
# GUJARAT ELECTRICITY REGULATORY COMMISSION

# (GERC)

## AHMEDABAD

# TARIFF ORDER

# FOR

# Gujarat State Electricity Corporation Limited (GSECL)

# Case No. 943 of 2008

## 17 January 2009

# C O N T E N T S

# List of Tables

# Annexure

# BEFORE THE GUJARAT ELECTRICITY REGULATORY COMMISSION AT AHMEDABAD

Case No.943 / 2008

**Date of Order 17.01.2009**

**CORAM**

**Dr. P K Mishra, Chairman**
**Shri K P Gupta, Member**
**Dr. Man Mohan, Member**

## ORDER

## 1. INTRODUCTION

### 1.1 Background

1.1.1 The Government of Gujarat unbundled and restructured the Gujarat Electricity Board with effect from 1st April 2005. The Generation, Transmission & Distribution businesses of the erstwhile Gujarat Electricity Board were transferred to seven successor companies. The seven successor companies are listed below:

**i) Gujarat State Electricity Corporation Limited (GSECL)**

(A Generation Company)

ii) Gujarat Energy Transmission Corporation Limited (GETCO)

(A Transmission Company)

Four Distribution Companies:

iii) Dakshin Gujarat Vij Company Limited (DGVCL)

iv) Madhya Gujarat Vij Company Limited (MGVCL)

v) Uttar Gujarat Vij Company Limited (UGVCL)

vi) Paschim Gujarat Vij Company Limited (PGVCL)

and

vii) Gujarat Urja Vikas Nigam Limited (GUVNL) – A Holding Company and is also responsible for purchase of electricity from various sources and supply to Distribution Companies.

1.1.2 The Government of Gujarat vide notification dated 3rd October 2006 notified the final opening balance sheets of the transferee companies as on 1st April 2005, containing the value of assets and liabilities, which stand transferred from the erstwhile Gujarat Electricity Board to the transferee companies including Gujarat State Electricity Corporation Limited (GSECL). Assets and liabilities (gross block, loans and equity) have been considered by the Commission in line with the Financial Restructuring Plan (FRP) as approved by Government of Gujarat.

1.1.3 **Commission's order for 2007-08**

GSECL filed its ARR petition for the FY 2007-08 on 28.12.2006 in accordance with the Regulation notified by GERC on Terms and Conditions of Tariff. The Commission, in exercise of the powers vested in it under section 61 and 62 of the Electricity Act, 2003 and all other powers enabling it in this behalf and after taking into its consideration the submissions made by GSECL, the objections by various stakeholders, response of GSECL, issues raised during the public hearing and other relevant material, issued the order for the year 2007-08 on 31st March 2007.

**1.2 Multi Year Tariff (MYT) Regulations**

The Commission issued Multi Year Tariff (MYT) Framework Regulations for generation, transmission and distribution vide notification dated 20th December 2007 specifying the Terms and Conditions for Determination of Tariff for generation, transmission and distribution of electricity under MYT Framework through consultation and public hearing process.

**1.3 MYT Tariff petition for control period FY 2008-09 to 2010-11.**

GSECL filed the MYT petition for approval of Generation tariff for the control period (2008-09 to 2010-11) on 31st July 2008.

**1.4 Admission of petition and public hearing process**

1.4.1 The Commission conducted a preliminary analysis of the petition submitted by GSECL and admitted the ARR petition of GSECL for the control period (Case No.943 of 2008) on 14th August 2008.

In accordance with section 64 of the Electricity Act, 2003 the Commission directed GSECL to publish its application in the abridged form and manner to ensure public participation.

A public notice was issued by the GSECL inviting objections / suggestions from stakeholders on or before 22.09.2008, which was published in the following newspapers on 22.08.2008.

| Sl. No. | Name of the newspaper | Language |
|---|---|---|
| 1. | Indian Express | English |
| 2. | Gujarat Samachar | Gujarati |
| 3. | Sandesh | Gujarati |

Meanwhile, the Commission received requests for extending the time limit for filing objections/ suggestions from some consumers / consumer organizations. With a view to giving some time for obtaining views of the stakeholders, the Commission positively considered the request and extended the time limit upto 13.10.2008. The GSECL was

asked to give public notice to this effect, which was published on the same newspapers on 20.09.2008.

1.4.2 The Commission has received 5 objections / suggestions to the petition filed by GSECL. The Commission considered the objections received and sent communication to the objectors inviting them to take part in public hearing process by presenting their views in person before the Commission. Each objector was provided with a time slot on the days of public hearing from 10th November 2008 to 20th November 2008 for presenting their views on GSECL petition before the Commission in the Court Hall, Commission's office in Ahmedabad. The names of persons and organizations who filed their objections and the objectors who appeared at the public hearing and presented their objections are given below:

| | |
|---|---|
| 1 | Gondal Chamber of Commerce and Industries, Gondal |
| 2 | Federation of Industries and Association (Gujarat), Ahmedabad |
| 3 | Laghu Udhyog Bharati, Ahmedabad. |
| 4 | Shri Ghanshyam R. Darji, Vadodara |
| 5 | Consumer Education and Research Society |

A short note on the main issues raised by the objectors at the public hearings in respect of this petition along with the response of the DISCOMs is briefly given in Chapter-3.

1.4.3 The Commission obtained further information and clarification from GSECL. GSECL has also furnished supplementary information / data as required by the Commission.

1.4.4 Taking into account the fact that the MYT framework Regulations were issued by the Commission in December 2007 and the time required by GSECL to prepare the MYT petition for the first time with projections for a three-year time frame, the Commission condones the delay in filing the MYT petition.

### 1.5 State Advisory Committee Meeting

A meeting of the State Advisory Committee (Constituted under Section 67 of the Electricity Act, 2003) was convened on 7th October 2008 and members were briefed on the MYT petition of GSECL.

# Chapter 2

# Summary of DGVCL's Tariff Petition

## 2.0 SUMMARY OF GSECL TARIFF PETITION

GSECL in its petition submitted the projected operational parameters and costs for each of the generating stations owned and operated by it. The Operational Parameters pertain to plant availability, plant load factor, station heat rate (SHR), auxiliary consumption, specific oil consumption, transit loss of coal, gross and net generation. The costs cover both variable and fixed costs including O&M expenses.

GSECL mentioned that all the operational parameters of the stations transferred to it from GEB are based on present operating conditions of plants and overhauling / R&M schedule of the plants.

GSECL mentioned that for PPA based stations, all the parameters are based on the provisions of PPAs except for auxiliary consumption @ 5.5% (upper ceiling) at CCPP – 1 Dhuvaran and at Utran since gas boosters are being used.

For the thermal power stations of GSECL where the availability factor is less than 80%, such lower availability factor is to be considered as neutralization level for full fixed cost recovery.

For the Hydro Stations, the neutralization level for full fixed cost recovery will be availability of machines, irrespective of whether or not water is released by the State Irrigation Department subject to a ceiling of 80% availability of machines.

Incentives corresponding to the plant availability factor exceeding the target plant availability factor approved by the Commission will be billed separately at the prevailing rate.

GSECL has submitted the Operational Parameters and costs for the approval of the Commission. The approved parameters and costs would be the basis for billing GUVNL- the sole purchaser of power from GSECL.

## 2.1 SUMMARY OF FIXED COSTS PROJECTED BY GSECL

The fixed costs projected by GSECL for FY 2008-09 to FY 2010-11 are given in Table 2.1 below.

**Table 2.1**

**Projected Fixed Cost for FY 2008-09 to FY 2010-11**

| S.No | Stations | Total Fixed Cost (Rs. Lakhs) | | |
|---|---|---|---|---|
| | | 2008-09 | 2009-10 | 2010-11 |
| 1 | Ukai | 24867 | 28081 | 31919 |
| 2 | Gandhinagar 1 to 4 | 26321 | 28616 | 28817 |
| 3 | Gandhinagar 5 | 9111 | 9161 | 9259 |
| 4 | Wanakbori 1 to 6 | 37464 | 40323 | 44376 |
| 5 | Wanakbori 7 | 9039 | 9016 | 9070 |
| 6 | Sikka | 10593 | 10719 | 11034 |
| 7 | KLTPS 1 to 3 | 16470 | 16693 | 16833 |
| 8 | KLTPS 4 | 8445 | 7140 | 6934 |
| 9 | Dhuvaran Oil | 7630 | 7573 | 7647 |
| 10 | Dhuvaran Gas 1 | 5277 | 5143 | 5011 |
| 11 | Dhuvaran Gas 2 | 7635 | 7505 | 7283 |
| 12 | Utran | 5289 | 5232 | 5188 |
| 13 | Ukai Hydro | 2499 | 2519 | 2550 |
| 14 | Kadana Hydro | 6906 | 6889 | 6895 |
| 15 | Utran Extension | 0 | 18211 | 25402 |
| **16** | **Total** | **178592** | **202821** | **218218** |

## 2.2 SUMMARY OF VARIABLE CHARGES PROJECTED BY GSECL

The station wise variable charges as projected by GSECL for the Control Period for FY 2008-09 to FY 2010-11 are summarised in Table 2.2 below:

**Table 2.2**

**Projected variable charges for FY 2008-09 to FY 2010-11**

| S.No | Station | Variable charges(Net) (Rs./Kwh) 2008-09 | Variable charges(Net) (Rs./Kwh) 2009-10 | Variable charges(Net) (Rs./Kwh) 2010-11 |
|---|---|---|---|---|
| 1 | Ukai | 1.50 | 1.50 | 1.50 |
| 2 | Gandhinagar 1 to 4 | 1.98 | 1.98 | 1.98 |
| 3 | Gandhinagar 5 | 1.65 | 1.65 | 1.65 |
| 4 | Wanakbori 1 to 6 | 1.75 | 1.75 | 1.75 |
| 5 | Wanakbori 7 | 1.66 | 1.66 | 1.66 |
| 6 | Sikka | 2.09 | 2.09 | 2.09 |
| 7 | KLTPS 1 to 3 | 1.14 | 1.14 | 1.14 |
| 8 | KLTPS 4 | 1.08 | 1.08 | 1.08 |
| 9 | Dhuvaran Oil | 4.04 | 4.04 | 4.04 |
| 10 | Dhuvaran Gas 1 | 1.92 | 1.92 | 1.92 |
| 11 | Dhuvaran Gas 2 | 3.47 | 3.47 | 3.47 |
| 12 | Utran | 1.99 | 1.99 | 1.99 |
| 13 | Ukai Hydro | 0.00 | 0.00 | 0.00 |
| 14 | Kadana Hydro | 0.00 | 0.00 | 0.00 |
| 15 | Utran Extension | | | |
| **16** | **Total** | **1.82** | **1.82** | **1.82** |

**2.3 GSECL requested the Commission -**

- To admit the MYT Petition for control period 2008-09 to 2010-11.
- To approve the operational and financial parameters as proposed by GSECL considering the vintage and constraints of the old machines, and consider the same for recovery of full fixed cost for the 1st control period.
- To approve the Station operating parameters viz. PAF, Auxiliary Consumption, Station Heat Rate, Transit Loss, Specific Oil Consumption and actual fuel rate for each of the stations of GSECL for recovery of variable cost for 1st control period.
- To approve reimbursement of Tax on Income earned through the sale of power for the 1st control period.
- To approve incentive and UI charges as prayed.
- To grant any other relief as Commission may consider appropriate.
- To allow further submissions, addition and alteration to this Petition as may be necessitating from time to time.
- Pass any other order as the Commission may deem fit and appropriate under the circumstances of the case and in the interest of justice.

# Chapter 3

# Brief outline of objections raised, response from GSECL and Commission's comments

### 3.0 Public Response to the Petition

This chapter deals with the objections received in response to the Public Notice, the response of GSECL to the objections and the comments of the Commission thereon.

### 3.1 DELAY IN FILING OF MYT PETITION

The Consumer Education and Research Society, Ahmedabad and the Gujarat Chamber of Commerce and Industry submitted that the MYT Petition 943 of 2008 for approval of generation tariff determination was filed after 31/03/2008 i.e. beyond the extended time fixed by GERC. The same should be rejected as per provisions of Section 64 (3) (b) of Act 2003.

**Response of GSECL**

The GSECL has made an exercise for tariff petition for the year i.e. FY 2008-09 as per the existing Tariff Regulations 2005 in force prior to notification of MYT Tariff Regulations. The MYT Framework Regulations were issued by the end of December 2007. The GSECL subsequently collected considerable data / information, and processed and filed the MYT Petition for the control period 2008-09 to 2010-11. The entire exercise took more time than normally required for a one-year tariff petition, because the MYT Petition is to incorporate aspects such as future maintenance planning for overhauling, R&M envisaged, implementation of new projects etc. for three years. This is the first MYT Petition. The GSECL regretted for the delay in filing the MYT Petition before the Commission and requested the Commission to condone the delay.

***Commission's view***

*As the petition is the first one under MYT Regulations 2007, the Commission has allowed the petition 943 of 2008 and taken on record and condoned the delay.*

### 3.2 IMPLEMENTATION OF NEW TARIF WITH PROSPECTIVE EFFECT

The Consumer Education and Research Society, Ahmedabad and the Gujarat Chamber of Commerce and Industry have submitted that implementation of new MYT Tariff Order for FY 2008-09 to 2010-11 with retrospective effect may kindly be rejected as per rules and regulations. It should be implemented with prospective date only.

**Response of GSECL**

The Tariff Order dated 31/03/2007 was effective only upto 31/03/2008 and hence GSECL requests to approve the tariff order with effect from 01/04/2008. Further, 1st control period of MYT Regulations starts from 01/04/2008 to 31/03/2011. Hence, the effective date of the order should be from 01/04/2008.

*Commission's view*

*The revised tariffs would be implemented from prospective date.*

## 3.3 INEFFICIENT PLANT OPERATION AND NO CAPACITY ADDITION

The Consumer Education and Research Society, Ahmedabad has commented on inefficient plant operation and shortage of installed capacity of GSECL. There is only 8120 MW installed capacity of GSECL against 11500 MW demand. GSECL is capable of only 40% of State demand. The petitioner has not added any capacity, instead it has scrapped 63.5 MW of each of the units 1 to 4 at Dhuvaran totaling to 254 MW and derated units-5 & 6 from 140 MW to 110 MW amounting to a total reduction of 314 MW and added at Dhuvaran new gas based units totaling 219 MW. Therefore, there is a net reduction of capacity of 95 MW. The petitioner has not made any addition from 1998. GSECL proposes a marginal increase of 385 MW during control period 2008-09 to 2010-11.

Shri G.R. Darji submitted that, there is no increase in installed capacity since 15 years. The existing plants are only being renovated.

The Gujarat Chamber of Commerce and Industry submitted that the GSECL has not added any capacity for generation in a span of eight years. The C.P.P. capacity addition is constrained due to Electricity duty, yet, the average generation of C.P.P. has gone up by 17.35%. GSECL has not increased any generation in the same period.

Gondal Chamber of Commerce & Industry submitted that as GSECL failed to produce energy as per capacity of the units, GUVNL is purchasing power from private sector at higher costs to meet the demand. GSECL has failed to meet energy demand and caused unlimited interruptions in power supply.

**Response of GSECL**

The GSECL has achieved highest ever PLF 80.29% as well as generation during 2007-08. The Electricity Act 2003 envisages to encourage competitive generation price from private sectors to avert monopoly. The Dhuvaran plants 1 to 4 have served 43 years of life and their useful life was over long back. The performance of the units is not economical. M/S IOC has informed that oil will not be available from July 2009. The CEA has allowed to retire unit 1 to 4 of Dhuvaran vide its letter CEA/PLG/DML/513/200 dated 20/04/2007. The units 5 and 6 of 140 MW each have served life of 35 years and hence have been derated from 140 mw to 110 MW. Ukai unit 6 of 500 MW, Sikka extension 2X250 (3 and 4 units), KLTPS unit 4 of 75 MW and Utran extension GBPS – II of 374.571 MW is coming up. Further, 10 MW of wind energy is already commissioned. The GSECL is planning for new generation projects.

***Commission's view***

*GSECL shall improve the performance of its thermal power stations. Some of the units are old, the company shall take up R&M and improve their performance. While encouraging private participation, GSECL shall also add capacity to meet the demand for power. GSECL shall compete with private sector and generate power at competitive rates.*

## 3.4 PAF AND PLF

The Consumer Education and Research Society has submitted that GSECL has not mentioned in the petition about PLF, but mentioned only about PAF. The incentives are paid for PLF of above 80% as per Regulations. Directives are needed to GSECL to increase PLF by 5% every year during the control period 2008-09 to 2010-11. The power plants, which were undertaken by GSECL after unbundling, shall not be considered any

more as IPPs. Therefore PPAs of (1) Gandhinagar unit 5, (2) Wanakbori unit 7, (3) Utran CCPP, (4) Dhuvaran unit 7 (5) Dhuvuran unit 8 may not be considered as I.P.P.

The Gondal Chambers of Commerce and Industry submits that GSECL could balance the supply and demand gap by maintaining higher PAF & PLF. The PAF and PLF need to be improved.

**Response of GSECL**

The PAF based incentive is proposed based on draft amendment in CERC "Terms and Conditions of Tariff, Regulations". The GSECL has not misguided consumers. The GSECL plants are old and served their full life and require R&M to improve the performance. The contention of Consumer Education and Research Society to increase 5% PLF each year is unrealistic, as some of the plants have served their normal life.

As per the Regulations, "Terms and Conditions of Tariff", the conditions of PPA based stations are in force which are agreed before unbundling. These PPAs are done with GUVNL with technical & financial parameters of the plants. The agreements will continue for the term of contract.

The GSECL is supplying power to GUVNL and demand and supply is being monitored by GUVNL on behalf of all unbundled companies. Further the supply of power to the state is no more monopoly. The private sector needs to be encouraged for competitive price of generation in the field to meet situations and to balance as per Act 2003.

***Commission's view***

*As commented earlier the performance of the GSECL stations shall be improved to generate more energy so that the purchases at high cost can be minimized.*

## 3.5 RELAXATION IN OPERATION PARAMETERS

The Consumer Education and Research Society has submitted that GSECL has requested for relaxation of the standard operating parameters of PAF and PLF, station heat rate, auxiliary consumption, specific oil consumption on the pretext of aging of plant, which may be rejected, as per notification No. 12 of 2005 on standard operating parameters of Terms and Conditions of Tariff. The private sectors i.e. TPL has not requested any relaxation in respect of operational parameters. The GSECL should compare the efficiencies of operating parameters, which are under similar conditions and capacity in our own state.

**Response of GSECL**

The Commission may decide to differ from the required normative parameters on a case to case basis as per provisions of Regulations " Terms and Conditions of Tariff", for existing plants based on existing age of plants, mix of vintage, size of technology, fuel grades, site specific conditions, other circumstantial factors responsible for efficiency of the units. The GSECL is unable to execute timely shut downs, due to acute power shortage in the state. The Appellate Tribunal also allowed the contentions of the GSECL in relation to relaxation in parameters. The Consumer Education and Research Society was also respondent in this issue. The objectors also absorb this directive of Tribunal.

***Commission's view***

*All required parameters, site-specific conditions, other circumstantial factors related to the efficiency of the plants are scrutinized before approval.*

### 3.6 POOR PLANT PERFORMANCE

The Consumer Education and Research Society has submitted that the petitioner stated that the plant performances are comparatively poor due to aging. The GSECL is hiding the inefficiencies and loopholes as indicated below.

a) Frequent breakdowns of coal mills of Gandhinagar Plants could have rectified with the support of BHEL.

b) Low vacuum at Sikka unit 1 & 2 and Dhuvaran 5 & 6 are within the purview of GSECL for resolving problems.

c) Inferior quality of lignite at KLTPS 1,2,3 are within the controllable powers of GSECL.

d) The GSECL can learn lessons from TPL from similar comparison of 110 MW unit

| S.N | **Parameter** | **GSECL** | **TPL** |
|---|---|---|---|
| 1. | Name of the unit | Unit II | D 'Station |
| 2. | Location | Gandhinagar | Sabarmati |
| 3. | Capacity | 120 MW | 110/120 MW |
| 4. | Fuel | Coal | Coal |
| 5. | Year of commissioning | 1977 | 1978 |
| 6. | PLF % (2007-08) | 60% | 91.6 |
| 7. | Auxiliary consumption % | 11.8 | 9 |
| 8. | Station heat rate (Kcal/kWh) | 2855 | 2565 |
| 9. | Secondary fuel oil ML/kWh | 3.90 | 1.45 |

Preventive maintenance and periodical care is the main cause of performance base of plant. The GSECL not effectively cared for preventive maintenance. GSECL's plea for adoption of the above operational parameters may be rejected.

**Response of GSECL**

The GSECL has developed local vendors and resolved various problems, the performance of Gandhinagar plant improved considerably recently. In respect of low vaccum at Sikka, it is beyond the control of GSECL, as it is due to low water availability at low tide period. The GSECL is exploring the possibility to install Induced Draft Cooling Tower (IDCT) to resolve the problem at Sikka and it is under process. In respect of the plant capacity at Dhuvaran, units 5 & 6 are de-rated from 140 MW to 110 MW each due to aging effect and CEA has also approved it. Water from Narmada has been stopped by the irrigation department, due to poor monsoon for irrigation purpose. Under these conditions, very turbid well water is being used which is resulting in high scaling in the condenser tubes, which is reflecting reduction of condenser vacuum and thereby the load. Water treatment is not planned because of high cost. However efforts are being made to have Narmada water.

At KLTPS due to restricted quantity of lignite and that too poor quality and other circumstantial factors, the units cannot be comparable with similar units of TPL.

