wise investment for Reliability Improvement (Cumulative) and corresponding targeted Reliability Indices is depicted in Chart – 4.5

**Chart – 4.5**




### 4.2.4 Capex for Infrastructure Development (Civil +IT+Admin.)

Capital Investment for Administration and Infrastructure is as is shown in Table – 4.7

**Table – 4.7**

| CAPEX for Infrastructure Development | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Circle** | **S N.** | **District** | **2007-08** | **2008-09** | **2009-10** | **2010-11** | **Total** |
| Sub Urban Circle | 1 | Bawana | 1.5 | 1.5 | 1.5 | 0.5 | 5 |
| | 2 | Narela | 2.5 | 1.5 | 1.5 | 0.5 | 6 |
| Metro Circle | 3 | Rohini | 2.5 | 3.5 | 2 | 1 | 9 |
| | 4 | Mangolpuri | 2 | 1.5 | 1.5 | 0.5 | 5.5 |
| Urban Circle | 5 | Shalimar Bagh | 2 | 1.5 | 1.5 | 0.5 | 5.5 |
| | 6 | Badli | 2 | 1.5 | 1.5 | 0.5 | 5.5 |
| Town Circle | 7 | Shakti Nagar | 2 | 1.5 | 1.5 | 0.5 | 5.5 |
| | 8 | Civil Lines | 9 | 6.5 | 2.5 | 2 | 20 |
| | 9 | Model Town | 2 | 0.5 | 1.5 | 0.5 | 4.5 |
| City Circle | 10 | Keshav puram | 2.5 | 1.5 | 1 | 0.5 | 5.5 |
| | 11 | Moti Nagar | 2 | 1.5 | 1.5 | 0.5 | 5.5 |
| | 12 | Pitam pura | 2 | 1.5 | 1.5 | 0.5 | 5.5 |
| **Total (Rs. Cr)** | | | **32.00** | **24.00** | **19.00** | **8.00** | **83.00** |

Details of Civil Infrastructure jobs identified for execution during the period of FY 2007-11 are as shown in Table - 4.8A

**Table – 4.8A**

| Civil Infrastructure CAPEX | | | | | |
|---|---|---|---|---|---|
| **SN** | **Job Details** | **2007-08** | **2008-09** | **2009-10** | **2010-11** |
| 1 | Command Centre | 3.00 | 5.00 | 4.00 | - |
| 2 | Commercial Office | 3.00 | 4.00 | 1.00 | - |
| 3 | Others Buildings | 1.00 | - | 2.00 | 3.00 |
| 4 | Zonal Renovation | 1.50 | - | 1.00 | - |
| 5 | Moti Nagar Dist. Off. Renovation | 0.50 | - | - | - |
| 6 | Rohini Off. Renovation | 1.00 | 1.00 | - | - |
| 7 | Shalimar Bagh Colony Renovation | 1.50 | - | - | - |
| 8 | Narela Colony Renovation | 1.50 | - | - | - |
| 9 | CENPEID | 1.00 | - | - | - |
| **GRAND TOTAL (Rs. Cr)** | | **14.00** | **10.00** | **8.00** | **3.00** |

Details of Information Technology jobs identified for execution during the period of FY 2007-11 are as shown in Table - 4.8B

**Table – 4.8B**

| Information Technology CAPEX | | | | |
|---|---|---|---|---|
| **Item** | **2007- 08** | **2008-09** | **2009-10** | **2010-11** |
| Hardware | 5.1 | 3 | 2 | 0.75 |
| Network | 2.6 | 2 | 1.5 | 0.75 |
| Software | 6.3 | 3 | 2.5 | 1.5 |
| **GRAND TOTAL (Rs. Cr)** | 14 | 8 | 6 | 3 |

Details of Admin jobs identified for execution during the period of FY 2007-11 are as shown in Table - 4.8C

**Table – 4.8C**

| Administration Support CAPEX | | | | |
|---|---|---|---|---|
| **Item** | **2007- 08** | **2008-09** | **2009-10** | **2010-11** |
| Administration Support | 4 | 6 | 5 | 2 |
| **GRAND TOTAL (Rs. Cr)** | 4 | 6 | 5 | 2 |