GSECL has made concerted efforts to achieve good performance by improving the operating performance of various stations. (1) Energy Audit of 10 plants have been completed. (2) Wanakbori TPS has been awarded with ISO – 14001 certificate. (3) Dhuvaran CCPP has been awarded with green tech environment excellence. (4) Utran GBPS and Ganhinagar TPS also awarded with green tech environment excellence.

***Commission's view***

*As commented earlier GSECL shall improve the performance of its power plant. Where the plant is old, R&M shall be taken up to improve the performance. Other issues such as supply of lignite shall be resolved to improve the performance..*

## 3.7 MYT TARIFF FRAMEWORK

The Consumer Education and Research Society has submitted that revision of tariff for 3 years at 6%, 4% and 2% is objectionable. The GERC has to pass ARR for the base year 2008-09, considering financial and technical details provided for the first six months of 2007-08. The other two years may be approved based on annual review of performance as indicated in MYT regulations.

**GSECL Reply**

The GSECL has not made any such demand for revision of Tariff at 6%, 4% and 2% for the control period.

MYT Regulations provide adequate provision for approval of MYT with a mechanism to share benefits and loss due to controllable as well as uncontrollable factors. The performance parameters asked for respective years, based on facts documented and circumstances explained in the MYT Petition for the control period 2008-09 to 2010-2011 have to be approved by the Commission.

***Commission's view***

*The Commission has taken note of the objections. Tariff is considered as per MYT Regulations 2007 of the GERC. The tariffs for 2008-09 only are determined now. The tariff for 2009-10 will be determined based on a review of performance of 2008-09 on filing of petition by GSECL.*

## 3.8 CONTROLLABLE / UNCONTROLLABLE FACTORS

The Consumer Education and Research Society has submitted that the expenses of generation company should be classified into controllable and uncontrollable factors. Except expenses due to inflation and taxes on income, all other fixed and variable charges are controllable.

**GSECL Reply**

The entire performance parameters depend on various factors, such as mix of vintage, size, technology, fuel grades, site-specific conditions etc. Further, regular carrying out of periodical preventive maintenance as required is essential, which is not possible for GSECL due to non-availability shut down timings and having no spinning reserve. The plants are required to run at whatsoever capacity and constraints irrespective of their regular due maintenance schedules. In this condition, one cannot assume that performance parameters are controllable.

***Commission's view***

*Once the operational parameters are approved and fixed by the Commission, the Commission would go with the operational parameters fixed while reviewing the performance. Controllable and un-controllable factors are taken into consideration.*

### 3.9 O&M COSTS

The Federation of Industries and Associations (Gujarat) Ahmedabad submitted that the O&M costs are on high side, which should be reduced.

**Reply by GSECL**

The O&M charges for generating company are as per terms and conditions of Tariff Regulations issued by The Commission. The high charges are due to inflation and 6th Pay Commission Pay Revision.

***Commission's view***

*O&M expenditure proposed is scrutinized and admitted to the extent allowable.*

### 3.10 Return on Equity (ROE)

Federation of Industries and Association submitted that claim of ROE at 14% is very high. Reduction in ROE will give further scope for lower rate hike.

**Reply by GSECL**

The R.O.E. at 14% is as per the terms and conditions of Tariff Regulations 2005 issued by the Commission.

***Commission's view***

*ROE of 14% is reasonable and is being allowed by CERC and other State Commissions. This level of return is allowed to attract investments in power sector.*

### 3.11 FUEL CHARGES

Mr. G.R. Darji submitted that the rate of transportation of fuel and coal are fixed and so fuel charges cannot be increased by about 25% of earlier base tariff. Coal transit loss is high.

**Reply by GSECL**

The fuel prices are varying in the market. The FPPPA will take care of both rise and fall of prices of fuel as per GERC orders.

***Commission's view***

It is true that coal is transported from long distances. Considering natural conditions of moisture evaporation, circumstantial and incidental factors involved, the Commission has allowed a reasonable transit loss. GSECL has no control over fuel prices and hence allowed as a pass through.

### 3.12 FUEL COST ADJUSTMENTS

Federation of Industries and Associations (Gujarat), Ahmedabad submitted that any price reduction in fuel price should be passed on to consumer on regular basis in case of fuel rate decrease.

Gondal Chamber of Commerce and Industry submitted that fuel adjustment charges at 65 Ps/ Unit has been imposed during one year and there is 35 Ps/ Unit subsidy of Government of Gujarat burdening consumers. GSECL is proposing increase in fuel cost by 10% every year from 2008-09 for 3 years which is unjustified. The decrease of oil price shall be taken into consideration.

**Reply by GSECL**

The fuel cost adjustment is calculated on the basis of approved parameters and price difference of fuel. GSECL prepares the claims, and GUVNL being a procurer of power, consolidates the increase / decrease in fuel price and submits to GERC for approval. As per GERC orders the FPPPA is charged. The fuel cost adjustment arises only when there is variation of fuel price and GCV of the fuel. FPPPA covers both rise and fall of the fuel purchase price. Hence FCA will be calculated accordingly in case of fall in prices.

***Commission's view***

*The FCA component of the FPPPA covers both rise and fall of prices of fuel and quality of fuel supplied. The data furnished by GSECL/GUVNL on claims made towards increase in fuel price is being scrutinized by the Commission as per Regulations.*

## 3.13 SALE OF ENERGY (POWER) DIRECTLY TO DISCOMs

The Laghu Udyog Bharati, Ahmedabad suggested that GSECL should sell power directly to MGVCL and DGVCL through a competitive bidding process.

**Response of GSECL**

As directed by the Commission, a power purchase agreement between the petitioner and GUVNL is under process.

***Commission's view***

*The coordinating agency GUVNL is procuring power from GSECL, central generating stations and IPPs. The procurement of power and monitoring expenses will be less as per the State Govt order on restructuring of GEB.*

## 3.14 ENERGY AUDIT

The Laghu Udyog Bharati, Ahmedabad suggested that there should be complete energy audit of all plants and complete implementation of energy audit, which are feasible. This in turn will directly improve SHR and auxiliary consumption. The amounts of benefits accumulated after pay back period due to energy audit implementation shall be set aside for further investment in updating the energy audit.

**Reply by GSECL**

Periodical Energy Audit of plants is required to be carried out by the petitioner as directed by the Commission and hence, no separate arrangement for keeping aside the amount of benefits is required.

***Commission's view***

*GSECL is already directed by the Commission to conduct Energy Audit at all the thermal stations and submit a report to the Commission.*

## 3.15 ACCURACY OF DATA

M/S Laghu Udyog Bharati, Ahmedabad suggested that there must be an independent agency to verify the data furnished by petitioner of 943 of 2008 before presenting it to the GERC for ARR approval.

**Reply by GSECL**

The contention is not in the purview of the petitioner.

***Commission's view***

*The data furnished by the utility is verified with latest audited annual accounts. It may not be necessary to have it checked by an independent agency.*

## 3.16 FIXED CHARGES

Shri G.R. Darji submitted that in the projections the fixed costs remain constant but available energy is reduced resulting in higher rate per unit as shown in Table 29,30, 31 of the petition. No electricity duty is to be levied on fixed charges.

**Reply by GSECL**

The tables mentioned do not pertain to the above data in GSECL petition. Further, in Table 21 of GSECL petition, generation in MUs is furnished in which net generation is increasing year by year. GSECL plants are maintained properly and the PLF during FY 2007-08 was highest.

***Commission's view***

*The GSECL needs to collect reasonable fixed charges to recover the investment costs and O&M costs and variable energy charges to recover fuel costs. This will be reviewed by the Commission.*

# Chapter 4

# Compliance of Directives

**4.0 Compliance of Directives issued by the Commission**

4.1 The Commission in its Tariff Order dated 31st March 2007 for the year 2007-08 had issued various Directives to GSECL.

GSECL has submitted the compliance of the Directives issued earlier.

Commission's comments on the status of Compliance of the Directives by GSECL are given below.

The Commission is now giving specific directives to the licensee wherever required.

**Directive 1: Renovation and Modernization (R&M) of Thermal plant.**

It is stated that the R&M of Ukai TPS Units 1 & 2 and Gandhinagar TPS, KLTPS unit No.3 is being taken up on priority and the works will be completed early. The scheduled programme for completion should be furnished to the Commission by May 2007. The R&M of Ukai TPS units 3, 4 and 5 and Wanakbori TPS Units 1, 2 and 3 should also be completed according to the milestones indicated. The R&M programme for other units is to be furnished to the Commission.

**Compliance:**

GSECL has given the status of R&M works under progress. Present status of Scheduled Programme for R&M/LE works of Gandhinagar TPS Unit No. 1&2 is attached as Annexure-1, 2 & 3.

Scheduled Program for R&M/LE works of Ukai TPS Unit No. 1&2, Ukai Unit No. 3, 4&5, Wanakbori Unit No. 1,2&3 and KLTPS Unit No.3 is attached as Annexure-I. R&M program as identified and approved by CEA under 'Mission 2012-Power to all' program has already been submitted. R&M program is being identified and approved by CEA. Hence, as and when programme for other units are identified by CEA, the same will be informed to the Commission. The action plan and status of Major R&M of various units are shown at Annexure 1, 2 & 3.

***Commission's Comments:***

*The programme for R&M given is noted. The status of implementation may be reported quarterly. R&M works shall be taken up on priority to improve the performance of the generating units.*

**Directive 2: Energy Audit**

It is reported that GSECL has carried out Energy Audit of Utran GBPS, Sikka Units No.1 and 2. It is also reported that energy audit of Ukai unit No.5, Gandhinagar Unit No.1, Wanakbori Unit No.1 and KLTPS unit No.3 are to be completed during 2006-07. The findings of the Energy Audit, and the benefits/ savings achieved should be reported to the Commission. The benefits / savings need to be quantified and a report should be submitted to the Commission in the next six months. Energy audit shall be conducted for all generating units to reduce Auxiliary consumption and costs. The programme for Energy

Audit of other stations should be submitted early. GSECL is silent on installation of gravimetric feeders. The action taken on this may be reported.

**Compliance:**

The energy audits of the various units of power stations were planned in 2007-2008 and order No. CEG/EFFI/13/859 dated 3/3/2007 has been placed with Electrical Research & Development Association, Vadodara for 10 units of different power stations. Gandhinagar unit No. 1 is planned for major R & M and energy audit is not considered at present.

The programme of the energy audit for 10 units of various power stations are as under:

**Status of the energy audit programme**

| Sl No. | Names of TPS | Unit No. | Electrical Audit | Thermal Audit | Insulation Survey | Draft Report | Final Report |
|---|---|---|---|---|---|---|---|
| 1. | KLTPS | 1 | Completed | Completed | Completed | Received | Submitted |
| | | 3 | Completed | Completed | Completed | Received | Submitted |
| 2. | GTPS | 3 | Completed | Completed | Completed | Received | Submitted |
| | | 5 | Completed | Completed | Completed | Received | Submitted |
| 3. | UKAI | 3 | Completed | Completed | Completed | Received | Submitted |
| | | 5 | Completed | Completed | Completed | Received | Submitted |
| 4. | WTPS | 1 | Completed | Completed | Completed | Received | Submitted |
| | | 3 | Completed | Completed | Completed | Received | Submitted |
| | | 5 | Completed | Completed | Completed | Received | Submitted |
| 5. | Dhuvaran | CCPP-1 | Completed | Completed | Completed | Received | Submitted |

The quantification of the benefits / savings at Utran GBPS & Sikka TPS realized through implementation of the recommendations of energy auditor is submitted before the Commission, which is reproduced as under:

**Details of saving at Sikka and Utran GBPS due to energy audit**

| Station | Approx. Energy Saving (KWH) | Plus Approx. coal/ water (at UGBPS) saving | Approx savings – Rs. In Lakhs |
|---|---|---|---|
| Sikka Unit-1 | 1676963KWH | 5616 MT | 154.75 |
| Sikka Unit-2 | 1740979 KWH | 7738 MT | 198.81 |
| Utran GBPS | 362931 KWH | 73000$M^3$ water | 11.17 |

**Plan for energy audit of GSECL units**

| Sr.No. | Year | Total No. of Units | Unit No. |
|---|---|---|---|
| 1 | 2008-2009 | 5 No. | KLTPS - 2<br>WTPS - 6 & 7<br>GTPS - 4<br>DTPS - CCPP II |
| 2 | 2009-10 7 | 7 No. | WTPS - 2 & 4<br>UKAI -1<br>UKAI - 4<br>UTRAN GBPS<br>GTPS - 1 & 2 |
| 3 | 2010-11 | 3 No. | SIKKA - 1 & 2<br>UKAI-2 |

***Commission's Comments:***

*The report on the Energy Audit results may be submitted to the Commission. Energy Audit on other units may also be taken up.*

***Directive 3: Operational Costs***

A Directive was issued in the last Tariff Order to the effect that GSECL should report various steps taken in reducing the O&M expenses including employee's costs. No specific compliance has been furnished by GSECL. It should be possible to rationalize the manpower requirement by outsourcing some of the jobs etc. Efforts should be made in this direction and action taken reported.

**Compliance:**

As per Contract labour (Regulation and Abolition) Act, perennial nature work cannot be outsourced.

GSECL has rationalized the manpower requirement by outsourcing some of the jobs (by Annual Rate Contracts (ARCs)) at all power stations as mentioned below:

- Gas Turbine Long-Term Service Maintenance
- Operation and Maintenance of Ash plants.
- Coal Plant Maintenance.
- Coal Mill Maintenance
- Stone picking from running coal conveyor belt.
- Electrical Motor Rewinding and Maintenance.
- Cleaning of Power Station as well as Colony.
- Miscellaneous works to be carried out as per the requirement of the plant.
- Hiring of vehicles (in order to avoid the expenses of drivers' salary etc)
- Hiring manpower for data entry to reduce employment of staff.

Other minor works are also being outsourced with an aim to reduce the manpower requirement.

Here, it would be relevant to mention that GSECL is an ever-expanding organization, which requires additional manpower to operate and maintain power stations. However, recruitments have been minimized.

***Commission's Comments:***

*Action taken is noted*

***Directive 4: Quality of Coal***

The Commission observed that the quality of coal obtained during 2006-07, especially for the Wanakbori Station is inferior, with a GCV of about only 3700/3800 K.Cal/Kg. as against more than 4200 K.Cal/Kg during 2005-06. At the same time, there has no significant variation in the cost / MT. GSECL, shall probe the reason for supply of such inferior quality of coal during 2006-07 and submit a report to the Commission within the next two months.

It should also take up the matter with coal companies and Ministry of Coal, Government of India and initiate steps to obtain better quality of coal.

Since transport costs for coal are high, efforts shall be made to obtain better quality coal for its stations. As washed coal gives better performance and reduces transport costs efforts shall also be made to obtain washed coal to meet the total requirement.

The efforts made and the outcome in this regard may be reported to the Commission within the next two months.

**Compliance:**

GSECL has been lodging complaints regarding the quality of coal to coal companies time to time for improvement in the quality of coal loaded for GSECL Power Stations. Copies of the letters in this regard have already been sent to the Commission.

Further, SECL is releasing less quantity of delivery orders of raw coal on M/s. Spectrum Coal & Power Limited since last 1 year on the ground of washing capacity. GSECL made frequent requests to Ministry of Coal/SECL to issue delivery orders of raw coal on M/s. Spectrum Coal & Power Limited as per the assigned linkage. Thus, due to curtailment of raw coal quantity by SECL, Wanakbori Power Station is getting less washed coal supply and proportionate increase of Main Line Coal. Restoration of washed coal quantity as per the approved linkage is expected from October, 2008 onwards.

Regarding enhancement of washed coal quantity, GSECL has already booked washing capacity of M/s. Aryan's Gevra Washery for enhancement of quantity so as to minimize the problems of coal quality as well as transit loss.

***Commission's Comments:***

*GSECL shall make all possible efforts to obtain adequate and better quality mine coal and adequate quantity of washed coal.*

**Directive 5: Performance of Stations**

The Heat Rate for smaller capacity units at Thermal Stations is approved, based on average existing Heat Rates, as recommended by the CEA Technical Committee. GSECL shall strive to improve the performance and bring down the Heat Rates to within 110% of guaranteed Heat rates within 3 years from the zero date of the R&M programme of the units.

**Compliance:**

Directive is noted.

***Commission's Comments:***

*Action shall be taken to improve the performance by better maintenance and taking up R&M of units*

***Directive 6: Transit Loss of Coal***

GSECL is directed once again to make all out efforts to bring down the transit loss of coal, to the level closer to the norms specified by the Commission at least by the next Tariff Petition.

**Compliance:**

GSECL is making all the efforts to minimize Transit loss and utilize imported / washed coal to minimize the transit loss and improve the performance. Transit loss for the year 2007-08 (upto December 2007) is reduced considerably and GSECL has achieved the approved level.

**Commission's Comments:**

GSECL shall reduce the transit loss to normative level.

***Directive 7: Power Purchase Agreement between GSECL and GUVNL***

GUVNL may enter into an Agreement with GSECL for purchase of power from its generating stations as in the case of purchase of power from CGS and IPPs and submit the power purchase agreement for the approval of the Commission.

**Compliance:**

The work of PPA is under progress and it will be submitted to the Commission shortly.

***Commission's Comments:***

*The conclusion of PPA between GUVNL and GSECL shall be expedited and reported to the Commission.*

## Annexure 1

### Major R&M works (Plant-wise): Action Plan and Status of R & M of various units

| Name of Unit | Action Plan |
|---|---|
| Ukai Unit-1&2 (2x 120 MW) | Placement of LOI to BHEL – 10.01.2005 |
| | Placement of order to BHEL – 16.07.2005 |
| | Zero date – 29.03.2005 |
| | Material supply : Unit – 2 –90% |
| | Unit 1 was under shutdown since 06.09.2006. Due to the problem of high HP Eccentricity & vibrations, BHEL tried to resolve the problem and machine taken back in service with from 24.05.2008, which is yet to stabilize and yet to achieve 120 MW. |
| | Scheduled Shut-down for Unit-2<br>After re commissioning of Unit-1<br>& stabilization of the same. |
| Unit-1&2. (2x 120 MW)<br>Gandhinagar<br>Unit No | Placement of LOI/Order to BHEL - Oct-06 / May -07. |
| | The Effective Zero date – 02.11.06 |
| | Scheduled Completion of Engineering and Supply of Materials as per contract :<br>(a) Unit No.1: From 12th Month to 19 months from Zero Date. i.e. Sept. -07 to May -08.<br>(b) Unit No.2: From 12th Month to 24 months from Zero Date i.e. Sept.-07- to Octo.-08. |
| | Scheduled Completion/ Execution of the R&M/LE Works as per contract:<br>a) Unit No.1: From 17th Months of Zero Date for a period of 7 months i.e. 02.04.08 to 01.11.2008.<br>b) Unit No.2: From 24th Months of Zero Date for a period of 7 months i.e. 02.11.08 to 01.06.09 |
| WTPS-1,2,3<br>(2x 210 MW) | RLA, CA, LE STUDY of units Wanakbori Units 1,2 3 of 210 MW are planned as under:<br>Two units in 2008-09. One unit in 2009-10. |
| UKAI TPS- Unit - 3,4,5<br>(2x 200 MW, 1x 210 MW) | RLA, CA, LE STUDY of units Ukai Units 3,4 5 of 210 MW are planned as under:<br>One unit in 2008-09, one unit in 2009-10. One unit in 2010-11 |
| KLTPS-1&2<br>(2x 70 MW) | Unit –1 Synchronized on 30-12-05.<br>Unit – 2 Synchronized on 30-8-06. |

# Annexure 2

## Schedule Program for R&M/LE works of Gandhinagar TPS Unit No.1&2

Present Status and Schedule Programme for R&M/LE works of Gandhinagar TPS Unit No.1 & 2 for Major R&M.

1. LOI for major R&M is issued to M/s BHEL on 12.10.06. Design Engg. Of Main Plant under Progress.

2. As discussed with CEA some of the "Balance of Plant " packages to be finalized separately, for which Tender documents are under preparation.

   The total estimated cost for the said project would be as under:

   R&M/LE of Main Plant equipments by BHEL: Rs. 361.00 Crores.
   R&M/LE of BOP (Approximate): Rs. 060.00 Crores.

   TOTAL Rs. 421.00 Crores.

3. The works of Main Plant and BOP is scheduled simultaneously in the ensuing shutdown of the Unit.

4. Zero date of the contract is fixed as 02.11.06 with completion schedule of 24 months and 31 months from zero date for Unit No.1 and Unit No. 2 respectively.

   Accordingly the tentative shutdown to carry out above works was as under:

   (a) Shutdown of Unit No.1: April-08 to the end of Oct-08.

   (b) Shutdown of Unit No.2: Nov-08 to the end of May -09.

   However, as Ukai Unit- 1 took very long period for the R&M and bringing back the unit in service, the revised schedule shall be decided after completion of R&M of Ukai Unit-1.

   Present status of GTPS #1 & #2 are as under:

   80% of Design and Engineering work is completed and about 15 % of material for each unit is received.

# Annexure 3

## Schedule Program for R&M/LE works of, Ukai Unit No. 3, 4&5, Wanakbori Unit No. 1,2&3 and KLTPS Unit No.3

**(A) R&M of Ukai TPS unit 3,4 and 5 and Wanakbori TPS units 1,2 & 3.**

Even after vigorous follow up with BHEL, OEM, since long, they have not submitted offer for RLA, CA, LE Study of Ukai TPS unit no 3,4 & 5 and Wanakbori TPS unit no 1,2 & 3 and hence study could not be carried out in Ukai Unit No 4 and WTPS Unit No 2. However, BHEL is constantly pursued for submission of offers at the earliest to complete the RLA, CA, LE study to achieve the milestones as indicated.

**(B) R&M of KLTPS Unit No. 3.:**

Only the work of Lignite feeding from Unit 4 side is envisaged in R&M of KLTPS Unit No. 3 by extending conveyer belts. The Order for Lignite Handling Plant for Unit No. 4 is already placed and supply and erection work is under progress. The scheduled date of commissioning of first stream and second stream for Unit No. 4 is end of July-08 and Aug-08 respectively. The work of extension of conveyer belts for Unit No. 3 shall also be completed y end of Aug-08.

# Chapter 5

# GSECL Generating Stations and their Performance

## 5.0 GSECL GENERATING STATIONS AND THEIR PERFORMANCE

### 5.1 Generating stations of GSECL

GSECL owns and operates four coal based thermal generating stations, one lignite fired thermal station, one thermal station with oil and gas fired units, one gas based station and two major hydel stations and two mini hydel stations as detailed below.

The capacity of each generating station, commercial operation date (COD) of each generating unit and age of each unit are given in Table 5.1 below:

**Table 5.1**

**Capacity, COD and age of GSECL Generating Stations**

| Name of the station | Unit No. | Capacity of the unit (MW) | Date of commissioning | Age (Years) |
|---|---|---|---|---|
| Ukai | 1 | 120 | 19/03/76 | 32 |
| | 2 | 120 | 23/06/76 | 32 |
| | 3 | 200 | 21/01/79 | 29 |
| | 4 | 200 | 11/09/79 | 29 |
| | 5 | 210 | 30/01/85 | 23 |
| **Sub-Total** | | **850** | | |
| Gandhinagar | 1 | 120 | 13/03/77 | 31 |
| | 2 | 120 | 10/04/77 | 31 |
| | 3 | 210 | 20/03/90 | 18 |
| | 4 | 210 | 20/07/91 | 17 |
| | 5 | 210 | 17/03/98 | 10 |
| **Sub-Total** | | **870** | | |
| Wanakbori | 1 | 210 | 23/03/82 | 26 |
| | 2 | 210 | 15/01/83 | 25 |
| | 3 | 210 | 15/03/84 | 24 |
| | 4 | 210 | 09/03/86 | 22 |
| | 5 | 210 | 23/09/86 | 22 |
| | 6 | 210 | 18/11/87 | 20 |
| | 7 | 210 | 31/12/98 | 09 |
| **Sub-Total** | | **1470** | | |
| Sikka | 1 | 120 | 26/03/88 | 20 |
| | 2 | 120 | 31/03/93 | 15 |
| **Sub-Total** | | **240** | | |
| KLTPS | 1 | 70 | 29/03/90 | 18 |
| | 2 | 70 | 25/03/91 | 17 |
| | 3 | 75 | 31/03/97 | 11 |
| | 4 | 75 | **commissioned in 2007 - 08** | 01 |
| **Sub-Total** | | **290** | | |

| Name of the station | Unit No. | Capacity of the unit (MW) | Date of commissioning | Age (Years) |
|---|---|---|---|---|
| **Dhuvaran*** | 5 – Oil<br>6 – Oil<br>7 – Gas<br>8 – Gas | 110<br>110<br>106.617<br>112.45 | 27/05/72<br>10/09/72<br>28/01/04<br>01/11/07 | 36<br>36<br>04<br>01 |
| **Sub-Total** | | **439.067** | | |
| **Utran (New)** | GT – 1<br>GT – 2<br>GT – 3<br>STG | 30<br>30<br>30<br>45 | 17/12/92<br>28/12/92<br>07/05/93<br>17/07/93 | 16<br>16<br>15<br>15 |
| **Sub-Total** | | **135** | | |
| **Total GSECL (Coal + Lignite)** | | **3720** | | |
| **Total GSECL (Oil)** | | **220** | | |
| **Total GSECL (Gas)** | | **354.07** | | |
| **Total GSECL (Thermal)** | | **4294** | | |
| **Ukai Hydro** | 1<br>2<br>3<br>4 | 75<br>75<br>75<br>75 | 08/07/74<br>13/12/74<br>22/04/75<br>04/03/76 | 34<br>33<br>33<br>32 |
| **Ukai LBC** | 1<br>2 | 2.5<br>2.5 | 08/12/87<br>19/02/88 | 20<br>20 |
| **Total** | | **305** | | |
| **Kadana Hydro** | 1<br>2<br>3<br>4 | 60<br>60<br>60<br>60 | 31/03/90<br>02/09/90<br>03/01/98<br>27/05/98 | 18<br>18<br>10<br>10 |
| **Sub-Total** | | **240** | | |
| **Panam** | 1<br>2 | 1<br>1 | 24/03/94<br>31/03/94 | 14<br>14 |
| **Sub-Total** | | **2** | | |
| **Total Hydro** | | **547** | | |
| **Total GSECL as a whole** | | **4841** | | |

* It is stated by GSECL that Dhuvaran Oil Units 1 - 4 have been retired from service w.e.f. from 20/04/07 and Dhuvaran Oil Units 5 & 6 have been derated from 140MW to 110 MW, vide CEA Approval letter No. CEA/PLG/DMLF/513 (Dhuvaran)/200 dated 20/4/07.

Apart from the above generating stations, GSECL has planned capacity addition of 1385 MW out of which 375 MW will be commissioned during the control period as under.

| Station | Capacity (MW) | Probable Date of Commercial Operation (COD) |
|---|---|---|
| Utran Extension | 375 | 1-Sep-2009 |
| Sikka Extension | 500 | 1-Oct-2010* |
| Wind Power | 10 | 1-April-2008 |
| Ukai Extension | 500 | 5-Feb-2011* |
| **Total** | 1385 | |

* Sikka Extension and Ukai Extension are likely to commence full operation only after the first control period. Hence the generation from these plants has not been included in the projections in this petition.

## 5.2 Projected Performance Parameters

GSECL submitted the station-wise constraints / reasons for deterioration in efficiency of coal fired units as under:

**UKAI TPS**

The 2x120 MW stage I units are 32 years old and have completed their stipulated service life. The performance of these units is adversely affected due to ageing effect. These units have peculiar problems due to inherent design deficiencies, such as high APH in leakages due to recuperative type APH instead of regenerative type APH, high air ingress, staggered design of economizer tubes, frequent leakages in Final / platen SH tubes etc. With all these, the load is restricted to 75 – 80 MW. Other issues affecting performance are – Obsolete control & Instrumentation systems, high turbine eccentricity / vibrations, high silica due to condenser tube leakages etc.

To resolve the inherent design deficiencies, major R & M of these units is undergoing. The R & M of unit no. 1 is completed in 2007-08 and the unit is under stabilization and that of unit no. 2 is planned after stabilization of unit no. 1.

The 2 x 200 MW stage II units are 29 years old and completed their stipulated service life and the ageing has resulted in deteriorated condition of boilers. These units have problems like frequent tube leakages in economiser due to severe erosion, high silica due to condenser tube leakages, very long start up time due to non availability of HP / LP by pass system and the unit can be taken back after 36 hours in case of tripping. There is problem of HP turbine parting plant leakage in unit-3, frequent water wall tube leakages in unit-4 due to steam erosion from soot blowers, and the load is restricted to 185 – 190 MW.

Over & above, the coal consumption can not be measured accurately in absence of gravimetric feeders. The coal consumption is derived from regular verification of physical stock of coal with stock on ledger.

**GANDHINAGAR TPS**

The 2 x 120 MW stage I units are of 31 years old and have completed their stipulated service life. The performance of these units is adversely affected due to ageing effect. These units have peculiar problems due to inherent design deficiencies, like high APH in leakages due to recuperative APH instead of regenerative APH, high air ingress, ID fan margin problem, high silica due to condenser tube leakage etc. The load is restricted to 75-80 MW; in unit 1, on account of problem of high generator winding temperature and more clearance of IP turbine front glands, and in unit 2, one Platen SH Assly is plugged and there is problem of high vibrations of bearing no. 5 of turbine. To resolve the inherent design deficiencies, major R & M of these units is chalked out. The R & M of unit no. 1 & 2 will be decided after stabilization of Ukai unit No.1.

The 2 x 210 MW stage II units (3 & 4) have the coal mills of STEIN (France) make. Over a period of time, the maintenance of the mills has drastically increased and the availability of spares is a big question, as the spares are imported in nature the delivery normally remains @ 18-24 months. GSECL has been trying for procurement of the spares through open tender in national dailies / internet. Due to these , the availability of coal mills remains low and the available mills too run with various problems restricting the capacity of the mill, and so even with keeping five mills (against the design of four mills for full load) the load of 180

– 190 MW is achieved on these units. Due to frequent tube leakages in re-heater in unit-4, the reheat temperature is maintained @ 20$^{o}$C less than the designed values which adversely affects the overall performance of the unit.

**WANAKBORI TPS (6 x 210 MW)**

The stage I units of Wanakbori TPS are on the verge of completion of their service life. Due to system demand, the units at WTPS are running with boiler extensions, the condition of boilers has deteriorated and resulted in increased boiler tube leakages. In stage II (units 4, 5 & 6) there is problem of ID fan margin, i.e. no mechanical margin on ID fans which adversely affects generation during "low system frequency". Also, the load is required to be restricted due to high SH steam temperature, even with maximum spray. The situation aggravates when top elevation coal mills are in service when lower elevation are taken for maintenance. These reasons affect the overall performance of units.

**SIKKA TPS (2 x 120 MW)**

The ambient conditions (near sea coast) affect the plant performance of the units. During low tide period, the load is required to be reduced due to vacuum problems. The HP heaters are not available in unit-2 due to tube leakage problem. In unit-1, the problem of ID fan margin i.e. no mechanical margin on ID fans which adversely affects the performance during "low system frequency".

**KUTCH LIGNITE TPS**

Due to use of brackish water, the condenser vacuum problems are high and affect the performance of units. Also due to inferior quality of lignite, the problems of clinker formation has increased and results in frequent outage of units due to bottom ash chain problems. Also the Capital Overhaul of unit no. 3 is overdue and the condition of boiler / air pre-heater is deteriorated which affects the performance of the unit.

**Overall Scenario**

The generating capacity available in the country as a whole including in the State of Gujarat as at present is not adequate to meet required demand all the times. Therefore, scheduled overhauling of Boilers and Turbines are getting deferred and the Boilers are running with extensions, which result in deterioration in the operating parameters of the machines. Further, the extended running of machines is also aggravating the problems like tripping / boiler tube leakages /ash disposal problems (KLTPS) etc

**5.2.1** As per CEA Performance Review of Thermal Power Stations for 2006-07, the operating station Heat Rate had been 2861 Kcal/Kwh against the design Heat Rate of 2398 Kcal/Kwh having percentage deviation of 19.31 % (deteriorated by 3.35% over preceding year) GSECL has projected the performance parameters and generation costs for the generating stations for the control period 2008-09 to 2010-11 and sought approval of the Commission, which are discussed in this chapter.

## 5.3 Performance of Generating Stations – GSECL Projections and Commission's analysis and decisions

GSECL has submitted the actual performance of the stations for the year 2006 – 07 and projected performance for the years 2007 – 08 and for the control period 2008-09 to 2010-

11. **GSECL has also submitted the maintenance schedule for the units and R&M programme (where applicable) during the Control Period.**

GSECL has furnished the actuals for the year 2007-08, vide their letter no. 4574 dt. 21-10-08, as required by the Commission. The performance of the stations is discussed below.

### 5.3.1 Availability of the plant

GSECL has submitted the Plant Availability Factors of all the stations as given in Table 5.2 below:

**Table 5.2**

**Plant Availability Factors (%) for the Control Period 2008-09 to 2010-11 – GSECL Submission**

| S.N | Station | @Availability fo the earlier 3 years average (2003-05) (%) | @2005 – 06 (Actuals) (%) | 2006 – 07 (Actuals) (%) | 2007 – 08 (Actuals) (%) | 2008-09 (Projected) (%) | 2009-10 (Projected) (%) | 2010-11 Projected (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 76.00 | 74.86 | 66.95 | 69.78 | 72.00 | 74.00 | 74.00 |
| 2 | Gandhinagar 1to 4 | 82.66 | 67.15 | 55.87 | 68.81 | 60.00 | 60.00 | 60.00 |
| 3 | Gandhinagar - 5 | 91.00 | 97.23 | 77.37 | 94.58 | 80.00 | 80.00 | 80.00 |
| 4 | Wanakbori 1- 6 | 88.06 | 83.78 | 90.01 | 85.47 | 80.00 | 80.00 | 80.00 |
| 5 | Wanakbori – 7 | 93.00 | 97.75 | 82.43 | 97.66 | 80.00 | 80.00 | 80.00 |
| 6 | Sikka | 70.00 | 70.20 | 76.16 | 75.11 | 75.00 | 75.00 | 75.00 |
| 7 | KLTPS 1 to 3 | 76.66 | 35.55 | 65.54 | 70.70 | 72.00 | 72.00 | 72.00 |
| 8 | KLTPS 4 | - | 0.00 | - | - | 75.00 | 75.00 | 75.00 |
| 9 | Dhuvaran oil | 87.00 | 37.58 | 31.51 | 47.66 | 80.00 | 80.00 | 80.00 |
| 10 | Dhuvaran gas 1 | 85.00 | 79.77 | 27.41 | 80.39 | 80.00 | 80.00 | 80.00 |
| 11 | Dhuvaran gas 2 | - | 0.00 | - | 77.74 | 80.00 | 80.00 | 80.00 |
| 12 | Utran – Gas | - | 92.99 | 92.59 | 87.58 | 80.00 | 80.00 | 80.00 |
| 13 | Ukai – Hydro | 88.67 | 93.71 | 99.24 | 88.72 | 80.00 | 80.00 | 80.00 |
| 14 | Kadana Hydro | 85.00 | 77.78 | 70.14 | 71.17 | 80.00 | 80.00 | 80.00 |
| 15 | Utran Extension | | | | | | 80.00** | 80.00 |

@ Data obtained from last tariff order.

** For the Period of Operation after COD.

For all the PPA governed stations of GSECL (viz., Gandhinagar-5, Wanakbori-7, Dhuvaran Gas-1 and Utran), which are relatively new plants, availability and neutralization level is sought to be fixed at 80% as per the PPA parameters.

As per the directive dated 3.10.2008 of the Commission, GSECL furnished the actual PAF for all stations for the year 2007-08 in their letter No.4574 dated 21.10.2008. Further to the direction given on 19.12.2008 GSECL furnished on 22.12.2008 the unit wise projected PAF for all the stations. The above PAFs unit-wise are furnished in the table below:

| Sl.No | NAME OF POWER STATION | UNIT NO | 2007-08 Actual | PAF (%) 2008-09 projected | 2009-10 Projected | 2010-11 Projected |
|---|---|---|---|---|---|---|
| 1 | UKAI | 1 | | 63.98 | 77.75 | 73.33 |
| | | 2 | | 63.98 | 56.63 | 73.33 |
| | UTPS 1 & 2 | | | 35.19 | 67.19 | 73.33 |
| | | 3 | | 78.77 | 78.46 | 73.37 |
| | | 4 | | 89.84 | 78.46 | 73.56 |
| | | 5 | | 90.64 | 73.27 | 75.79 |
| | UTPS 3 TO 5 | | | 86.48 | 76.67 | 74.26 |
| | TOTAL | TOTAL | 69.78 | 72.00 | 74.00 | 74.00 |
| 2 | GANDHINAGAR | 1 | | 54.61 | 35.03 | 72.88 |
| | | 2 | | 54.61 | 62.48 | 27.95 |
| | GTPS 1 & 2 | | | 54.61 | 48.76 | 50.41 |
| | | 3 | | 61.14 | 66.42 | 65.47 |
| | | 4 | | 63.72 | 66.42 | 65.47 |
| | GTPS 3 & 4 | TOTAL | | 62.43 | 66.42 | 65.47 |
| | GTPS 1 TO 4 | | 68.81 | 60.00 | 60.00 | 60.00 |
| 3 | GANDHINAGAR | 5 | 94.58 | 90.00 | 89.53 | 89.53 |
| 4 | WANAKBORI | 1 | | 75.64 | 80.95 | 80.84 |
| | | 2 | | 79.03 | 80.95 | 80.84 |
| | | 3 | | 84.25 | 75.05 | 80.84 |
| | | 4 | | 86.09 | 76.97 | 82.95 |
| | | 5 | | 87.43 | 83.03 | 82.95 |
| | | 6 | | 88.53 | 83.03 | 82.97 |
| | WTPS 1 TO 6 | TOTAL | 85.47 | 83.50 | 80.00 | 81.90 |
| 5 | WTPS 7 | 7 | 97.66 | 90.92 | 89.53 | 89.53 |
| 6 | SIKKA | 1 | | 69.38 | 68.32 | 73.86 |
| | | 2 | | 80.62 | 81.68 | 76.13 |
| | | TOTAL | 75.11 | 75.00 | 75.00 | 75.00 |
| 7 | KLTPS | 1 | | 74.44 | 76.96 | 68.75 |
| | | 2 | | 74.44 | 77.01 | 74.79 |
| | | 3 | | 67.43 | 62.68 | 72.42 |
| | KLTPS #1-3 | | 70.70 | 72.00 | 72.00 | 72.00 |
| 8 | KLTPS-4 | 4 | | 75.00 | 75.00 | 75.00 |
| 9 | DHUVARAN | 5 | | 83.97 | 82.44 | 82.19 |
| | (LSHS) | 6 | | 71.71 | 77.56 | 77.80 |
| | | TOTAL | 47.66 | 77.84 | 80.00 | 80.00 |
| 10 | UTRAN(GAS) | TOTAL | 80.00 | 87.65 | 90.37 | 90.37 |
| 11 | DHUVARAN (GAS) | I | 80.39 | 77.46 | 84.41 | 84.41 |
| 12 | | II | 77.74 | 86.94 | 88.04 | 85.37 |
| 13 | UTRAN (EXTN) (GAS) | I | 0 | 0.00 | 86.50 | 86.50 |

Note:
1) Where PAF is shown more than 80 %, the neutralization level shall be 80 %
2) The bifurcation is tentative, the capacity declaration to SLDC is made on station basis

**Ukai (Units- 1-5)**

The availability of Ukai (TPS) is projected at 72% for 2008–09 and 74% for the years 2009-10 & 2010-11.The average availability for the years 2002-03 to 2004-05 was about 76% and the actual for 2005-06, 2006-07and 2007-08 was 74.86%, 66.95% and 69.78% respectively. It is submitted by GSECL that the projected availability for Ukai is less as the units are very old and susceptible for outages. It is stated, Unit -1 was taken back into service from 24.05.08, after BHEL resolved problem of high HP Eccentricity & Vibrations and it is yet to stabilize and achieve 120 MW capacity. Unit – 2 is scheduled for shut down

for R & M, after re-commissioning of Unit -1 and stabilization of the same. Ukai TPS Units 3, 4 & 5 are planned for RLA, CA, LE study, one unit in 2008-09, one unit in 2009-10 and one unit in 2010-11.

**Gandhinagar (Units-1-4)**

The availability of Gandhinagar 1 to 4 is projected at 60% for the control period 2008-09 to 2010 -11. The average availability for the years 2002-03 to 2004-05 was 82.66% and the actual availability for 2005-06, 2006-07 & 2007-08 was about 67.15%, 55.87% and 68.81% respectively. The performance of the units has deteriorated during the last 3 years. It is submitted by GSECL, that the projected availability for this station is less at 60% for the control period 2008-09 to 2010-11, as the units are very old. **Also, for Unit-1 (120 MW), R & M is scheduled from 2.04.08 to 1.11.2008 and R & M of Unit-2 (120 MW) is scheduled from 2.11.2008 to 1.06.2009.**

**Wanakbori (Units 1-6)**

The availability of Wanakbori 1 to 6 is projected at 80% for the control period 2008-09 to 2010-11. The average availability for 3 years 2002-03 to 2004-05 was 88.06% and it is 83.78%, 90.01% and 85.47% for the years 2005-06, 2006-07 and 2007-08 respectively.

It is stated that the units 1, 2 & 3 at Wanakbori are planned for RLA, CA, LE study, two units in 2008-09 and one unit in 2009-10.

**Sikka (Units 1-2)**

The availability of Sikka is projected at 75% for the control period 2008 – 09 to 2010 –11. The average availability for the 3 years 2002-03 to 2004-05 was 70% and the availability for the years 2005-06 and 2007-08 are 70.20% and 76.16% respectively. It is stated by GSECL, that at Sikka station, load has to be reduced for both the units, during low tide period, because of the creation of low vacuum.

**KLTPS (Units 1-3)**

The availability of KLTPS 1 to 3 is projected at 72% for the control period 2008-09 to 2010-11, against the average for 3 years (from 02-03 to 04-05) was 76.66%, 35.55% for 2005-06, 65.54% for 2006-07 and 70.70% for 2007-08.It is stated by GSECL that the work of extending conveyor belts for Unit No.3 from Unit No.4 will be completed during August 2008.

GSECL has also stated that apart from Gandhi Nagar – 5, Wanakbori – 7, Dhuvaran gas - 1, Utran and other recent capacity additions, all the other stations are old and many of them have already exceeded the normative life, which can be evidenced from Table 1 and further these stations are easily susceptible to the outages and such outages and faults occur at abnormally high level. Due to these factors and other reasons stated above, GSECL requested for approval of availability as projected and to consider the same as neutralization level for full fixed cost recovery. According to Regulations of GERC, fixed charges of Hydro stations are recoverable fully, only if the machine runs three hours in a day during peak hours. As the operation of the units of the Hydro stations of GSECL are entirely dependant on the instructions by Government of Gujarat (Irrigation Department) for release of water as they are entirely based on the irrigation requirement, GSECL requested

for recovery of the full fixed cost based on the plant availability, irrespective of the operation during peak hours, as proposed.