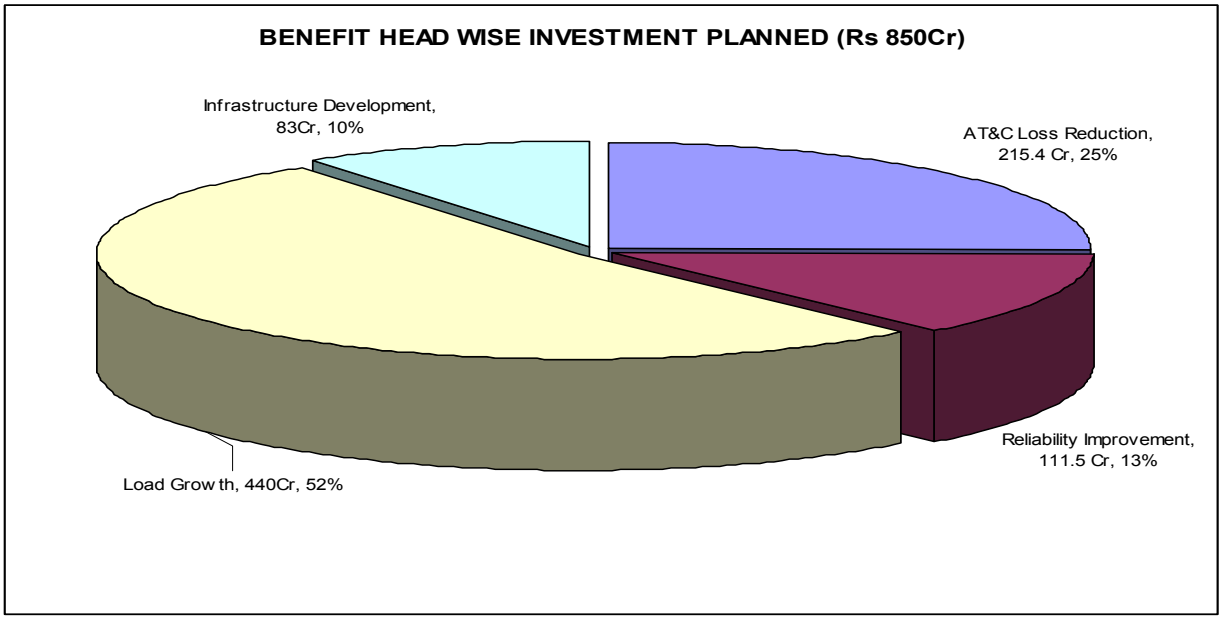
The Target Area wise distribution of CAPEX is summarized in Table 4.9.

**Table – 4.9**

| Target Area Wise Distribution of CAPEX | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Circle** | **S. No.** | **District** | **AT&C** | **Load Growth** | **Reliability** | **Infrastructure Development** | **Total** |
| **Sub Urban Circle** | 1 | Bawana | 13.84 | 100.39 | 26.77 | 5.00 | **146.01** |
| | 2 | Narela | 26.12 | 27.27 | 20.08 | 6.00 | **79.47** |
| **Metro Circle** | 3 | Rohini | 7.38 | 78.08 | 20.08 | 9.00 | **114.54** |
| | 4 | Mangolpuri | 35.55 | 12.39 | 8.37 | 5.50 | **61.81** |
| **Urban Circle** | 5 | Shalimar Bagh | 20.90 | 44.62 | 8.37 | 5.50 | **79.38** |
| | 6 | Badli | 10.68 | 12.39 | 8.37 | 5.50 | **36.94** |
| **Town Circle** | 7 | Shakti Nagar | 10.97 | 23.55 | 8.37 | 5.50 | **48.38** |
| | 8 | Civil Lines | 11.76 | 37.18 | 2.23 | 20.00 | **71.17** |
| | 9 | Model Town | 12.03 | 33.46 | 2.23 | 4.50 | **52.22** |
| **City Circle** | 10 | Keshav puram | 25.76 | 23.55 | 2.23 | 5.50 | **57.04** |
| | 11 | Moti Nagar | 28.98 | 12.39 | 2.23 | 5.50 | **49.10** |
| | 12 | Pitam pura | 11.47 | 34.70 | 2.23 | 5.50 | **53.91** |
| **Total** | | | **215.4** | **440.0** | **111.5** | **83.0** | **850.0** |