Summing up R&M works are proposed to be taken up on the following units during the control period.

1. Ukai 1 to 2 and 3 to 5
2. Gandhinagar 1 to 2
3. Wanakbori 1 to 3

***Commission's view:***

*GSECL stated that the unit wise PAF bifurcation is tentative. The capacity availability declaration to SLDC is made on station basis. Hence the station-wise plant availability is considered for approval. The above facts, the objections raised in response to public notice and during public hearings and also the response of GSECL in explaining the reasons for reduced PAF are examined and approved as follows.*

**Ukai**

Taking into consideration the capacity and vintage of the units, past performance and maintenance and R & M programme submitted by GSECL, the PAFs as projected by GSECL are approved for the control period.

**Gandhi Nagar 1 to 4**

R & M for Unit -1 will be completed during 2008-09 and for Unit -2, it will be completed by June 2009. Hence higher PAF, than projected by GSECL can be achieved for the years 2009-10 and 2010-11.

Taking into consideration the capacity and vintage of units, past performance, maintenance and R & M programmes during the control period, a PAF of 65% is approved for the year 2008-09. For the years 2009-10 and 2010-11, however, the PAF is approved at 70% and 80% respectively.

**Wanakbori 1 to 6**

It is stated that two units are planned for RLA, CA, LE study during 2008 – 09 and one unit during 2009 – 10. Hence higher PAF can be achieved during 2009 – 10 and 2010 – 11 than 2008 – 09. Based on this, and other considerations, like age and past performance, the PAF of 80% for 2008-09, 85% for 2009-10 and 90% for 2010-11 are approved.

**Sikka (1 to 2)**

Based on the capacity and age of the units and past performance which was 73.82% average for earlier three years and operational constraints during low tide for cooling, the PAF of 75% is approved for the control period, as projected by the GSECL.

**KLTPS (1 to 3)**

Based on the capacity, age and past performance, problem of inferior quality of lignite, cooling water problems the PAF for this station is approved at 72% for the year 2008-09, 75% for the year 2009-10 and 78% for the year 2010-11 in view of extending conveyor belt from Unit IV.

**KLTPS - 4**

The PAF for this Station is approved at 80% for the control period, against 75% projected by GSECL, as it is a new unit.

**Gandhi Nagar – 5, Wanakbori – 7, Dhuvaran Oil, Dhuvaran gas -1, Dhuvaran gas – 2, Utran gas and Utran gas extension :**

The PPA governed stations of GSECL (viz Gandhinagar-5, Wanakbor-7, Dhuvaran gas and Utran) which are relatively new plants, the actual PAF was 97.23%, 97.75%, 79.77% and 92.99% respectively during 2005-06 and 77.37%, 82.43%, 27.41% and 92.59% respectively for the year 2006-07 and 94.58%, 97.66%, 80.39% and 87.58% respectively for the year 2007-08. The average PAF for the earlier 3 years was also well above 90% for above stations.

The PAF as projected by GSECL and as approved by the Commission for the Control Period 2008 – 09 to 2010 – 11, are as given in Table 5.3 below.

**Table 5.3**
**Availability Factor (%) approved by the Commission for the Control Period 2008-09 to 2010-11**

| S.N | Station | GSECL Proposal | | | Approved by the Commission | | |
|---|---|---|---|---|---|---|---|
| | | 2008-09 | 2009-10 | 2010-11 | 2008-09 | 2009-10 | 2010-11 |
| 1 | Ukai | 72.00 | 74.00 | 74.00 | 72.00 | 74.00 | 74.00 |
| 2 | Gandhi Nagar 1to 4 | 60.00 | 60.00 | 60.00 | 65.00 | 70.00 | 80.00 |
| 3 | Gandhi Nagar - 5 | 90.00 | 89.53 | 89.53 | 90.00 | 90.00 | 90.00 |
| 4 | Wanakbori 1- 6 | 80.00 | 80.00 | 81.90 | 80.00 | 85.00 | 90.00 |
| 5 | Wanakbori – 7 | 80.00 | 89.53 | 89.53 | 90.00 | 90.00 | 90.00 |
| 6 | Sikka | 75.00 | 75.00 | 75.00 | 75.00 | 75.00 | 75.00 |
| 7 | KLTPS 1 to 3 | 72.00 | 72.00 | 72.00 | 72.00 | 75.00 | 78.00 |
| 8 | KLTPS 4 | 75.00 | 75.00 | 75.00 | 80.00 | 80.00 | 80.00 |
| 9 | Dhuvaran oil | 77.94 | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 |
| 10 | Dhuvaran gas 1 | 77.46 | 84.41 | 84.41 | 80.00 | 85.00 | 85.00 |
| 11 | Dhuvaran gas 2 | 86.94 | 88.04 | 85.37 | 87.00 | 88.00 | 88.00 |
| 12 | Utran – Gas | 80.00 | 80.00 | 80.00 | 90.00 | 90.00 | 90.00 |
| 13 | Utran – Extension | - | 86.50 | 86.50 | 0 | 87.00 | 87.00 |
| 14 | Ukai Hydro | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 |
| 15 | Kadana Hydro | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 | 80.00 |

For Hydro Stations, GSECL is allowed to recover full fixed costs at 80% availability irrespective of operation during peak hours.

GSECL will recover the full fixed costs at the availability approved above. If the availability is lower than what is approved by the Commission, the fixed charges will be proportionately reduced to the actual availability.

The PLF need not be limited to the PAF approved. It is necessary to achieve maximum generation by GSECL stations to limit purchase of higher cost power from other sources.

### 5.3.2 Plant Load Factor (PLF)

GSECL has submitted the plant load factor for all the thermal stations, actuals for the year 2006 – 07 and for 2007-08, and projected PLF for the Control Period 2008 – 09 to 2010 – 11, as given in Table -5.4 below:

**Table 5.4**
**Plant Load Factor (PLF) (%) for the Control Period 2008–09 to 2010–11**
**GSECL Submission**

| S. N | Station | @Average of earlier 3 years (2003 – 05) | @2005 – 06 (actuals) | *(Actuals) 2006-07 | *(Actuals) 2007-08 | (Projection) 2008-09 | (Projection) 2009-10 | (Projection) 2010-11 |
|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 66.70 | 72.03 | 64.64 | 67.81 | 72.00 | 74.00 | 74.00 |
| | Gandhi Nagar 1 to 4 | 63.30 | 64.06 | 58.80 | 66.78 | 60.00 | 60.00 | 60.00 |
| 3 | Gandhi Nagar-5 | 88.67 | 94.77 | 77.98 | 94.95 | 92.00 | 92.00 | 92.00 |
| 4 | Wanakbori 1- 6 | 82.67 | 76.76 | 85.80 | 83.10 | 85.00 | 85.00 | 85.00 |
| 5 | Wanakbori – 7 | 91.00 | 92.92 | 82.56 | 96.87 | 92.00 | 92.00 | 92.00 |
| 6 | Sikka | 56.67 | 66.81 | 74.62 | 70.95 | 75.00 | 75.00 | 75.00 |
| 7 | KLTPS 1 to 3 | 50.00 | 35.55 | 68.95 | 72.96 | 72.00 | 72.00 | 72.00 |
| 8 | KLTPS 4 | - | - | - | - | 75.00 | 75.00 | 75.00 |
| 9 | Dhuvaran oil | 35.33 | 31.20 | 28.44 | 64.95 | 77.00 | 77.00 | 77.00 |
| 10 | Dhuvaran gas 1 | 75.00 | 78.45 | 28.08 | 75.37 | 90.00 | 90.00 | 90.00 |
| 11 | Dhuvaran gas 2 | - | - | - | 76.32 | 80.00 | 80.00 | 80.00 |
| 12 | Utran – Gas | 78.33 | 91.11 | 89.28 | 83.93 | 92.00 | 92.00 | 92.00 |
| 13 | Utran Extension | - | - | - | - | - | 58.00 | 80.00 |
| 14 | Ukai Hydro | | 21.73 | 45.55 | 34.96 | 24.00 | 24.00 | 24.00 |
| 15 | Kadana Hydro | | 10.10 | 16.80 | 14.29 | 9.00 | 9.00 | 9.00 |

@ The data obtained from last tariff order.
* The data furnished by GSECL letter no. 4574 dated 21.10.2008

GSECL also stated that because of aging and operation constraints some machines could not be operated at full load impacting the PLF.

***Commission's view:***

*The above facts, the objections raised in response to public notice and during public hearings and also the response of GSECL in explaining the reasons for reduced PLF are examined and approved as follows.*

**Ukai:**

For this station, the PLF was projected at 72%, 74% and 74% for the control period which is the same as PAF. As discussed earlier, the PAF as projected by GSECL is approved. Similarly, PLF also is approved as projected by GSECL, which is in line with the past performance.

**Gandhinagar (1 to 4)**

GSECL projected a PLF 60% for the control period 2008 -09 to 2010-11. In line with the approved PAF of 60%, 70% and 80% for the year 2008-09, 2009-10 and 2010-11 and based on the average PLF for the earlier years, the PLF for control period is approved at 65%, 70% and 75% for the years 2008-09, 2009-10 and 2010-11 respectively.

**Gandhinagar – 5**

The actual PLF for the year 2005-06 was 94.77% for the year 2006-07 was 77.98% and for the year 2007-08 it was 94.95% whereas the average PLF for earlier 3 years (2003-05) was 88.67%. GSECL projected a PLF of 92% for the control period which

is in keeping with the average PLF of earlier years. The PLF of 92% is thus approved for Gandhi Nagar 5 for the control period 2008-09 to 2010-11.

**Wanakbori – (1 to 6)**

The PLF for Wanakbori 1 to 6 is projected at 85% for the control period. Considering the previous performance of 85.80% and 83.10% in 2006-07 and 2007-08 respectively and the availability of 80% to 90%, the PLF of 85% for the control period is considered reasonable and hence approved.

**Wanakbori – 7**

The actual PLF for the year 2005-06 was 92.92% and for 2006 – 07, it was 82.56 % and for 2007 – 08 it was 96.87%, whereas the average PLF for the earlier 3 years was 91%. The projection of PLF of 92% for the control period 2008 – 09 to 2010 – 11 by GSECL is considered reasonable and hence approved.

**Sikka**

For Sikka station a PLF of 75% is approved as projected by GSECL, considering the performance of earlier years which was 74.62% and 70.95% in 2006-07 and 2007-08 respectively and approved PLF of 75%.

**KLTPS- (1 to 3)**

The PLF of 72% projected for the control period is reasonable, taking the past performance which was 68.95% and 72.96% in 2006-07 and 2007-08 respectively and approved PAF into consideration and hence approved.

**KLTPS – 4:**

The PLF for this station is projected at 75% for the control period. The Station being a new one, with approved availability of 80%, PLF of 80% is approved for KLTPS – 4 for the control period 2008-09 to 2010-11.

**Dhuvaran Oil, Dhuvaran gas -1 and Dhuvaran gas -2:**

The PLF as projected by GSECL for the control period for these stations are approved, as they are in keeping with the earlier performances.

The Dhuvaran Gas – 2 can also achieve 90% PLF. It is stated that there is no firm agreement for supply of gas and gas is being purchased at spot prices. Hence PLF of 90% is approved and the availability of gas and actual PLF will be reviewed at the end of the year.

**Utran gas:**

The actual PLF for the year 2005-06 was 91.11%, for 2006-07 was 89.28% and for 2007-08 it was 83.93%, where as the average PLF for the earlier 3 years was 78.33%. PLF of 92 % as projected by GSECL for the control period is considered reasonable and hence approved.

**Utran Extension**

The PLF as projected by GSECL for the years 2009-10 and 2010-11 for the station is approved as it is a new station and performance is to be observed.

Considering the capacity of the units, vintage, technology of the plant, past performance site specific problems and maintenance and R&M programmes furnished by GSECL and the reasons stated above, the Commission approves plant load factor for various thermal stations and hydro stations as given in Table 5.5 below:

**Table 5.5**
**Plant Load Factor (%) approved by the Commission for the Control Period 2008 – 09 to 2010 – 11**

**(%)**

| S.N | Station | GSECL Proposal | | | Commission Approved | | |
|---|---|---|---|---|---|---|---|
| | | 2008-09 | 2009-10 | 2010-11 | 2008-09 | 2009-10 | 2010-11 |
| 1 | Ukai | 72.00 | 74.00 | 74.00 | 72.00 | 74.00 | 74.00 |
| 2 | Gandhi Nagar 1to 4 | 60.00 | 60.00 | 60.00 | 65.00 | 70.00 | 75.00 |
| 3 | Gandhi Nagar - 5 | 92.00 | 92.00 | 92.00 | 92.00 | 92.00 | 92.00 |
| 4 | Wanakbori 1- 6 | 85.00 | 85.00 | 85.00 | 85.00 | 85.00 | 85.00 |
| 5 | Wanakbori – 7 | 92.00 | 92.00 | 92.00 | 92.00 | 92.00 | 92.00 |
| 6 | Sikka | 75.00 | 75.00 | 75.00 | 75.00 | 75.00 | 75.00 |
| 7 | KLTPS 1 to 3 | 72.00 | 72.00 | 72.00 | 72.00 | 72.00 | 72.00 |
| 8 | KLTPS 4 | 75.00 | 75.00 | 75.00 | 80.00 | 80.00 | 80.00 |
| 9 | Dhuvaran oil | 77.00 | 77.00 | 77.00 | 77.00 | 77.00 | 77.00 |
| 10 | Dhuvaran gas 1 | 90.00 | 90.00 | 90.00 | 90.00 | 90.00 | 90.00 |
| 11 | Dhuvaran gas 2 | 80.00 | 80.00 | 80.00 | 90.00 | 90.00 | 90.00 |
| 12 | Utran – Gas | 92.00 | 92.00 | 92.00 | 92.00 | 92.00 | 92.00 |
| 13 | Utran - Extension | - | 58.00 | 80.00 | - | 58.00 | 80.00 |
| 14 | UKai – Hydro | 24.00 | 24.00 | 24.00 | 24.00 | 24.00 | 24.00 |
| 15 | Kadana Hydro | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |

### 5.3.3 Auxiliary consumption

GSECL has submitted the auxiliary consumption, actuals for the years 2006-07 and 2007-08 and projections for the Control Period as given in Table 5.6 below:

**Table 5.6**
**Auxiliary consumption (%) – Submission by GSECL**

| S.N | Station | @Average of earlier 3 years(2003 – 05) | @2005 – 06 (actuals) | (Actuals) 2006 – 07 | (Actuals) 2007 – 08 | (Projection) 2008-09 | (Projection) 2009-10 | (Projection) 2010-11 |
|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 9.21 | 9.05 | 8.92 | 9.35 | 9.20 | 9.20 | 9.20 |
| 2 | Gandhi Nagar 1 to 4 | 11.06 | 11.12 | 12.58 | 11.51 | 11.80 | 11.80 | 11.80 |
| 3 | Gandhi Nagar - 5 | 8.83 | 8.61 | 9.85 | 9.19 | 9.00* | 9.00* | 9.00* |
| 4 | Wanakbori 1- 6 | 9.01 | 8.67 | 8.49 | 8.70 | 9.00 | 9.00 | 9.00 |
| 5 | Wanakbori – 7 | 8.84 | 8.76 | 8.94 | 8.48 | 9.00* | 9.00* | 9.00* |
| 6 | Sikka | 11.31 | 10.81 | 10.31 | 10.94 | 11.30 | 11.30 | 11.30 |
| 7 | KLTPS 1 to 3 | 13.80 | 12.65 | 11.94 | 12.89 | 12.50 | 12.50 | 12.50 |
| 8 | KLTPS 4 | - | - | - | 12.50 | 12.50 | 12.50 | 12.50 |
| 9 | Dhuvaran oil | 11.59 | 12.50 | 11.85 | 9.72 | 11.50 | 11.50 | 11.50 |
| 10 | Dhuvaran gas 1 | 3.93 | 4.80 | 5.60 | 4.81 ** | 3.00** | 3.00** | 3.00** |
| 11 | Dhuvaran gas 2 | - | - | - | 3.93^ | 3.00^ | 3.00^ | 3.00^ |
| 12 | Utran – Gas | 4.90 | 4.41 | 4.94 | 5.02^ | 4.00^ | 4.00^ | 4.00^ |
| 13 | Utran Extension | - | - | - | - | - | 5.50 | 5.50 |
| 14 | Ukai Hydro | 0.37 | 0.67 | 0.70 | 0.68 | 0.70 | 0.70 | 0.70 |
| 15 | Kadana Hydro | 0.89 | 0.85 | 1.19 | 1.21 | 1.19 | 1.19 | 1.19 |

@ data obtained from last year tariff order.

*As per PPA, Aux Con after 10 years for GTPS – 5 and WTPS – 7 is 9% (Commissioning date of GTPS – 5 is 17.03.1998 and WTPS – 7 is 31.12.1998)

** In addition to it, Auxiliary Consumption of gas booster compressor (GBC) shall be claimed at actuals by measuring it through an energy meter exclusively to calculate Auxiliary Consumption of the GBC in line with approval of the Commission vide Order No. GERC/Legal/1436 Dtd. 07.02.07 for Dhuvaran CCPP – I.

^For Dhuvaran gas–1 the Commission has approved in principal the additional Aux. Consumption on account of GBS at actuals, subject to measuring the same by providing an exclusive energy meter. Hence for gas based stations Utran and Dhuvaran gas–2, GSECL requests to approve additional auxiliary consumption due to the use of gas boosters.

GSECL submitted that the auxiliary consumption for most of the thermal stations is high, as the stations are not operating at full capacities due to aging effect and due to the fact that auxiliaries of thermal stations are on at full capacities even if the plant is not working at full load. Therefore in terms of percentage it is higher.

GSECL justified the higher auxiliary Consumption for the reasons mentioned below for the following stations.

| **Stations** | **Justification for higher consumption for the control period (FY 2008-09 to 2010-11)** |
|---|---|
| Gandhinagar 1 to 4 | ➢ Unit – 1 & Unit – 2 – run at part load.<br>➢ Unit 1&2 would be under R&M during the control period.<br>➢ Coal mill problems of Unit No. 3&4 due to non – availability of spares. |
| Sikka 1&2 | ➢ Load is required to be reduced during low tide period because of low vacuum. |
| KLTPS 4 | ➢ CFBC and stabilization. |
| Dhuvaran Oil – 5&6 | ➢ Vacuum problem due to condenser getting chocked up, resulting in partial load operation, |
| Gandhinagar – 5 | ➢ As per PPA Aux Con after 10 years is 9% (Commissioning date is 17.03.1998) |
| Wanakbori – 7 | ➢ As per PPA Aux Con after 10 years is 9%. (Commissioning date is 31.12.1998) |
| Dhuvaran Gas – 1 | ➢ As per PPA and due to use of Gas Booster as per the order of the Commission. |
| Dhuvaran Gas – 2 | ➢ As per PPA and justification as above, given under Unit - I. |
| Utran GBPS – 1 | ➢ As per PPA and justification as above, given under Dhuvaran Gas Units. |

For Hydro stations, auxiliary consumption corresponding to the PLF mentioned is taken as base.

***Commission's view**:*

*Commission, in its Regulations, has specified auxiliary consumption of 9% for coal based thermal stations of 200 MW series with cooling towers and 8.5% without cooling towers. For gas turbine, it is 1% for open cycle and 3% for combined cycle. For Lignite – fired station, it is 0.5% more than coal based thermal stations. For units smaller than 200/210 MW, the Commission may specify auxiliary consumption separately based on past performance etc.*

*The thermal stations of GSECL have cooling towers except Ukai (Thermal). The auxiliary consumption for 200 MW series should be 9.0% in accordance with the norms for the thermal stations except Ukai (T) where it should be 8.5%. The auxiliary consumption of Gandhinagar – 5, Wanakbori 1-6 and Wanakbori – 7 is within in the norm specified by the Commission and for other stations the auxiliary consumption is relatively high. The auxiliary consumption of all the stations barring the above three stations was consistently high during the last five years.*

*The projected auxiliary consumption is between 9.00% to 12.5%. CEA has also recommended auxiliary consumption in the range of 11.5% to 12% for units less than 200 MW. A number of units other than at Gandhinagar and Wanakbori are of lower capacity and are old having completed their useful life, some of the units operate at partial load due to backing down (on account of high cost of generation), coal mill problems etc.*

**Ukai**

For Ukai Station the auxiliary consumption of 9% is approved for the control period against 9.2% projected by GSECL, based on the earlier performance and also the units one & two are less than 200 MW capacity (120 MW).

**Gandhinagar –1-4, Sikka, KLTPS and Dhuvaran Oil**

"The Appellate Tribunal for Electricity" also, in its Judgment 129 dated 23/11/2006 directed for revision in respect of auxiliary consumption approved in the Tariff Order dated 06/05/2006, for the generating stations viz., Gandhinagar 1-4, Sikka, KLTPS and Dhurvran Oil. Accordingly, they were revised for 2006 – 07 at 11.12%, 10.81% 12.65% and 12.50% respectively. For 2007-08 the auxiliary consumption approved for the stations are 11.12%, 10.70%, 12.25% and 11.50% respectively. The same values are considered and approved for the control period also.

**Dhuvaran Gas-1**

Regarding Dhuvaran Gas-1 the auxiliary consumption, for the year 2003 – 05 was 3.93%, the actual for 2005-06 was 4.80% and for 2006-07 it was 5.6%. It is stated that higher Auxiliary consumption is due to use of gas booster. The Commission approved the auxiliary consumption of 4.8% for Dhurvran Gas-1 station for 2007-08. For control period the auxiliary consumption of 3% as projected by the GSECL is approved. The claim of GSECL to allow actual additional consumption of gas booster compressor (GBC) will be considered at the time of true up.

**Dhuvaran Gas-2 and Utran Gas**

The Commission approves the auxiliary consumption of 3% for Dhuvaran Gas -2 station and 4% for Utran Gas station as projected by GSECL. The claim of GSECL to allow actual additional consumption of gas booster compressor (GBC) will be considered at the time of true up.

**Utran Extension**

For Utran extension, the auxiliary consumption at 5.50% was projected by GSECL for the control period, which is on high side. It is approved at 4%, the same level as for Utran Gas station.

For Ukai Hydro and Kadana Hydro Stations the auxiliary consumption is approved at 0.70% and 1.19% respectively for the control period, as projected, as the generation in this station is very meager.

In view of the facts and circumstances mentioned above, the auxiliary consumption for various stations approved by the Commission are given in Table 5.7 below:

**Table 5.7**

**Auxiliary consumption (%) – Approved by the Commission for the control period (2008-09 to 2010-11)**

**(%)**

| S.No | Station | Proposed by GSECL | | | Approved by the commission | | |
|---|---|---|---|---|---|---|---|
| | | 2008-09 | 2009-10 | 2010-11 | 2008-09 | 2009-10 | 2010-11 |
| 1 | Ukai | 9.20 | 9.20 | 9.20 | 9.00 | 9.00 | 9.00 |
| 2 | Gandhi Nagar 1to 4 | 11.80 | 11.80 | 11.80 | 11.12 | 11.12 | 11.12 |
| 3 | Gandhi Nagar - 5 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| 4 | Wanakbori 1- 6 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| 5 | Wanakbori – 7 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 | 9.00 |
| 6 | Sikka | 11.30 | 11.30 | 11.30 | 10.70 | 10.70 | 10.70 |
| 7 | KLTPS 1 to 3 | 12.50 | 12.50 | 12.50 | 12.25 | 12.25 | 12.25 |
| 8 | KLTPS 4 | 12.50 | 12.50 | 12.50 | 12.25 | 12.25 | 12.25 |
| 9 | Dhuvaran oil | 11.50 | 11.50 | 11.50 | 11.50 | 11.50 | 11.50 |
| 10 | Dhuvaran gas 1 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| 11 | Dhuvaran gas 2 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| 12 | Utran – Gas | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| 13 | Utran – Extension | - | 5.50 | 5.50 | - | 4.00 | 4.00 |
| 14 | Ukai Hydro | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| 15 | Kadana Hydro | 1.19 | 1.19 | 1.19 | 1.19 | 1.19 | 1.19 |

### 5.3.4 Station Heat Rate

GSECL submitted the Heat Rate actuals for the years 2006-07, 2007-08 and projections for the control period 2008-09 to 2010-11 as given in Table 5.8 below:

**Table 5.8**

**Station Heat Rates – Submission by GSECL**

**(Kcal / kWh)**

| S.N | Station | @Average of earlier 3 years (2003-05) | @2005 – 06 (Actuals) | 2006 – 07 (Actuals) | 2007 – 08 (Actuals) | 2008-09 (Projection) | 2009-10 (Projection) | 2010-11 (Projection) |
|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 2779 | 2767 | 2783 | 2850 | 2775 | 2775 | 2775 |
| 2 | Gandhinagar 1to4 | 2841 | 2887 | 3124 | 2751 | 2855 | 2855 | 2855 |
| 3 | Gandhinagar - 5 | 2680 | 2694 | 2804 | 2520 | 2460 | 2460 | 2460 |
| 4 | Wanakbori 1- 6 | 2943 | 2883 | 2589 | 2628 | 2650 | 2650 | 2650 |
| 5 | Wanakbori – 7 | 2893 | 2763 | 2485 | 2474 | 2460 | 2460 | 2460 |
| 6 | Sikka | 3178 | 3262 | 3078 | 3297 | 3100 | 3100 | 3100 |
| 7 | KLTPS 1 to 3 | 3661 | 3379 | 3219 | 3602 | 3300 | 3300 | 3300 |
| 8 | KLTPS 4 | - | - | - | 3000 | 3000 | 3000 | 3000 |
| 9 | Dhuvaran oil | 3079 | 3415 | 3197 | 3000 | 3200 | 3200 | 3200 |
| 10 | Dhuvaran gas 1 | - | 1948 | 1915 | 2032 | 1950 | 1950 | 1950 |
| 11 | Dhuvaran gas 2 | - | - | 3400* | 2036 | 1950 | 1950 | 1950 |
| 12 | Utran – Gas | 2187 | 2182 | 2150 | 2194 | 2150 | 2150 | 2150 |
| 13 | Utran Extension | - | - | - | - | - | 1850 | 1850 |

@ The data obtained from last year tariff order.
*Trial / Test run and open cycle operation. COD is 1.11.07.

It is submitted by GSECL that the majority of the generating units are very old and the aging is playing a major role, whereby the plants are not in a position to operate at its full

rated capacity due to technical constraints and aging is also resulting in more frequent forced outages of the plant, thus resulting in interrupted capacity operations consequently resulting in higher heat rate. All other SEBs and NTPC having very old power stations are facing the same problem. It is also submitted that the report of CEA on "Technical Standards for Operations of the Thermal Plants (2004)" mentions that the poor performance of older units is due to various reasons attributable to basic design deficiencies, lack of appropriate R&M, aging, coal quality deterioration, etc and as such deterioration in the performance has to be recognized.

GSECL has mentioned the following specific reasons for consideration of approval of the Heat rate of each station as projected.

| Station | Basis of Consideration of SHR of Various stations |
|---|---|
| Ukai | ➢ Unit 3&4 have already completed useful normative life<br>➢ Improvement in SHR expected after scheduled R&M<br>➢ Partial Load Operation of Unit – 2 during stabilization period.<br>➢ Design problem in units – 3&4 (takes very long time to re-start operation as there are no HP-LP By-pass system) |
| Gandhinagar 1 to 4 | ➢ Unit 1&2 completed useful life.<br>➢ Inherent design problem causing leakages in Unit – 1&2.<br>➢ Coal Mill problems due to unavailability of spares from STEINs.<br>➢ Frequent tube failure in reheater causing low temp operation. |
| Wanakbori 1 to 6 | ➢ Units 1&2 have completed useful life.<br>➢ Unit 3-5 would complete useful life during the control period.<br>➢ Problem of ID Fan Margin in Unit – 4-6.<br>➢ High steam temperature restricting full load operation (even with maximum spray). |
| Sikka | ➢ Load required to be reduced due to low tide problem.<br>➢ Unavailability of HP heaters due to frequent tube leakage problem. |
| KLTPS 1 to 3 | ➢ High condenser vacuum problems due to use of brackish water.<br>➢ Inferior quality of lignite creating problem of clinker formation. |
| Dhuvaran Oil | ➢ Only Unit no. 5&6 (having SHR of around 3200) are in service |
| Gandhinagar 5 | ➢ As per PPA. |
| Wanakbori 7 | ➢ As per PPA |
| Dhuvaran Gas 1 | ➢ As per PPA |
| Dhuvaran Gas 2 | ➢ As per PPA |
| Utran Gas | ➢ 2150 Kcal/kWh as per the Order No. GERC/Legal/0360 dtd. 15.03.2008. |

***Commission's view:***

*The Commission has specified normative Station Heat Rate of 2500 Kcal / kWh for 210/250 MW thermal units. For lower capacity units the Commission may allow higher Heat Rate based on the past operational performance. For lignite fired stations, station heat rate of 1.1 times the heat rate for coal based stations is allowed. It is seen from the submission of GSECL, for coal based stations, except in the case of Gandhinagar – 5 and Wanakbori – 7, which are PPA covered, for all other stations, the heat rate is more than 2500 Kcal/kWh. The actual heat rate for the last five years is also high and is in the range of 2589 to 3661 Kcal/kWh.*

*As mentioned in the last Tariff Order, the Heat Rates for 200 / 250 capacity units can be adopted as per CEA recommendation, and CERC / GERC norms. For smaller size units, the CEA Technical Committee has recommended that* ***"average existing heat rate may be allowed as normative heat rate for these units for some time and certain time frame of 3-5 years may be allowed to attain the recommended normative performance level of 110% of guaranteed heat rate"****. The utilities have to take up R&M to achieve normative performance levels.*

*The Appellate Tribunal for electricity, in its judgment 129 of 2006, directed that "the station heat rate has to be allowed considering the vintage and present condition of the station in view of the CEA recommendations and treatment given by CERC for similarly placed stations".*

*The station-wise constraints / reasons for deterioration in efficiency of coal fired units submitted by GSECL are given in paras 5.2 and 5.3.4.*

*In respect of SHR, it is noted that according to CEA's report in addition to age it depends upon the technical parameters like type of technology, fuel used and performance parameters like, PLF, Auxiliary consumption etc. However, the five year actual data and the proposed figures for the control period 2008-09 to 2010-11 do not correlate with other technical parameters according to CEA report.*

*The GSECL has stated that most of the units in their generating stations are of smaller capacity and are very old. Even the units of 200/210 MW are very old and served their useful life and so the parameters like PLF, auxiliary consumption, specific oil consumption, heat rate etc., are on higher side comparative to norms and GSECL has therefore, claimed for higher values.*

The design heat rates of these stations as furnished by the GSECL are as follows:

| Sr.No. | Name of Power Stations | Stage | Boiler efficiency in % | Turbine efficiency in % | Overall HeatRate kCal/kWh |
|---|---|---|---|---|---|
| 1 | Ukai TPS | I | 86.92/85.50* | 41.7/40.53* | 2366/2482* |
| | | II | 86.00 | 42.08 | 2376 |
| | | III | 86.00 | 41.70 | 2398 |
| 2 | Gandhinagar TPS | I | 86.60 | 41.70 | 2382 |
| | | II | 85.77 | 43.24 | 2319 |
| | | III | 85.80 | 43.24 | 2307 |
| 3 | Wanakbori TPS | I | 86.04 | 41.70 | 2396 |
| | | II | 86.27 | 43.24 | 2306 |
| | | III | 86.45 | 43.24 | 2301 |
| 4 | Sikka TPS | I | 85.90 | 41.20 | 2430 |
| | | II | 85.90 | 42.85 | 2336 |
| 5 | KLTPS | I | 81.29/77.00* | 37.10/34.36* | 2851/3250* |
| | | II | 88.24 | 38.29 | 2910 |
| | | III | 76.40 | 39.37 | 2859 |
| 6 | Utran GBPS | | | Open Cycle | 2877 |
| | | | | Closed Cycle | 2150 |
| 7 | Dhuvaran Oil | I | | | 2682 |
| | | II | | | 2428 |
| 8 | Dhuvaran CCPP-I | | | Open Cycle | 2625 |
| | | | | Closed Cycle | 1862 |
| 9 | Dhuvaran CCPP-II | | | Open Cycle | 2868 |
| | | | | Closed Cycle | 1850 |

- - After R & M

**Therefore, with a view to establish exact correlation of SHR with age, size, technology, PLF, type and quality of fuel, the Commission proposes to get a study conducted to assess the normative value of SHR, through consultant like CEA. This study will be made for all units in thermal stations of GSECL.**

The terms of reference to the consultant shall be to establish the following among others.

(i) Normative plant performance parameters such as PAF, PLF, Auxiliary consumption and specific oil consumption of all GSECL stations.

(ii) How do the heat rates furnished by GSECL correlate with design heat rates and recommendations of CEA based on the vintage, technology etc of the generating units.

(iii) What would be the appropriate values of SHR based on –

(a) Present level of performance of the plant such as plant load factor, secondary fuel consumption, auxiliary consumption etc.

(b) The vintage, technology and other related factors like R&M done if any.

(c) Any other factors within or beyond the control of the power plant operation.

Pending the study, the station heat rates proposed by GSECL to all the units / stations are accepted. These values will be reviewed during truing up of 2008-09 based on the recommendations of the Consultant (CEA) and the trajectory of these parameters for the control period will be fixed accordingly.

The station heat rates projected by GSECL and approved by the Commission for the control period are given in Table –5.9 below:

**Table 5.9**
**Station Heat Rates Approved by the Commission for the control period 2008-09 to 2010-11**

**(Kcal/kWh)**

| S.N | Station | Unit No. | Heat rate projected by GSECL | | | Heat rate approved by the Commission | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2008-09 | 2009-10 | 2010-11 | 2008-09 | 2009-10 | 2010-11 |
| 1 | Ukai | 1 | 2775 | 2775 | 2775 | 2775 | 2775 | 2775 |
| | | 2 | 2775 | 2775 | 2775 | 2775 | 2775 | 2775 |
| | | 3 | 2775 | 2775 | 2775 | 2775 | 2775 | 2775 |
| | | 4 | 2775 | 2775 | 2775 | 2775 | 2775 | 2775 |
| | | 5 | 2775 | 2775 | 2775 | 2775 | 2775 | 2775 |
| | | 1-5 | 2775 | 2775 | 2775 | 2775 | 2775 | 2775 |
| 2 | Gandhinagar | 1 | 2855 | 2855 | 2855 | 2855 | 2855 | 2855 |
| | | 2 | 2855 | 2855 | 2855 | 2855 | 2855 | 2855 |
| | | 3 | 2855 | 2855 | 2855 | 2855 | 2855 | 2855 |
| | | 4 | 2855 | 2855 | 2855 | 2855 | 2855 | 2855 |
| | | 1-4 | 2855 | 2855 | 2855 | 2855 | 2855 | 2855 |
| 3 | Gandhinagar | 5 | 2460 | 2460 | 2460 | 2460 | 2460 | 2460 |
| 4 | Wanakbori | 1 | 2650 | 2650 | 2650 | 2650 | 2650 | 2650 |
| | | 2 | 2650 | 2650 | 2650 | 2650 | 2650 | 2650 |
| | | 3 | 2650 | 2650 | 2650 | 2650 | 2650 | 2650 |
| | | 4 | 2650 | 2650 | 2650 | 2650 | 2650 | 2650 |

| S.N | Station | Unit No. | Heat rate projected by GSECL | | | Heat rate approved by the Commission | | |
|---|---|---|---|---|---|---|---|---|
| | | | 2008-09 | 2009-10 | 2010-11 | 2008-09 | 2009-10 | 2010-11 |
| | | 5 | 2650 | 2650 | 2650 | 2650 | 2650 | 2650 |
| | | 6 | 2650 | 2650 | 2650 | 2650 | 2650 | 2650 |
| | | 1-6 | 2650 | 2650 | 2650 | 2650 | 2650 | 2650 |
| 5 | Wanakbori | 7 | 2460 | 2460 | 2460 | 2460 | 2460 | 2460 |
| 6 | Sikka | 1 | 3100 | 3100 | 3100 | 3100 | 3100 | 3100 |
| | | 2 | 3100 | 3100 | 3100 | 3100 | 3100 | 3100 |
| 7 | KLTPS | 1 | 3300 | 3300 | 3300 | 3300 | 3300 | 3300 |
| | | 2 | 3300 | 3300 | 3300 | 3300 | 3300 | 3300 |
| | | 3 | 3300 | 3300 | 3300 | 3300 | 3300 | 3300 |
| | | 1-3 | 3300 | 3300 | 3300 | 3300 | 3300 | 3300 |
| 8 | KLTPS | 4 | 3000 | 3000 | 3000 | 3000 | 3000 | 3000 |
| 9 | Dhuvaran Oil | 5 | 3200 | 3200 | 3200 | 3200 | 3200 | 3200 |
| | | 6 | 3200 | 3200 | 3200 | 3200 | 3200 | 3200 |
| 10 | Dhuvaran Gas– 1 | | 1950 | 1950 | 1950 | 1950 | 1950 | 1950 |
| 11 | Dhuvaran Gas– 2 | | 1950 | 1950 | 1950 | 1950 | 1950 | 1950 |
| 12 | Utran Gas | | 2150 | 2150 | 2150 | 2150 | 2150 | 2150 |
| 13 | Utran Extension | | - | 1850 | 1850 | - | 1850 | 1850 |

### 5.3.5 Secondary Oil Consumption

GSECL has submitted station wise secondary oil consumption for the coal / lignite based thermal stations, actuals for 2005–06, 2006-07 and 2007-08 and projections for the control period as given in Table 5.10 below:

**Table 5.10**
**Specific Oil Consumption – GSECL submission**

**(ML/ kWh)**

| S.N | *Station* | @Average of earlier 3 years (2003 – 05) | @2005 – 06 (Actuals) | 2006 – 07 (Actuals) | 2007 – 08 (Actuals) | 2008-09 (Projection) | 2009-10 (Projection) | 2010-11 (Projection) |
|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 2.96 | 2.08 | 2.87 | 2.16 | 2.05 | 2.05 | 2.05 |
| 2 | Gandhi Nagar 1to4 | 8.47 | 5.90 | 8.21 | 3.40 | 3.90 | 3.90 | 3.90 |
| 3 | Gandhi Nagar - 5 | 0.76 | 0.91 | 1.73 | 0.76 | 3.50 | 3.50 | 3.50 |
| 4 | Wanakbori 1- 6 | 1.09 | 1.07 | 0.70 | 0.79 | 2.00 | 2.00 | 2.00 |
| 5 | Wanakbori – 7 | 1.07 | 1.00 | 0.83 | 0.37 | 3.50 | 3.50 | 3.50 |
| 6 | Sikka | 3.75 | 2.77 | 2.94 | 3.05 | 3.00 | 3.00 | 3.00 |
| 7 | KLTPS 1 to 3 | 5.25 | 5.51 | 5.10 | 3.58 | 3.00 | 3.00 | 3.00 |
| 8 | KLTPS 4 | - | - | - | - | 5.00 | 3.00 | 3.00 |

@ The data obtained from last year tariff order

The Commission has specified in the Regulations a norm of 2.0 ML/kWh for coal fired stations and 3.0 ML/kWh for lignite fired stations. In the case of existing PPAs, the parameters specified will continue to operate. The specific oil consumption projected for the control period 2008-09 to 2010-11 is much higher than the norm specified by the Commission in the case of Ukai, GandhiNagar 1-4 and Sikka. In case of GandhiNagar –5 and Wanakbori - 7, the PPA provisions are followed.

GSECL mentioned that the oil consumption is high at some of the stations due to the following reasons.

| | |
|---|---|
| **Ukai :** | In FY 08-09, unit –2 at Ukai is expected to be completing R&M and will be in stabilization phase. |
| **GandhiNagar1-4:** | Unit 3&4 is having in coal mill problems due to unavailability of spares while unit 1&2 are old and would be under R&M during the control period. |
| **Sikka :** | As Sikka units are using sea water for the cooling purpose, low tide creates vacuum problem due to lower availability of sea water for the cooling of condenser, restricting total capacity under operation, leading to higher oil consumption as well as high Auxiliary consumption. |
| **KLTPS – 4:** | The unit is expected to be in stabilization in FY 2008-09, Hence specific oil consumption of 5.0 ML/kWh during stabilization period is projected. |

***Commission's view:***

*For Gandhinagar – 5 and Wanakbori – 7 stations, the claim of 3.50 ML/kWh is as per PPAs and is accepted.*

*For Gandhinagar 1 to 4, 3.50 ML/Kwh is approved. The oil consumption of these units was much higher earlier.*

*For Wanakbori 1 to 6, though the norm is 2.0 ML/kWh, 1.00 ML/kWh, is approved for the control period, based on the earlier performance.*

*For Ukai station, 2.00 ML/kWh, as per norms is approved, as the earlier performance is nearer to that.*

*For Sikka station in spite of the vacuum problems, the specific oil consumption for 2005-06 was 2.77 ML/kWh. The same level can be maintained for the control period also.*

*CEA has also recommended norms for specific oil consumption based on PLF. The norms vary from 1.5 to 2.5 ML / kWh.*

*Having considered norms specified by the Commission, performance of the stations, the operational constraints, recommendations of CEA and the directions of the Appellate Tribunal for Electricity, the Commission approves the specific oil consumption as given in Table 5.11 below:*

**Table 5.11**
**Specific Oil Consumption approved by the Commission for the Control Period 2008-09 to 2010-11**

**(ML/kWh)**

| S.N | Station | GSECL Proposal | | | Approved by the Commission | | |
|---|---|---|---|---|---|---|---|
| | | 2008-09 | 2009-10 | 2010-11 | 2008-09 | 2009-10 | 2010-11 |
| 1 | Ukai | 2.05 | 2.05 | 2.05 | 2.00 | 2.00 | 2.00 |
| 2 | Gandhi Nagar 1to4 | 3.90 | 3.90 | 3.90 | 3.50 | 3.50 | 3.50 |
| 3 | Gandhi Nagar - 5 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| 4 | Wanakbori 1 to 6 | 2.00 | 2.00 | 2.00 | 1.00 | 1.00 | 1.00 |
| 5 | Wanakbori – 7 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| 6 | Sikka | 3.00 | 3.00 | 3.00 | 2.77 | 2.77 | 2.77 |
| 7 | KLTPS 1 to 3 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |
| 8 | KLTPS 4 | 5.00 | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 |

# Chapter 6

# Generation Costs: Variable and Capacity (Fixed) Charges

**6.0** Generation costs – variable and capacity (Fixed) charges are discussed in this chapter

## 6.1 VARIABLE COSTS

### 6.1.1 Gross generation

Based on the capacity of the station and approved PLF (Table 5.5) the energy that could be generated by each of the stations for the control period is given in Table 6.1 below.