Benefit Head wise investment planned for the period of 2007 to 2011 is depicted in Chart – 4.6.

**Chart – 4.6**



## 4.3 Geographical Distribution Wise Capex

The Capex in this section has been classified according to the proposed district of deployment. The major share of investment has been earmarked for Narela, Bawana, Rohini and Shalimar Bagh districts in view of higher load growth in the area and proposed new grid sub-stations. Details of proposed District wise yearly Capex is summarized in Table – 4.10.

**Table – 4.10**

| Geographical Distribution Wise CAPEX | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Circle** | **S. No.** | **District** | **2007-08** | **2008-09** | **2009-10** | **2010-11** | **Total** |
| Sub Urban Circle | 1 | Bawana | 58.46 | 29.37 | 28.47 | 29.70 | **146.01** |
| | 2 | Narela | 30.47 | 18.05 | 16.36 | 14.59 | **79.47** |
| Metro Circle | 3 | Rohini | 45.36 | 24.07 | 22.09 | 23.02 | **114.54** |
| | 4 | Mangolpuri | 22.61 | 15.45 | 13.14 | 10.60 | **61.81** |
| Urban Circle | 5 | Shalimar Bagh | 31.10 | 17.23 | 15.87 | 15.18 | **79.38** |
| | 6 | Badli | 14.02 | 8.53 | 7.83 | 6.56 | **36.94** |
| Town Circle | 7 | Shakti Nagar | 18.81 | 10.64 | 9.92 | 9.02 | **48.38** |
| | 8 | Civil Lines | 29.53 | 17.02 | 12.25 | 12.38 | **71.17** |
| | 9 | Model Town | 21.06 | 10.41 | 10.63 | 10.12 | **52.22** |
| City Circle | 10 | Keshav puram | 22.13 | 13.44 | 11.26 | 10.21 | **57.04** |
| | 11 | Moti Nagar | 18.05 | 12.30 | 10.42 | 8.32 | **49.10** |
| | 12 | Pitam pura | 21.39 | 11.48 | 10.74 | 10.30 | **53.91** |
| **Total** | | | **333.0** | **188.0** | **169.0** | **160.0** | **850.0** |

## 4.4 Capitalization Schedule

The details of Capital Investment by NDPL and the assets capitalized against these investments are given below:

**Table – 4.11**

| Year | Capital Investment | Asset Capitalised |
|---|---|---|
| 2002-03 | 49 | 4.41 |
| 2003-04 | 281 | 188.09 |
| 2004-05 | 338 | 241 |
| 2005-06 | 431 | 324 |
| 2006-07 | 270 | 277.3 |
| Total | **1369** | **1034.8** |

For the period 2007-11, the proposed capital investment and asset capitalization is given in the Table below:

**Table 4.12**

| Year | Capital Investment | Asset to Capitalize |
|---|---|---|
| 2007-08 | 333 | 450 |
| 2008-09 | 188 | 275 |
| 2009-10 | 169 | 225 |
| 2010-11 | 160 | 200 |
| **Total** | **850** | **1150** |

## 4.5 Financing Plan

NDPL proposes to fund the capital expenditure through a mix of consumer contribution, depreciation, internal accruals and domestic loans in the same order of priority.

CHAPTER – 5

# QUALITY IMPROVEMENT PLAN

## 5.1. Transformer and Feeder Failure Rate

At the time of take over distribution transformer failure rate was as high as 8.3%, which has been brought down to 1.73% as on 31st March 2006. Similarly, interruption per 11 kV feeder has been brought down to 9.89 hour per feeder from 101.59 hours per feeder.