**Table 6.1**

**Gross generation Approved by the Commission for the Control Period – 2008-09 to 2010-11**

| S.No | Station | Capacity (MW) | 2008-09 | | 2009-10 | | 2010-11 | |
|---|---|---|---|---|---|---|---|---|
| | | | PLF (%) | Gross Generation (Mu) | PLF (%) | Gross Generation (Mu) | PLF (%) | Gross Generation (Mu) |
| 1 | Ukai | 850 | 72.00 | 5361 | 74.00 | 5510 | 74.00 | 5510 |
| 2 | Gandhinagar 1-4 | 660 | 65.00 | 3758 | 70.00 | 4047 | 75.00 | 4336 |
| 3 | Gandhinagar -5 | 210 | 92.00 | 1692 | 92.00 | 1692 | 92.00 | 1692 |
| 4 | W.bori 1-6 | 1260 | 85.00 | 9382 | 85.00 | 9382 | 85.00 | 9382 |
| 5 | W.bori -7 | 210 | 92.00 | 1692 | 92.00 | 1692 | 92.00 | 1692 |
| 6 | Sikka | 240 | 75.00 | 1577 | 75.00 | 1577 | 75.00 | 1577 |
| 7 | KLTPS 1-3 | 215 | 72.00 | 1356 | 72.00 | 1356 | 72.00 | 1356 |
| 8 | KLTPS -4 | 75 | 80.00 | 526 | 80.00 | 526 | 80.00 | 526 |
| 9 | Dhuvaran oil | 220 | 77.00 | 1484 | 77.00 | 1484 | 77.00 | 1484 |
| 10 | Dhuvaran gas-1 | 106.6 | 90.00 | 840 | 90.00 | 840 | 90.00 | 840 |
| 11 | Dhuvaran gas-2 | 112.45 | 90.00 | 887 | 90.00 | 887 | 90.00 | 887 |
| 12 | Utran gas | 135 | 92.00 | 1088 | 92.00 | 1088 | 92.00 | 1088 |
| 13 | Utran - Extension | 375 | 0.00 | 0 | 58.00 | 1905 | 80.00 | 2628 |
| | **Total Thermal** | | | **29644** | | **31988** | | **32999** |
| 14 | Ukai Hydro | 305 | 24.00 | 641 | 24.00 | 641 | 24.00 | 641 |
| 15 | Kadana Hydro | 242 | 9.00 | 191 | 9.00 | 191 | 9.00 | 191 |
| | **Total Hydro** | | | **832** | | **832** | | **832** |
| | **Total Thermal + Hydro** | | | **30476** | | **32820** | | **33831** |

The generation from Hydro Stations is stated to be based on water availability and water release based on irrigation requirement.

The gross generation from GSECL stations for the control period as approved by the Commission would be 30476 MU for 2008-09, 32820 MU for 2009-10 and 33831 MU for 2010-11 against 30054 MU, 32070 MU and 32792 MU respectively projected by GSECL.

### 6.1.2 Net Generation

Considering the approved auxiliary consumption for each of the generating stations (Table 5.7) the net generation from each of the stations of GSECL for the control period is given in Table 6.2 below:

**Table 6.2**

**Net generation approved by the Commission for the Control period 2008-09 to 2010-11**

| S. no | Station | 2008-09 | | | | 2009-10 | | | | 2010-11 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Gross Generation (Mu) | Auxiliary Consumption (%) | Auxiliary Consumption (Mu) | Net Generation (Mu) | Gross Generation (Mu) | Auxiliary Consumption (%) | Auxiliary Consumption (Mu) | Net Generation (Mu) | Gross Generation (Mu) | Auxiliary Consumption (%) | Auxiliary Consumption (Mu) | Net Generation (Mu) |
| 1 | Ukai | 5361 | 9 | 482 | 4879 | 5510 | 9 | 496 | 5014 | 5510 | 9 | 496 | 5014 |
| 2 | Gandhinagar 1-4 | 3758 | 11.12 | 418 | 3340 | 4047 | 11.12 | 450 | 3597 | 4336 | 11.12 | 482 | 3854 |
| 3 | Gandhinagar-5 | 1692 | 9 | 152 | 1540 | 1692 | 9 | 152 | 1540 | 1692 | 9 | 152 | 1540 |
| 4 | W.bori 1-6 | 9382 | 9 | 844 | 8538 | 9382 | 9 | 844 | 8538 | 9382 | 9 | 844 | 8538 |
| 5 | W.bori -7 | 1692 | 9 | 152 | 1540 | 1692 | 9 | 152 | 1540 | 1692 | 9 | 152 | 1540 |
| 6 | Sikka | 1577 | 10.7 | 169 | 1408 | 1577 | 10.7 | 169 | 1408 | 1577 | 10.7 | 169 | 1408 |
| 7 | KLTPS 1-3 | 1356 | 12.25 | 166 | 1190 | 1356 | 12.25 | 166 | 1190 | 1356 | 12.25 | 166 | 1190 |
| 8 | KLTPS -4 | 526 | 12.25 | 64 | 461 | 526 | 12.25 | 64 | 461 | 526 | 12.25 | 64 | 461 |
| 9 | Dhuvaran oil | 1484 | 11.5 | 171 | 1313 | 1484 | 11.5 | 171 | 1313 | 1484 | 11.5 | 171 | 1313 |
| 10 | Dhuvaran Gas-1 | 840 | 3 | 25 | 815 | 840 | 3 | 25 | 815 | 840 | 3 | 25 | 815 |
| 11 | Dhuvaran gas-2 | 887 | 3 | 27 | 860 | 887 | 3 | 27 | 860 | 887 | 3 | 27 | 860 |
| 12 | Utran gas | 1088 | 4 | 44 | 1044 | 1088 | 4 | 44 | 1044 | 1088 | 4 | 44 | 1044 |
| 13 | Utran - Extension | 0 | 0 | 0 | 0 | 1905 | 4 | 76 | 1829 | 2628 | 4 | 105 | 2523 |
| | **Total Thermal** | **29644** | | **2715** | **26929** | **31988** | | **2836** | **29150** | **32999** | | **2897** | **30101** |
| 14 | Ukai Hydro | 641 | 0.7 | 4 | 637 | 641 | 0.7 | 4 | 637 | 641 | 0.7 | 4 | 637 |
| 15 | Kadana Hydro | 191 | 1.19 | 2 | 189 | 191 | 1.19 | 2 | 189 | 191 | 1.19 | 2 | 189 |
| | **Total Hydro** | **832** | | **7** | **825** | **832** | | **7** | **825** | **832** | | **7** | **825** |
| | **Total Thermal + Hydro** | **30476** | | **2722** | **27754** | **32820** | | **2843** | **29975** | **33831** | | **2904** | **30926** |

## 6.2 Fuel supply

6.2.1 GSECL generating stations run on coal, lignite, oil and gas as base fuel as shown below:

| | | |
|---|---|---|
| a) | Coal fired stations | Ukai, Gandhinagar 1-4, Gandhinagar – 5, Wanakbori 1-6, Wanakbori – 7 and Sikka |
| b) | Lignite fired station | KLTPS |
| c) | Oil / gas fired station | Dhuvaran oil |
| d) | Gas fired stations | Dhuvaran 7&8 and Utran |

**Coal**

GSECL obtains coal from South Eastern Coal fields limited, Western Coal fields, Singareni Collieries, Mahanadi coalfields and others according to allocation by the Standing Linkage Committee. The coal is of low calorific value with high ash content. Grade D&E coal is being normally supplied.

GSECL is also obtaining washed coal for improved performance and to reduce transport costs. It also imports coal to some extent to supplement the coal from indigenous sources according to guidelines of Ministry of Power, Government of India.

A mix of washed coal and indigenous mine coal is being used at Ukai and Wanakbori stations. At Gandhinagar station, a mix of imported, washed and indigenous coal is being used.

At Sikka, a mix of imported and indigenous mine coal is being used.

GSECL projected certain percentage of mix of imported (and / or) washed (and / or) indigenous coal for different stations, in their Tariff Petition.

The following is the mix of different types of coals approved in the tariff order for the year 2007-08 based on the actuals for the period April – December 2006

**Table 6.3**

**The mix of different types of coal Approved for the years 2008-09 to 2010-11**

| S.N | Station | Mainline Indigenous Coal (%) | Washed Coal (%) | Imported Coal (%) |
|---|---|---|---|---|
| 1 | Ukai TPS | 31.00 | 69.00 | 0 |
| 2 | G.Nagar 1-4 | 28.00 | 49.00 | 23.00 |
| 3 | G.Nagar – 5 | 28.00 | 51.00 | 21.00 |
| 4 | W.Bori 1-6 | 54.00 | 46.00 | 0 |
| 5 | W.Bori – 7 | 53.00 | 47.00 | 0 |
| 6 | Sikka | 75.00 | 0 | 25.00 |

Though, GSECL furnished the actual ratio of different types of coal used for different stations during the year 2007-08, in its letter dt. 21-10-08, the same mix as approved earlier in the Tariff Order for the year 2007-08 is considered for arriving at the fuel cost for the control period and any variation can be taken care by proper adjustment through FPPPA formula.

### 6.2.2 Transit loss of coal

The thermal generating stations of GSECL are far away from the coalfields, involving long haulage of coal by rail. It is recognized, that there would be loss of certain quantum of coal during transit.

The Commission have specified in the tariff regulations, transit loss of coal in transport as below:

- Pit head stations - 0.3%
- Non – pit head stations - 0.8%

This is in line with the guidelines issued by CERC.

It is submitted by GSECL in their petition that actual transit loss of coal is ranging from 1.20% to 2% at different stations as furnished in the table below and requested for approval of the same.

**Table 6.4**
**Transit loss of non-washed coal for FY 2008-09 to 2010-11**

%

| S.No | Station | Transit loss | | | |
|---|---|---|---|---|---|
| | | Estimated 2007-08 | Projected 2008-09 | Projected 2009-2010 | Projected 2010-11 |
| 1 | Ukai | 1.20 | 1.20 | 1.20 | 1.20 |
| 2 | Gandhinagar 1 to 4 | 1.40 | 1.40 | 1.40 | 1.40 |
| 3 | Gandhinagar-5 | 1.40 | 1.40 | 1.40 | 1.40 |
| 4 | Wanakbori 1 to 6 | 1.50 | 1.50 | 1.50 | 1.50 |
| 5 | Wanakbori - 7 | 1.50 | 1.50 | 1.50 | 1.50 |
| 6 | Sikka | 2.00 | 2.00 | 2.00 | 2.00 |

The transit loss is attributed to

- Evaporation, windage and seepage
- Difference in weighment scales at loading and delivery points
- Long distance transportation of coal

GSECL has given detailed explanation why the transit loss cannot be limited to the norm specified by the Commission and requested approval of the Commission for actual loss in transit projected by them. They have also furnished details of higher transit loss accepted by Commissions in other states.

Some of the consumer groups have contended that the transit loss of coal cannot be passed on to the consumer and that it has to be absorbed by the utility.

***Commission's view:***

The Commission has examined the submission of GSECL and the points of view of objectors.

The Commission finds substance particularly in the following facts and arguments put forward by GSECL.

***Loss due to natural phenomena during transportation of coal:***

There is an expected element of loss in weight of coal, due to natural losses on account of evaporation, windage and seepage of fine coal through wagons. These losses are a function of distance, the longer the distance of coal transportation, the higher the level of losses. These losses are also a function of nature of carriage, with open wagons being more susceptible to losses.

The losses relating to natural phenomena, by their very nature, are expected to remain uncontrollable. Given that GSECL has the locational disadvantage due to its non-pit head power stations, it is expected that the losses on account of natural phenomena of coal transportation would be higher than most other states.

***Difference in Weighment scales at loading and unloading point:***

The differences can arise in quantity of coal due to difference in weighment scales at the loading and unloading point. The loading point is under the control of the Coal Company and the unloading point is under the control of the Power plant.

There could be solutions relating to enhanced frequency of joint testing and re-calibration of the weighing scales, but such measures may be theoretical, given that the distance

between the buyer and seller are over 1000 Kms, resulting in administrative and cost-effectiveness of such measures.

Another feasible arrangement, relates to the averaging of the readings at the loading and unloading points so as to even out any "manual intervention" related errors in measurement on either side.

***Loss in Transit due to theft, pilferage, etc***

These losses arise due to the inefficiencies in the transport system of coal. Given the nature of such losses, it can be considered that they are a function of the distance traversed by coal, in some ways, the longer the coal takes to reach destination, the higher the possibility of such losses, both in terms of probability and in terms of quantum. Given their nature, these losses are expected to be controllable.

**However at present the scope available to GSECL to reduce transit loss of coal appears to be limited as both the Coal India and Indian Railways are monopolies and have not been willing to consider commercially feasible solutions in order to bring down the losses.**

GSECL has tried to reduce the transit loss by entering into contract with suppliers to supply washed coal at the power station.

Considering the various aspects, the Commission approves transit loss of coal for the Control Period 2008-09 to 2010-11 at the same level as was done in the last Tariff Order, which was also upheld by the Appellate Tribunal for Electricity in its order 129 of 2006 dated 23.11.06.

The Commission feels that with more efforts and proper coordination with Coal India and Indian Railways, GSECL should try to reduce the transit loss of Indigenous coal to the norm of 0.8% in a span of 5 years, i.e. by 2013-14. The transit loss of indigenous coal for control period for different stations is approved as given in the table 6.5 below.

**Table 6.5**

**Transit loss of indigenous coal approved by the Commission for the control period**

(%)

| S.No | Station | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|
| 1 | Ukai | 1.2 | 1.2 | 1.2 |
| 2 | Gandhinagar 1 to 4 | 1.4 | 1.4 | 1.4 |
| 3 | Gandhinagar - 5 | 1.4 | 1.4 | 1.4 |
| 4 | Wanakbori 1 to 6 | 1.5 | 1.5 | 1.5 |
| 5 | Wanakbori - 7 | 1.5 | 1.5 | 1.5 |
| 6 | Sikka | 2.0 | 2.0 | 2.0 |

## 6.3 Fuel requirement and Fuel costs

Fuel for power generation of GSECL stations include.

- Coal
- Lignite
- Gas
- Fuel oil
- Secondary fuel (oil)

The requirement and cost of the fuels required for power generation are discussed below.

### 6.3.1 Coal

As mentioned earlier, four of the thermal stations of GSECL are coal based and coal is obtained from South-Eastern Coal fields, Western coal fields, Singareni collieries, Mahanandi coal fields etc depending on the linkage given by the Standing Linkage Committee (SLC). In addition, GSECL obtains washed coal, which gives better calorific value with less ash content. This washed coal is blended with indigenous mine coal and used at Ukai, Gandhinagar, Wanakbori stations. GSECL is also supplementing the coal requirement by importing coal according to the guidelines of Ministry of Power (MOP), Government of India. The imported coal is blended with indigenous mine coal at Gandhinagar, Wanakbori and Sikka. The imported coal is of high calorific value with low ash content. It is proposed to blend imported coal with indigenous mine coal and washed coal. The ratio of utilization of indigenous mine coal, washed coal and imported coal is already discussed in para 6.2.1.

### 6.3.2. Assessment of fuel requirement and cost

#### a) Coal

The consumption of coal and its cost is derived from the following parameters.

- Station heat rate in kCal / kWh
- Calorific value of coal
- Gross generation
- Specific oil consumption
- Price of coal

GSECL considered the following cost parameters of fuel mix of different types of coal, weighted average GCV of Coal and Oil. Prices of Coal and Oil for different stations based on the actuals for the period April to September 2007 are given in the table 6.6 below.

**Table 6.6**
**Cost Parameters of coal based power stations projected by GSECL for the Control Period**

| Sl | Station | Weighted average GCV of Indigenous Coal (Kcal/Kg) & Ratio of Coal | Weighted average GCV of Washed Coal (Kcal/Kg) Ratio of Coal | Weighted average GCV of Imported Coal (Kcal/Kg) Ratio of Coal | Weighted average cost of Indigenous Coal (Rs/Mt.) | Weighted average cost of Washed Coal (Rs/Mt.) | Weighted average cost of Imported Coal (Rs/Mt.) | Weighted average GCV of secondary (Fuel) oil (Kcal/L) | Weighted average Cost of secondary (Fuel)oil (Rs/Kl) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 4142 (28%) | 4044 (72%) | - | 1863 | 1985 | - | 10411 | 21540 |
| 2 | Gandhinagar 1-4 | 3199 (43%) | 3845 (35%) | 5810 (22%) | 2190 | 2320 | 2695 | 10403 | 21362 |
| 3 | Gandhinagar 5 | 3199 (43%) | 3845 (35%) | 5810 (22%) | 2190 | 2320 | 2695 | 10403 | 21362 |
| 4 | W.Bori 1-6 | 3540 (54%) | 4044 (46%) | - | 2179 | 2253 | - | 10423 | 22440 |
| 5 | W.bori 7 | 3540 (54%) | 4044 (46%) | - | 2179 | 2253 | - | 10423 | 22440 |
| 6 | Sikka | 4608 (76%) | - | 4980 (24%) | 2875 | - | 2030 | 10519 | 27463 |

GSECL has worked out the fuel requirement and the fuel costs based on the operating parameters as projected and cost Parameters as mentioned above.

**b) Lignite**

The KLTPS is the only station, which runs on Lignite. GSECL projected the other fuel cost parameters for the station for Control Period as given Table 6.7 below.

**Table 6.7**

**KLPTS Fuel cost parameters – GSECL submission for the Control Period**

| S.No | Station | Calorific value of lignite KCal /kWh | Delivered cost of lignite Rs. /MT |
|---|---|---|---|
| 1 | KLTPS – 3 | 2728 | 780 |
| 2 | KLTPS - 4 | 2728 | 780 |

GSECL considered the cost and GCV of lignite based on the actuals for the period April – September 2007.

**c) Oil**

**Dhuvaran Unit (Oil)**

Dhuvaran Oil has oil / gas fired boilers with LSHS and also gas. GSECL projected the following fuel costs parameters for the control period as given in table 6.8

**Table 6.8**

**Dhuvaran (Oil based) - cost parameters projected by GSECL for the control period**

| S.No | Station | Calorific value of Oil KCal /kWh | Delivered cost of Oil Rs. /MT |
|---|---|---|---|
| 1 | Dhuvaran (Oil) | 10088 | 11285 |

**Gas based stations**

GSECL projected the following other fuel cost parameters for Gas based stations as follows for the control period.

**Table 6.9**

**Gas based stations - cost parameters projected by GSECL for the control period**

| S.No | Station | Calorific value of Gas KCal /Scm | Delivered cost of Gas Rs./Scm |
|---|---|---|---|
| 1 | Dhuvaran Gas 1 | 9880 | 9.4 |
| 2 | Dhuvaran Gas 2 | 9880 | 17.1 |
| 3 | Utran Gas | 9955 | 8.8 |

The station wise fuel costs projected by GSECL based on its projections for the control period are as given in table 6.10 below:

**Table 6.10**
**Fuel Costs projected by GSECL for the control period 2008-09 to 2010-11**
**(Rs. Crores)**

| S. no | Station | 2008-09 | | | 2009-10 | | | 2010-11 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Gross Generation (Mu) | Net Generation (Mu) | Fuel Costs Rs. Cr | Gross Generation (Mu) | Net Generation (Mu) | Fuel Costs Rs. Cr | Gross Generation (Mu) | Net Generation (Mu) | Fuel Costs Rs. Cr |
| 1 | Ukai | 5361 | 4868 | 731.94 | 5510 | 5003 | 752.27 | 5510 | 5003 | 752.27 |
| 2 | Gandhinagar 1-4 | 3469 | 3060 | 604.89 | 3469 | 3060 | 604.89 | 3469 | 3060 | 604.89 |
| 3 | Gandhinagar -5 | 1692 | 1540 | 254.61 | 1692 | 1540 | 254.61 | 1692 | 1540 | 254.61 |
| 4 | W.bori 1-6 | 9382 | 8538 | 1498.19 | 9382 | 8538 | 1498.19 | 9382 | 8538 | 1498.19 |
| 5 | W.bori -7 | 1692 | 1540 | 255.01 | 1692 | 1540 | 255.01 | 1692 | 1540 | 255.01 |
| 6 | Sikka | 1577 | 1399 | 291.97 | 1577 | 1399 | 291.97 | 1577 | 1399 | 291.97 |
| 7 | KLTPS 1-3 | 1356 | 1187 | 135.33 | 1356 | 1187 | 135.33 | 1356 | 1187 | 135.33 |
| 8 | KLTPS -4 | 493 | 431 | 46.74 | 493 | 431 | 44.95 | 493 | 431 | 44.95 |
| 9 | Dhuvaran oil | 1484 | 1318 | 532.87 | 1446 | 1271 | 514.06 | 1445 | 1318 | 532.87 |
| 10 | Dhuvaran gas-1 | 840 | 815 | 156.35 | 840 | 815 | 156.35 | 840 | 815 | 156.35 |
| 11 | Dhuvaran gas-2 | 788 | 764 | 265.54 | 788 | 764 | 265.54 | 788 | 764 | 265.54 |
| 12 | Utran gas | 1088 | 1044 | 207.54 | 1088 | 1044 | 207.54 | 1088 | 1044 | 207.54 |
| 13 | Utran - Extension | - | - | - | 1905 | 1793 | 323.21 | 2628 | 2481 | 447.29 |
| | **Total Thermal** | | **26504** | **4980.97** | | | **5303.91** | | | **5446.79** |
| 14 | Ukai Hydro | 641 | 638 | - | 641.232 | 638 | - | 641 | 638 | - |
| 15 | Kadana Hydro | 191 | 179 | - | 190.7928 | 179 | - | 191 | 179 | - |
| | **Total Hydro** | | **817** | **-** | | **817** | **-** | | **817** | **-** |
| | **Total Thermal + Hydro** | **30055** | **27321** | | **32070.621** | **29202** | | **32793** | **29937** | |

## 6.4 Commission's analysis and decisions on variable costs

The commission decided to arrive at the fuel costs for the control period based on the

(1) performance parameters like heat rate, specific oil consumption, Auxiliary consumption etc, as approved in chapter 5.

(2) Transit loss of coal as approved in para 6.2.2 of this chapter and

(3) other cost parameters such as ratio of different types of coals for different stations, weight average GCV & Weighted average unit cost of coal, Oil etc as approved for the year 2007-08 in Tariff order for 2007-08.

Any variation in the cost parameters can be passed on to the consumers based on the approved FPPPA formula.

The performance parameters approved for the control period are given in tables 5.7, 5.9 & 5.11 of Chapter 5.

The cost parameters approved for the control period are as given in table 6.11 below.

## Table 6.11

### Cost parameters approved for the control period

| S. No | Stations | Mix of coal (%) | | | WT. Av GCV of Coal KCl/Kg | Wt. Av. Cost of Indigenous Coal Rs./Mt | Wt. Av. Cost of Washed Coal Rs./Mt | Wt. Av. Cost of Imported Coal Rs./Mt | Wt. Av GCV of Gas Kcl/Scm | Wt. Av Cost of Gas Rs/Scm | Wt. Av GCV of Oil Kcal/L | Wt. Av cost of Oil Rs/Kl |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Indigen-ous | Wash-ed | Import-ed | | | | | | | | |
| 1 | Ukai | 31 | 69 | 0 | 4102 | 1963 | 1976 | - | - | - | 10400 | 19934 |
| 2 | Gandhinagar1-4 | 28 | 49 | 23 | 4711 | 2511 | 2232 | 2917 | - | - | 10400 | 19967 |
| 3 | Gandhinagar -5 | 28 | 51 | 21 | 4714 | 2511 | 2232 | 2917 | - | - | 10400 | 19967 |
| 4 | W.bori 1-6 | 54 | 46 | 0 | 3793 | 2178 | 2242 | - | - | - | 10400 | 21564 |
| 5 | W.bori -7 | 53 | 47 | 0 | 3816 | 2178 | 2242 | - | - | - | 10400 | 21564 |
| 6 | Sikka | 75 | 0 | 25 | 4905 | 2833 | - | 2193 | - | - | 10400 | 27194 |
| 7 | KLTPS 1-3 | - | - | - | 2946 | 780 (Lignite) | - | - | - | - | 10735 | 24129 |
| 8 | KLTPS -4 | - | - | - | 2946 | 780 (Lignite) | - | - | - | - | 10735 | 24129 |
| 9 | Dhuvaran oil | - | - | - | - | - | - | - | - | - | 10355 | 10754 |
| 10 | Dhuvaran gas-1 | - | - | - | - | - | - | - | 9834 | 10.82 | - | - |
| 11 | Dhuvaran gas-2 | - | - | - | - | - | - | - | 9834 | 10.82 | - | - |
| 12 | Utran gas | - | - | - | - | - | - | - | 9796 | 9.46 | - | - |
| 13 | Utran – Extension | - | - | - | - | - | - | - | 9796 | 9.46 | - | - |

## 6.5 Fuel costs

Based on the generation and other operational parameters approved by the Commission above, the station wise fuel costs (variable cost) are summarized in Table 6.12 below. The detailed working of the costs is given in Annexure 6.1 to 6.13.

## Table 6.12

### Station wise Fuel (variable) costs approved for the Control Period 2008-09 to 2010-11

| S. no | Station | 2008-09 | | | 2009-10 | | | 2010-11 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Gross Generation (Mu) | Net Generation (Mu) | Fuel Costs (Rs. Cr) | Gross Generation (Mu) | Net Generation (Mu) | Fuel Costs (Rs. Cr) | Gross Generation (Mu) | Net Generation (Mu) | Fuel Costs (Rs. Cr) |
| 1 | Ukai 1-5 | 5361 | 4879 | 733.85 | 5510 | 5014 | 754.25 | 5510 | 5014 | 754.25 |
| 2 | Gandhinagar1-4 | 3758 | 3340 | 583.34 | 4047 | 3397 | 628.20 | 4336 | 3854 | 673.06 |
| 3 | Gandhinagar –5 | 1692 | 1540 | 226.16 | 1692 | 1540 | 226.16 | 1692 | 1540 | 226.16 |
| 4 | W.bori 1-6 | 9382 | 8538 | 1473.18 | 9382 | 8538 | 1473.18 | 9382 | 8538 | 1473.18 |
| 5 | W.bori -7 | 1692 | 1540 | 251.94 | 1692 | 1540 | 251.94 | 1692 | 1540 | 251.94 |
| 6 | Sikka | 1577 | 1408 | 280.10 | 1577 | 1408 | 280.10 | 1577 | 1408 | 280.10 |
| 7 | KLTPS 1-3 | 1356 | 1190 | 127.14 | 1356 | 1190 | 127.14 | 1356 | 1190 | 127.14 |
| 8 | KLTPS -4 | 526 | 461 | 45.14 | 526 | 461 | 45.14 | 526 | 461 | 45.14 |
| 9 | Dhuvaran oil | 1484 | 1313 | 493.18 | 1484 | 1313 | 493.18 | 1484 | 1313 | 493.18 |
| 10 | Dhuvaran gas-1 | 840 | 815 | 180.22 | 840 | 815 | 180.22 | 840 | 815 | 180.22 |
| 11 | Dhuvaran gas-2 | 887 | 860 | 190.30 | 887 | 860 | 190.30 | 887 | 860 | 190.30 |
| 12 | Utran gas | 1088 | 1044 | 225.90 | 1088 | 1044 | 225.90 | 1088 | 1044 | 225.90 |
| 13 | Utran-Extension | 0 | 0 | 0 | 1905 | 1829 | 340.34 | 2628 | 2523 | 469.50 |
| | **Total Thermal** | **29644** | **26929** | | **31988** | **29150** | | **32999** | **30101** | |
| 14 | Ukai Hydro | 641 | 637 | | 641 | 637 | | 641 | 637 | |
| 15 | Kadana Hydro | 191 | 189 | | 191 | 189 | | 191 | 189 | |
| | **Total Hydro** | **832** | **825** | | **832** | **825** | | **832** | **825** | |
| | **Total Thermal + Hydro** | **30476** | **27754** | **4810.45** | **32820** | **29975** | **5216.05** | **33831** | **30926** | **5390.07** |

The fuel costs approved by the Commission are Rs. 4810.45 crores for 2008-09, Rs.5216.05 crores for 2009-10 and Rs.5390.07 crores for the year 2010-11.

**Table 6.13**

**Station-wise per unit fuel cost for the control period 2008-09 to 2010-11**

| Sl.No. | Station | 2008-09 | | 2009-10 | | 2010-11 | |
|---|---|---|---|---|---|---|---|
| | | Fuel Cost Rs./kWh Gross | Fuel Cost Rs./kWh Net | Fuel Cost Rs./kWh Gross | Fuel Cost Rs./kWh Net | Fuel Cost Rs./kWh Gross | Fuel Cost Rs./kWh Net |
| 1 | Ukai 1-5 | 1.37 | 1.50 | 1.37 | 1.50 | 1.37 | 1.50 |
| 2 | Gandhinagar 1-4 | 1.56 | 1.75 | 1.56 | 1.75 | 1.56 | 1.75 |
| 3 | Gandhinagar -5 | 1.34 | 1.47 | 1.34 | 1.47 | 1.34 | 1.47 |
| 4 | Wanakbori 1-6 | 1.57 | 1.73 | 1.57 | 1.73 | 1.57 | 1.73 |
| 5 | Wanakbori -7 | 1.49 | 1.64 | 1.49 | 1.64 | 1.49 | 1.64 |
| 6 | Sikka | 1.78 | 1.99 | 1.78 | 1.99 | 1.78 | 1.99 |
| 7 | KLTPS 1-3 | 0.94 | 1.07 | 0.94 | 1.07 | 0.94 | 1.07 |
| 8 | KLTPS –4 | 0.86 | 0.98 | 0.86 | 0.98 | 0.86 | 0.98 |
| 9 | Dhuvaran oil | 3.32 | 3.76 | 3.32 | 3.76 | 3.32 | 3.76 |
| 10 | Dhuvaran gas-1 | 2.14 | 2.21 | 2.14 | 2.21 | 2.14 | 2.21 |
| 11 | Dhuvaran gas-2 | 2.14 | 2.21 | 2.14 | 2.21 | 2.14 | 2.21 |
| 12 | Utran gas | 2.08 | 2.16 | 2.08 | 2.16 | 2.08 | 2.16 |
| 13 | Utran - Extension | - | - | 1.79 | 1.86 | 1.79 | 1.86 |

## 6.6 ANNUAL CAPACITY (FIXED) CHARGES

### 6.6.1 The Annual Capacity (fixed) Charges consist of

- Interest on loans
- Depreciation including advance against depreciation
- Return on equity
- Operation and maintenance (O&M) expenses
- Interest on working capital
- Taxes, if any

### 6.6.2 Financial Parameters for fixed costs

The GSECL has submitted that the fixed cost for its generating stations has been estimated for the control period considering actual cost incurred in FY 2006-07 and on the basis of certain assumptions as detailed below.

For PPA based stations all the financial parameters are as per the PPA. In respect of non-PPA based stations, the details of Assets, Depreciation, Loans and Equity have been considered in line with the balance sheet as notified by Government of Gujarat at the time of unbundling.

The station wise gross fixed assets till 2005-06 have been considered as per the opening balance sheet notified by Government of Gujarat and the additions to the fixed assets during the year 2006-07 have been taken into consideration as per the audited annual accounts for 2006-07. The closing balance of loans for the year 2006-07, as per the audited accounts have been allocated to all the GSECL stations and is considered as opening loan for the respective station. Closing equity upto 2005-06 has been considered in line with the petition for the year 2007-08 and addition to the equity during 2006-07 has been considered as normative equity contribution towards assets capitalized during the year 2006-07. The closing balance of equity, loan and asset of 2006-07 has been considered as respective opening balance for the year 2007-08.

From 2007-08 onwards, the equity, loans and asset addition have been considered based on the normative contribution of loan and equity towards CAPEX.

The additional loans are assumed at an interest rate of 10.75% for FY 2007-08 and in the control period 2008-11 and the average tenure of additional loan has been considered as 10 years.

The additional loans are estimated for the control period FY 2008-11 based on the proposed major and minor R&M expenditure.

The guarantee charges on the existing loans for the FY 2007-08 and for the control period 2008-11 are reduced considering the repayment of loans.

The GSECL has further submitted that billing parameter sections are exclusive of income tax (including MAT), Fringe Benefit Tax, Incentive, Foreign exchange rate equivalent (if applicable), any statutory taxes, levies, duties, cess, filing fees or any other kind of imposition (s) and /or other surcharges, cess etc and the same shall be borne and additionally paid by the beneficiaries to the petitioner as per GERC (Terms and Conditions of Tariff) Regulations, 2005.

In respect of employee cost under O&M expenses any impacts of pay revision as well as other incidental expenses are also proposed to be pass through at actual, subject to prudence check.

6.6.3 The financial parameters proposed by the GSECL for the control period 2008-11 are detailed in the Table –6.14 below.

**Table 6.14**

**Financial parameters proposed by GSECL for the control period 2008-11**

| Stations | Depreciation Rate (%) ** | Rate of interest on working capital (%) | ROE Rate (%) | *Rate of* interest (%) | Escalation to O&M cost (%) |
|---|---|---|---|---|---|
| Ukai | 3.64 | 10.50 | 14.0 | 10.75 | 4.0 |
| Gandhinagar 1 to 4 | 3.41 | 10.50 | 14.0 | 10.75 | 4.0 |
| Gandhinagar 5 | 5.00 | 10.50 | 13.0 | 10.75 | 4.2* |
| Wanakbori 1 to 6 | 3.40 | 10.50 | 14.0 | 10.75 | 4.0 |
| Wanakbori 7 | 5.00 | 10.50 | 13.0 | 10.75 | 4.2* |
| Sikka | 3.56 | 10.50 | 14.0 | 10.75 | 4.0 |
| KLTPS 1 to 3 | 3.52 | 10.50 | 14.0 | 10.75 | 4.0 |
| KLTPS 4 | 4.50 | 10.50 | 14.0 | 10.75 | 4.0 |
| Dhuvaran Oil | 3.44 | 10.50 | 14.0 | 10.75 | 4.0 |
| Dhuvaran gas 1 | 5.00 | 10.50 | 13.0 | 10.75 | 4.2* |
| Dhuvaran Gas 2 | 6.00 | 10.50 | 14.0 | 10.75 | 4.0 |
| Utran | 5.00 | 10.50 | 13.0 | 10.75 | 4.2* |
| Ukai Hydro | 3.63 | 10.50 | 14.0 | 10.75 | 4.0 |
| Kadana Hydro | 3.64 | 10.50 | 14.0 | 10.75 | 4.0 |
| Utran Extension | 6.00 | 10.50 | 14.0 | 10.75 | 4.0 |

* The escalation methodology has been worked out as per the PPA terms.

** However, the depreciation shall be considered as per PPA between GUVNL and GSECL on finalization of it.

6.6.4 The GSECL has projected the fixed charges for the control period 2008-11 along with fixed cost of 2006-07 (actual) and 2007-08 (estimated) as detailed in the Table 6.15 below.

**Table 6.15**

**Fixed costs projected by GSECL for the control period 2008-11**

| Stations | Total fixed cost (Rs. crore) | | | | |
|---|---|---|---|---|---|
| | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 |
| | Actual | Est. | Proj. | Proj. | Proj. |
| Ukai | 209.46 | 237.07 | 248.67 | 280.81 | 319.19 |
| Gandhinagar 1 to 4 | 204.92 | 234.16 | 263.21 | 286.16 | 288.17 |
| Gandhinagar 5 | 88.83 | 90.91 | 91.01 | 91.61 | 92.59 |
| Wanakbori 1 to 6 | 351.42 | 365.19 | 374.64 | 403.23 | 443.76 |
| Wanakbori 7 | 92.52 | 91.82 | 90.38 | 90.16 | 90.70 |
| Sikka | 102.53 | 105.89 | 105..93 | 107.19 | 110.34 |
| KLTPS 1 to 3 | 154.31 | 163.16 | 164.70 | 166.93 | 168.33 |
| KLTPS 4 | 0.00 | 0.00 | 84.45 | 71.40 | 69.34 |
| Dhuvaran Oil | 101.28 | 73.64 | 76.30 | 75.73 | 76.47 |
| Dhuvaran gas 1 | 48.56 | 53.93 | 52.77 | 51.43 | 50.11 |
| Dhuvaran Gas 2 | 0.00 | 29.31 | 76.35 | 75.05 | 72.83 |
| Utran | .51.19 | 53.34 | 52.89 | 52.32 | 51.88 |
| Ukai Hydro | 25.39 | 24.75 | 24.98 | 25.19 | 25.50 |
| Kadana Hydro | 72.01 | 69.20 | 69.07 | 68.89 | 68.95 |
| Utran Extension | 0.00 | 0.00 | 0.00 | 182.11 | 254.02 |
| **Total** | **1502.42** | **1592.36** | **1775.44** | **2028.22** | **2182.18** |

The station wise equity and the assets position of GSECL are given in tables 23 & 24, the station wise interest and financing charges, depreciation charges, RoE, O&M Expenses and interest on working capital are given in tables 26, 27,28,31 & 33 respectively in the MYT petition which are as given below.

**Equity of GSECL for FY 2006-07 considered for the base year**

Rs. Lakhs

| S. No | Power Station (FY 2006-07) | Opening Equity | Additions | Closing Equity |
|---|---|---|---|---|
| 1 | Ukai | 10734 | 723 | 11457 |
| 2 | Gandhinagar 1 to 4 | 18929 | 1011 | 19940 |
| 3 | Gandhinagar 5 | 20648 | 0 | 20648 |
| 4 | Wanakbori 1-6 | 35258 | 1152 | 36411 |
| 5 | Wanakbori 7 | 20024 | 0 | 20024 |
| 6 | Sikka | 13859 | 527 | 14386 |
| 7 | KLTPS 1 to 3 | 29400 | 1058 | 30458 |
| 8 | KLTPS 4 | 0 | 0 | 0 |
| 9 | Dhuvaran oil | 4659 | 258 | 4916 |
| 10 | Dhuvaran gas 1 | 9632 | 0 | 9632 |
| 11 | Dhuvaran gas 2 | 0 | 0 | 0 |
| 12 | Utran | 7927 | 0 | 7927 |
| 13 | Ukai Hydro | 5392 | 120 | 5512 |
| 14 | Kadana Hydro | 19698 | 298 | 19996 |

## Asset Position of GSECL for FY 2006-07 considered for the base year

| S. No | Power Station (FY 2006-07) | Opening Equity | Additions | Closing Equity |
|---|---|---|---|---|
| 1 | Ukai | 67953 | 2410 | 70363 |
| 2 | Gandhinagar 1 to 4 | 94635 | 3370 | 98004 |
| 3 | Gandhinagar 5 | 63812 | 2233 | 66045 |
| 4 | Wanakbori 1-6 | 105498 | 3840 | 109338 |
| 5 | Wanakbori 7 | 63214 | 2182 | 65396 |
| 6 | Sikka | 49147 | 1756 | 50903 |
| 7 | KLTPS 1 to 3 | 95611 | 3527 | 99138 |
| 8 | KLTPS 4 | 0 | 0 | 0 |
| 9 | Dhuvaran oil | 24934 | 858 | 25793 |
| 10 | Dhuvaran gas 1 | 30012 | 0 | 30012 |
| 11 | Dhuvaran gas 2 | 0 | 0 | 0 |
| 12 | Utran | 26908 | 1014 | 27922 |
| 13 | Ukai Hydro | 11782 | 401 | 12183 |
| 14 | Kadana Hydro | 29194 | 994 | 30188 |

## Interest and Financing Charges

**Rs. Lakhs**

| S.No | Station | Interest and Guarantee Charges | | | | |
|---|---|---|---|---|---|---|
| | | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 |
| | | Actual | Est. | Proj. | Proj. | Proj. |
| 1 | Ukai | 4100 | 5583 | 5439 | 6955 | 8697 |
| 2 | Gandhinagar 1 to 4 | 4447 | 5505 | 6597 | 7139 | 6576 |
| 3 | Gandhinagar 5 | 375 | 159 | 41 | 0 | 0 |
| 4 | Wanakbori 1-6 | 5541 | 6048 | 5729 | 6269 | 7574 |
| 5 | Wanakbori 7 | 731 | 432 | 147 | 38 | 0 |
| 6 | Sikka | 2316 | 2551 | 2332 | 2211 | 2185 |
| 7 | KLTPS 1 to 3 | 4645 | 5210 | 4935 | 4764 | 4573 |
| 8 | KLTPS 4 | 0 | 0 | 2789 | 2523 | 2283 |
| 9 | Dhuvaran oil | 1026 | 1298 | 1208 | 1104 | 999 |
| 10 | Dhuvaran gas 1 | 1079 | 1287 | 1120 | 952 | 785 |
| 11 | Dhuvaran gas 2 | 0 | 1031 | 2213 | 1953 | 1693 |
| 12 | Utran | 1090 | 1180 | 1068 | 966 | 874 |
| 13 | Ukai Hydro | 714 | 587 | 531 | 480 | 435 |
| 14 | Kadana Hydro | 2298 | 1459 | 1320 | 1194 | 1080 |
| 15 | Utran Extension | 0 | 0 | 0 | 6321 | 8036 |
| **16** | **Total** | **28363** | **32331** | **35468** | **42871** | **45790** |

## Depreciation Proposed for the Years 2008-09 to 2010-11

Rs. Lakhs

| S.No | Station | Depreciation (Including AAD) | | | | |
|---|---|---|---|---|---|---|
| | | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 |
| | | Actual | Est. | Proj. | Proj. | Proj. |
| 1 | Ukai | 2519 | 2807 | 3143 | 3749 | 4872 |
| 2 | Gandhinagar 1 to 4 | 3508 | 3723 | 4284 | 4991 | 5318 |
| 3 | Gandhinagar 5 | 3246 | 3302 | 3302 | 3302 | 3302 |
| 4 | Wanakbori 1-6 | 3648 | 3764 | 3873 | 4382 | 5281 |
| 5 | Wanakbori 7 | 3215 | 3270 | 3270 | 3270 | 3270 |
| 6 | Sikka | 1782 | 1814 | 1824 | 1870 | 1959 |
| 7 | KLTPS 1 to 3 | 3323 | 3420 | 3525 | 3663 | 3780 |
| 8 | KLTPS 4 ** | 0 | 0 | 2594 | 1548 | 1548 |
| 9 | Dhuvaran oil | 872 | 896 | 910 | 916 | 916 |
| 10 | Dhuvaran gas 1 | 1501 | 1501 | 1501 | 1501 | 1501 |
| 11 | Dhuvaran gas 2 | 0 | 360 | 2076 | 2076 | 2076 |
| 12 | Utran | 1317 | 1396 | 1396 | 1396 | 1396 |
| 13 | Ukai Hydro | 435 | 442 | 442 | 442 | 442 |
| 14 | Kadana Hydro | 1081 | 1099 | 1099 | 1099 | 1099 |
| 15 | Sikka Extension | 0 | 0 | 0 | 0 | 0 |
| 16 | Utran Extension | 0 | 0 | 0 | 4844 | 7895 |
| **17** | **Total** | **26501** | **27793** | **33240** | **39049** | **44655** |