**Table – 5.1**

| Transformer and Feeder Failure Rate | | | | | |
|---|---|---|---|---|---|
| **Particulars** | **2002-03** | **2003-04** | **2004-05** | **2005-06** | **2006-07** |
| No of 11kv feeders | 525 | 530 | 548 | 602 | 631 |
| No of feeder tripping at 11kv (Due to faults) | 53333 | 28679 | 9792 | 5954 | 3774 |
| Total duration of feeders tripping in Hours. | 106666 | 57358 | 19297 | 8468 | 3431 |
| Interruptions per feeder (in hours) | 101.59 | 54.11 | 17.87 | 9.89 | 5.9 |
| Total no of DTs | NA | 5466 | 9959 | 13059 | 18609 |
| No of DT failure | 388 | 248 | 158 | 170 | 188 |
| DT failure rate (%) W.R.T. Installed capacity | 8.30% | 6.25% | 2.64% | 1.73% | 1.35% |

NDPL further plans to bring down the distribution transformer failure rate to 1.0% and interruption per 11 kV feeders to 4 hours per feeder as per the schedule given below:

**Table 5.2**

| **Particulars** | **2007-08** | **2008-09** | **2009-10** | **2010-11** |
|---|---|---|---|---|
| Interruptions per feeder (in hours) | 5.5 | 5.0 | 4.5 | 4.0 |
| DT failure rate (%) w.r.t. Installed capacity | 1.25 | 1.15 | 1.05 | 1.0 |

## 5.2 Frequency variations:

The NDPL shall maintain the supply frequency as per the Indian Electricity Grid Code (the present values being between 49.0 and 50.5 Hz), as amended from time to time.

## 5.3 Voltage Unbalance:

The NDPL shall ensure that the voltage unbalance does not exceed 3% at the point of commencement of supply.

NDPL

## CHAPTER – 6

# CAPITAL INVESTMENT PROPOSED FOR 90 MW POWER PLANT

## 90 MW GAS BASED POWER PLANT PROPOSED TO BE SET UP BY NDPL

### Background

During the last 5 years of our experience as a licensee to distribute electrical power in NDPL area, we have observed that there has been more than 10% increase in power demand. The peak demand met by NDPL in the FY 06-07 has been 3736 MW as against 3389 MW in FY 03-04. The peak load shortages between the availability of power as tied up through long term PPAs with various generating power stations and actual power demand being served in our area has been of the order of 150 to 200 MW. NDPL have State Load Dispatch Centre. As a result NDPL has been incurring unscheduled interchange tariff at penal rates to meet this gap and provide electricity to consumers in NDPL area.

While providing uninterrupted power supply to our consumers, NDPL has to make arrangements and purchase electrical power at very high rates over short duration. Besides, the steep rise in power demand brings along with it the problems of grid failures and blackouts. Apart from preparing to meet the continuous upsurge in the power demand, NDPL is concerned about grid stability and the burgeoning gap between demand and supply position in the northern grid.

Principal Secretary (Power), GONCTD vide letter dated December 30$^{th}$, 2005 and November 17$^{th}$, 2006 has highlighted to the power distribution companies in Delhi to ensure power availability to consumers by mitigating the power shortage by setting up power plants. Delhi Transco Limited vide his letter dated July 21$^{st}$, 2006 had also urged the power distribution companies to install distributed generation through small capacity standby power plants to provide uninterrupted power to the respective consumers of Delhi. We have been advised that such standby small capacity power plants can be set up very fast and we have been assured all possible support in our efforts to set up such small capacity power plants to meet the peak load power requirements for our consumers in NDPL area.

Considering the growth of power demand in NDPL area and with a view to have flexibility of operations along with enhanced reliability in the supply of power, we have, over the last 4 years put up several proposals to set up dedicated power generating facilities in NDPL area. The proposals include setting up small capacity power plants as well as large capacity power stations to meet the peaking load demands. It is recognized that for grid stability and safe islanding operations, it is required that the power generation should be near the load

centre while depending upon the regional grid for spinning reserves under exigent conditions.

As a step towards serving consumers in NDPL area with uninterrupted power supply, NDPL proposes to set up 90 MW Power Plant. The land for the plant has been identified and is located NDPL's license area. Permission from Government of NCT of Delhi has been sought to change the land use.

For setting up this power plant a suitable reconditioned machine is proposed to be procured and imported to Delhi. NDPL has tied up for purchase of Natural Gas required for running the machine as well as transportation of gas to Delhi. The Natural Gas line is passing by at a distance of about 6 kms from the project site.

NDPL is also in active discussions with Delhi Jal Board for releasing 2 MGD of raw water from Rithala Treatment plant, which would be treated suitably before use.

**Project Cost**

The total cost of the project is Rs. 156.58 Cr. The breakup is as follows:

| **90 MW COMBINED CYCLE POWER PLANT** | | | |
|---|---|---|---|
| **SL.NO** | **SCOPE** | **Amount** | |
| | | **$ million** | **Rs. Crores** |
| 1 | **GTG and STG** | | |
| 1.1 | Gas Turbine And Generator | 14.00 | 1.50 |
| 1.2 | Steam Turbine and Generator | included in above | |
| 1.3 | Expatriate Supervision at the time of plant erection by 6 engineers for 4 months | included in above | |
| 1.4 | Customs duty @ 22.975 % | | 13.20 |
| 1.5 | Octroi/Entry Tax | | |
| 1.6 | Port handling(1%) | | 0.64 |
| 1.7 | Local Transport | | 2.00 |
| 1.8 | Erection | | 0.00 |
| 1.9 | Erection - Insurance | | 0.60 |
| | **Sub total** | **14.00** | **17.94** |

| SL.NO | SCOPE | Amount | |
|---|---|---|---|
| | | $ million | Rs. Crores |
| 2 | Exhaust System | included in 1.00 above | |
| 3 | Fuel handling system | included in 1.00 above | 3.00 |
| 4 | Heat Recovery Steam Generator | included in 1.00 above | |
| 5 | Steam Condensing Equipment | included in 1.00 above | |
| 6 | Condensate and Feed Water & Chemical Dosing System | included in 1.00 above | |
| 7 | Power Plant Piping and valves | included in 1.00 above | |
| 8 | Control and Instrumentation | included in 1.00 above | |
| 9 | Communication | included in 1.00 above | |
| 10 | Water Treatment System | | 2.50 |
| 11 | Circulating Water System | included in 1.00 above | 4.50 |
| 12 | Compressed air, Cranes and Hoists, and HVAC Systems | included in 1.00 above | |
| 13 | Fire detection and Protection System | included in 1.00 above | 2.00 |
| 14 | Electrical & Switchyard | | 23.00 |
| 15 | Misc.maintenance equipment/Instruments | included in 1.00 above | |
| 16 | Civil Works | | 26.00 |
| 17 | Mandatory spares | | |
| 18 | Local Transportation from Indian port to site | | 2.00 |
| 19 | Plant erection | | 10.00 |
| 20 | Project / Site management | | 1.50 |
| 21 | Consultancy | | 1.25 |
| 22 | Works contract tax | | 1.44 |
| 23 | Construction power and water | | 0.25 |
| 24 | Temporary stores and office at site | | 0.20 |
| 25 | Contingencies | | 5.00 |
| | Total project cost | **14.00** | **100.58** |
| | **Total project cost after FE conversion into INR @ 40** | | **156.58** |

## Cost Benefit Analysis

Considering that the Generating Station would be used to meet the peak demand operating for about 10 hours per day during a period of 10 years (remaining useful life of the machinery), the levelised cost of power generation has been estimated at 426 Paisa/unit. This cost is competitive with respect to cost of power currently being procured to meet the demand-supply gap through bilateral arrangements which is 626 Paisa/unit from Damodar Valley Corporation, 730 Paisa/unit from Himachal Pradesh and 843 Paisa/unit from Kerala.