- However, the Depreciation shall be considered as per PPA between GUVNL and GSECL on finalization of it. ** AAD considered details as given below

## Proposed RoE for the years 2008-09 to 2010-11

Rs. Lakhs

| S.No | Station | RoE | | | | |
|---|---|---|---|---|---|---|
| | | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 |
| | | Actual | Est. | Proj. | Proj. | Proj. |
| 1 | Ukai | 1604 | 2103 | 2277 | 2816 | 3274 |
| 2 | Gandhinagar 1 to 4 | 2792 | 3112 | 4042 | 4701 | 4770 |
| 3 | Gandhinagar 5 | 2684 | 2684 | 2684 | 2684 | 2684 |
| 4 | Wanakbori 1-6 | 5097 | 5181 | 5294 | 6402 | 7495 |
| 5 | Wanakbori 7 | 2603 | 2611 | 2623 | 2623 | 2623 |
| 6 | Sikka | 2014 | 2014 | 2029 | 2102 | 2217 |
| 7 | KLTPS 1 to 3 | 4264 | 4354 | 4522 | 4666 | 4764 |
| 8 | KLTPS 4 | 0 | 0 | 1807 | 1807 | 1807 |
| 9 | Dhuvaran oil | 688 | 701 | 715 | 715 | 715 |
| 10 | Dhuvaran gas 1 | 1252 | 1252 | 1252 | 1252 | 1252 |
| 11 | Dhuvaran gas 2 | 0 | 202 | 1453 | 1546 | 1546 |
| 12 | Utran | 1030 | 1030 | 1030 | 1030 | 1030 |
| 13 | Ukai Hydro | 772 | 772 | 772 | 772 | 772 |
| 14 | Kadana Hydro | 2799 | 3255 | 3255 | 3255 | 3255 |
| 15 | Utran Extension | 0 | 0 | 0 | 3633 | 3909 |
| **16** | **Total** | | | | | |

## O&M Cost for FY 2008-09 to 2010-11

Rs. Lakhs

| S.No | Station | Total O&M Expenses | | | |
|---|---|---|---|---|---|
| | | 2007-08 | 2008-09 | 2009-10 | 2010-11 |
| | | Est. | Proj. | Proj. | Proj. |
| 1 | Ukai | 9945 | 10607 | 11010 | 11433 |
| 2 | Gandhinagar 1 to 4 | 7722 | 8236 | 8549 | 8878 |
| 3 | Gandhinagar 5 | 1830 | 1955 | 2033 | 2115 |
| 4 | Wanakbori 1-6 | 14742 | 15723 | 16321 | 16948 |
| 5 | Wanakbori 7 | 1811 | 1934 | 2011 | 2092 |
| 6 | Sikka | 2808 | 2995 | 3109 | 3228 |
| 7 | KLTPS 1 to 3 | 2516 | 2683 | 2785 | 2892 |
| 8 | KLTPS 4 | 0 | 936 | 971 | 1009 |
| 9 | Dhuvaran oil | 2574 | 2745 | 2850 | 2959 |
| 10 | Dhuvaran gas 1 | 685 | 732 | 761 | 792 |
| 11 | Dhuvaran gas 2 | 987 | 1053 | 1093 | 1135 |
| 12 | Utran | 896 | 957 | 995 | 1035 |
| 13 | Ukai Hydro | 625 | 705 | 774 | 850 |
| 14 | Kadana Hydro | 978 | 1103 | 1211 | 1330 |
| 15 | Utran Extension | 0 | 0 | 2104 | 3779 |
| **16** | **Total** | **48118** | **52362** | **56577** | **60475** |

## Proposed Interest on Working Capital for FY 2008-09 to 2010-11

**Rs. Lakhs**

| S.No | Station | Interest on working capital | | | | |
|---|---|---|---|---|---|---|
| | | 2006-07 | 2007-08 | 2008-09 | 2009-10 | 2010-11 |
| | | Actual | Est. | Proj. | Proj. | Proj. |
| 1 | Ukai | 3160 | 3270 | 3402 | 3552 | 3643 |
| 2 | Gandhinagar 1 to 4 | 2320 | 3354 | 3162 | 3236 | 3276 |
| 3 | Gandhinagar 5 | 614 | 895 | 898 | 903 | 909 |
| 4 | Wanakbori 1-6 | 6681 | 6783 | 6845 | 6949 | 7078 |
| 5 | Wanakbori 7 | 765 | 846 | 843 | 844 | 845 |
| 6 | Sikka | 1442 | 1403 | 1413 | 1427 | 1445 |
| 7 | KLTPS 1 to 3 | 780 | 816 | 806 | 816 | 824 |
| 8 | KLTPS 4 ** | 0 | 0 | 319 | 290 | 287 |
| 9 | Dhuvaran oil | 1534 | 1895 | 2052 | 1988 | 2058 |
| 10 | Dhuvaran gas 1 | 218 | 511 | 509 | 507 | 505 |
| 11 | Dhuvaran gas 2 | 0 | 350 | 839 | 837 | 834 |
| 12 | Utran | 592 | 646 | 645 | 644 | 644 |
| 13 | Ukai Hydro | 49 | 49 | 49 | 50 | 52 |
| 14 | Kadana Hydro | 134 | 130 | 130 | 130 | 132 |
| 15 | Sikka Extension | 0 | 0 | 0 | 0 | 0 |
| 16 | Utran Extension | 0 | 0 | 0 | 1310 | 1783 |
| **17** | **Total** | **18288** | **20948** | **21912** | **23484** | **24314** |

* Based on actual figures from Apr. 07 to Sept. 07 for the year 2007-08

In addition the GSECL has claimed advance against depreciation in respect of KLTPS – 4 and Utran Extension. The annual recurring cost in respect of E-Urja is included in A&G expenses.

The GSECL has not furnished all the details of fixed cost components station wise in a single table separately. The details given in the formats in Appendix – A & Appendix – B for each station are segregated component wise for each year of the control period and are shown in tables 6.16 to 6.19 below.

## Table 6.16
### Station wise fixed costs component wise segregated for the year 2007-08

(Rs. crore)

| Sl.No | Generating Station | Interest & Guarantee Charges | *Depreciation* | Advance AD | Return on Equity | O & M Charges | Insurance Charges | Total | Interest on Working Capital | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 55.83 | 28.07 | - | 21.03 | 99.45 | - | **204.38** | 32.70 | **237.08** |
| 2 | Gandhinagar 1 to 4 | 55.05 | 37.23 | - | 31.12 | 77.22 | - | **200.62** | 33.54 | **234.16** |
| 3 | Gandhinagar 5 | 1.59 | 33.02 | - | 26.84 | 18.30 | 2.21 | **81.96** | 8.95 | **90.91** |
| 4 | Wanakbori 1 to 6 | 60.48 | 37.64 | - | 51.81 | 147.42 | - | **297.35** | 67.83 | **365.18** |
| 5 | Wanakbori 7 | 4.32 | 32.70 | | 26.11 | 18.11 | 2.13 | **83.37** | 8.46 | **91.83** |
| 6 | Sikka | 25.51 | 18.14 | | 20.14 | 28.08 | - | **91.87** | 14.03 | **105.90** |
| 7 | KLTPS 1 to 3 | 52.10 | 34.20 | | 43.54 | 25.16 | | **155.00** | 8.16 | **163.16** |
| 8 | KLTPS 4 | - | - | | - | - | | **-** | - | **-** |
| 9 | Dhuvran Oil | 12.98 | 8.96 | | 7.01 | 25.74 | | **54.69** | 18.95 | **73.64** |
| 10 | Dhuvran gas 1 | 12.87 | 15.01 | | 12.52 | 6.85 | 1.57 | **48.82** | 5.11 | **53.93** |
| 11 | Dhuvran gas 2 | 10.31 | 3.60 | | 2.02 | 9.87 | | **25.80** | 3.50 | **29.30** |
| 12 | Utran | 11.80 | 13.96 | | 10.30 | 8.96 | 1.85 | **46.87** | 6.46 | **53.33** |
| 13 | Ukai Hydro | 5.87 | 4.42 | | 7.72 | 6.25 | | **24.26** | 0.48 | **24.74** |
| 14 | Kadana Hydro | 14.59 | 10.99 | | 32.55 | 9.78 | | **67.91** | 1.30 | **69.21** |
| 15 | Utran Extension | - | - | - | - | - | - | **-** | - | **-** |
| | **Total** | **323.30** | **277.94** | **0** | **292.71** | **481.19** | **7.76** | **1382.90** | **209.47** | **1592.37** |

## Table 6.17
### Station wise fixed costs component wise segregated for the year 2008-09

(Rs. crore)

| Sl. No | Generating Station | Interest Guarantee Charges | Depreciation | Advance AD | Return on Equity | O & M Charges | Insurance Charges | Total | Interest on Working Capital | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 54.39 | 31.43 | | 22.77 | 106.07 | | **214.66** | 34.02 | **248.68** |
| 2 | Gandhinagar 1 to 4 | 65.97 | 42.84 | | 40.42 | 82.36 | | **231.59** | 31.62 | **263.21** |
| 3 | Gandhinagar 5 | 0.41 | 33.02 | | 26.84 | 19.55 | 2.29 | **82.11** | 8.98 | **91.09** |
| 4 | Wanakbori 1 to 6 | 57.29 | 38.73 | | 52.94 | 157.23 | - | **306.19** | 68.45 | **374.64** |
| 5 | Wanakbori 7 | 1.47 | 32.70 | | 26.23 | 19.34 | 2.21 | **81.95** | 8.43 | **90.38** |
| 6 | Sikka | 23.32 | 18.24 | | 20.29 | 29.95 | - | **91.80** | 14.13 | **105.93** |
| 7 | KLTPS 1 to 3 | 49.35 | 35.25 | | 45.22 | 26.83 | | **156.65** | 8.06 | **164.71** |
| 8 | KLTPS 4 | 27.89 | 15.48 | 10.46 | 18.07 | 9.36 | | **81.26** | 3.19 | **84.45** |
| 9 | Dhuvran Oil | 12.08 | 9.10 | | 7.15 | 27.45 | | **55.78** | 20.52 | **76.30** |
| 10 | Dhuvran gas 1 | 11.20 | 15.01 | | 12.52 | 7.32 | 1.63 | **47.68** | 5.09 | **52.77** |
| 11 | Dhuvran gas 2 | 22.13 | 20.76 | | 14.53 | 10.53 | | **67.95** | 8.39 | **76.34** |
| 12 | Utran | 10.68 | 13.96 | | 10.3 | 9.57 | 1.93 | **46.44** | 6.45 | **52.89** |
| 13 | Ukai Hydro | 5.31 | 4.42 | | 7.72 | 7.05 | | **24.50** | 0.48 | **24.98** |
| 14 | Kadana Hydro | 13.20 | 10.99 | | 32.55 | 11.03 | | **67.77** | 1.30 | **69.07** |
| 15 | Utran Extension | - | - | - | - | - | - | **-** | - | **-** |
| | **Total** | **354.69** | **321.93** | **10.46** | **337.55** | **523.64** | **8.06** | **1556.3** | **219.11** | **1775.44** |

## Table 6.18

## Station wise fixed costs component wise segregated for the year 2009-10

(Rs. crore)

| Sl. No | Generating Station | Interest Guarantee Charges | Depreciation | Advance AD | Return on Equity | O & M Charges | Insurance Charges | *Total* | Interest on Working Capital | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 69.55 | 37.49 | | 28.16 | 110.10 | - | **245.30** | 35.52 | **280.82** |
| 2 | Gandhinagar 1 to 4 | 71.39 | 49.91 | | 47.01 | 85.49 | - | **253.80** | 32.36 | **286.16** |
| 3 | Gandhinagar 5 | - | 33.02 | | 26.84 | 20.33 | 2.39 | **82.58** | 9.03 | **91.61** |
| 4 | Wanakbori 1 to 6 | 62.69 | 43.82 | | 64.02 | 163.21 | - | **333.74** | 69.49 | **403.23** |
| 5 | Wanakbori 7 | 0.38 | 32.70 | | 26.23 | 20.11 | 2.30 | **81.72** | 8.44 | **90.16** |
| 6 | Sikka | 22.11 | 18.70 | | 21.02 | 31.09 | | **92.92** | 14.27 | **107.19** |
| 7 | KLTPS 1 to 3 | 47.64 | 36.63 | | 46.66 | 27.85 | | **158.78** | 8.15 | **166.93** |
| 8 | KLTPS 4 | 25.23 | 15.48 | | 18.07 | 9.71 | | **68.49** | 2.90 | **71.39** |
| 9 | Dhuvran Oil | 11.04 | 9.16 | | 7.15 | 28.50 | | **55.85** | 19.88 | **75.73** |
| 10 | Dhuvran gas 1 | 9.52 | 15.01 | | 12.52 | 7.61 | 1.70 | **46.36** | 5.07 | **51.43** |
| 11 | Dhuvran gas 2 | 19.53 | 20.76 | | 15.46 | 10.93 | | **66.68** | 8.37 | **75.05** |
| 12 | Utran | 9.66 | 13.96 | | 10.30 | 9.95 | 2.00 | **45.87** | 6.44 | **52.31** |
| 13 | Ukai Hydro | 4.80 | 4.42 | | 7.72 | 7.74 | - | **24.68** | 0.49 | **25.17** |
| 14 | Kadana Hydro | 11.94 | 10.99 | | 32.55 | 12.11 | | **67.59** | 1.30 | **68.89** |
| 15 | Utran Extension | 63.21 | 41.52 | 13.10 | 36.33 | 21.04 | | **175.20** | 6.92 | **182.12** |
| | **Total** | **428.69** | **383.57** | **13.10** | **400.04** | **565.77** | **8.39** | **1799.56** | **228.63** | **2028.19** |

## Table 6.19

## Station wise fixed costs component wise segregated for the year 2010-11

(Rs. Crore)

| Sl.No | Generating Station | Interest Guarantee Charges | Depreciation | Advance AD | Return on Equity | O & M Charges | Insurance Charges | Total | Interest on Working Capital | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 86.97 | 48.72 | | 32.74 | 114.33 | | **282.76** | 36.43 | **319.19** |
| 2 | Gandhinagar 1 to 4 | 65.76 | 53.18 | | 47.70 | 88.78 | | **255.42** | 32.76 | **288.18** |
| 3 | Gandhinagar 5 | - | 33.02 | | 26.84 | 21.15 | 2.48 | **83.49** | 9.09 | **92.58** |
| 4 | Wanakbori 1 to 6 | 75.74 | 52.81 | | 74.95 | 169.48 | - | **372.98** | 70.78 | **443.76** |
| 5 | Wanakbori 7 | - | 32.70 | | 26.23 | 20.92 | 2.39 | **82.24** | 8.45 | **90.69** |
| 6 | Sikka | 21.85 | 19.59 | | 22.17 | 32.28 | - | **95.89** | 14.45 | **110.34** |
| 7 | KLTPS 1 to 3 | 45.73 | 37.80 | | 47.64 | 28.92 | | **160.09** | 8.24 | **168.33** |
| 8 | KLTPS 4 | 22.83 | 15.48 | | 18.07 | 10.09 | | **66.47** | 2.87 | **69.34** |
| 9 | Dhuvran Oil | 9.99 | 9.16 | | 7.15 | 29.59 | | **55.89** | 20.58 | **76.47** |
| 10 | Dhuvran gas 1 | 7.85 | 15.01 | | 12.52 | 7.92 | 1.76 | **45.06** | 5.05 | **50.11** |
| 11 | Dhuvran gas 2 | 16.93 | 20.76 | | 15.46 | 11.35 | | **64.50** | 8.34 | **72.84** |
| 12 | Utran | 8.74 | 13.96 | | 10.30 | 10.35 | 2.08 | **45.43** | 6.44 | **51.87** |
| 13 | Ukai Hydro | 4.35 | 4.42 | | 7.72 | 8.50 | | **24.99** | 0.51 | **25.50** |
| 14 | Kadana Hydro | 10.80 | 10.99 | | 32.55 | 13.30 | | **67.64** | 1.32 | **68.96** |
| 15 | Utran Extension | 80.36 | 71.82 | 7.13 | 39.09 | 37.79 | | **236.19** | 17.83 | **254.02** |
| | **Total** | **457.90** | **439.42** | **7.13** | **421.13** | **604.75** | **8.71** | **1939** | **243.14** | **2182.18** |

### Commission's Analysis:

The financial parameters proposed by GSECL in Table 6.14 above are discussed and approved as detailed below.

#### 6.6.5 Interest and guarantee charges

Interest and guarantee charges for the control period 2008-11 have been projected by GSECL based on the existing loans and the new loans proposed to be drawn based on the proposed capital expenditure. The interest charges are projected with 10.75% interest rate per annum and repayment in 10 years. The final audited accounts for 2007-08 are not available. The Commission obtained the provisional accounts for 2007-08. On verification of the accounts for 2006-07 (audited) and for 2007-08 (provisional) it is found that the actual average rate of interest for the year 2006-07 worked to 8.36% as the interest being Rs. 280.44 crores on an average loan of Rs. 3354 crore and for the year 2007-08 it worked out to 8.68%, the interest being Rs. 267.95 crore on average loan of Rs. 3087 crore. Based on this the rate of interest of 10.75%, for the control period is not justified. Leaving a margin for the market fluctuation the Commission approves the interest rate at 10% per annum with 10 years repayment period for estimating the interest charges for the control period. The guarantee charges are approved as claimed by GSECL.

#### 6.6.6 Depreciation

The GSECL has claimed the depreciation charges with rates ranging from 3.4% to 6% for the control period as detailed below.

| | |
|---|---|
| Thermal stations (Coal / Lignite / oil based) | 3.4% to 3.64% |
| Thermal stations (Gas based) | 5% to 6% |
| Hydro stations | 3.63% to 3.64% |

The GSECL has submitted that rates of depreciation in the case of PPA governed station have been considered as per the respective PPAs. In respect of the new stations, for which PPAs are not yet signed, the depreciation rates have been considered in line with the norms. For GEB transferred stations, the depreciation rates have been considered as per the actual weighted average depreciation rates from the books of GSECL and the depreciation shall be considered as per PPA between GUVNL and GSECL on finalisation of PPA.

**Advance against Depreciation**

The GSECL has claimed advance against depreciation in respect of KLTPS-4 during 2008-09 and inrespect of Utran extension for the years 2009-10 and 2010-11. These are the new projects. KLTPS-4 was commissioned in 2007-08 and the Utran extension to be commissioned in 2009-10. Advance against depreciation is in accordance with Regulation 20 (ii) (b) of GERC (Terms and Conditions of Tariff) Regulations 2005. However this will be limited to actual based on actual repayment of loans for these new projects at the time of Annual Performance Review under MYT Regulations.

**The Commission accordingly approves the depreciation charges for the generating stations as projected by GSECL.**

### 6.6.7 Return on equity

The GSECL has projected the return on equity at 13% in respect of PPA based stations and at 14% in respect of other stations in accordance with the GERC (Terms and Conditions of Tariff) Regulations 2005.

The Commission accordingly approves the rates of return on equity as claimed by the GSECL for the control period 2008-11.

### 6.6.8 O&M charges

The GSECL has submitted that the O&M expenses for the PPA based stations, viz Gandhinagar –5, Wanakbori –7, Utran and Dhuvran CCPP-1 which have been considered as per the conditions of PPA. For the other stations GSECL has projected as per norms and an escalation of 10% per annum on an average for the control period.

The Commission accepts the escalation of O&M expenses at 4.2% in respect of PPA based stations and 4% in respect of other stations as per CERC norms.

### 6.6.9 Interest on working capital

The GSECL has projected the rate of interest on working capital @ 10.50% per annum.

Regulation 20 (v) (b), specified that the rate of interest on working capital shall be on a normative basis and shall be equal to the short term prime lending rate of SBI as on 01/04/2004 or on 1st April of the year in which the generating unit / station is declared under commercial operation which ever is later. The short term PLR as on 01/04/2004 was 10.25%. The Commission approves the rate of interest at 10.25% for all the existing generating stations and for other stations against rate of 10.5% as projected by GSECL.

The Commission as discussed above approves the financial parameters for the control period 2008-11 as detailed in the Table 6.20 below.

**Table 6.20**

**Financial parameters approved for the control period 2008-11**

| Financial parameters for the control period: FY 2008-09 to 2010-11 | | | | | |
|---|---|---|---|---|---|
| **Stations** | **Depreciation Rate (%) **** | **Rate of interest on working capital (%)** | **ROE Rate (%)** | **Rate of interest (%)** | **Escalation to O&M cost (%)** |
| Ukai | 3.64 | 10.25 | 14.0 | 10.00 | 4.0 |
| Gandhinagar 1 to 4 | 3.41 | 10.25 | 14.0 | 10.00 | 4.0 |
| Gandhinagar 5 | 5.00 | 10.25 | 13.0 | 10.00 | 4.2* |
| Wanakbori 1 to 6 | 3.40 | 10.25 | 14.0 | 10.00 | 4.0 |
| Wanakbori 7 | 5.00 | 10.25 | 13.0 | 10.00 | 4.2* |
| Sikka | 3.56 | 10.25 | 14.0 | 10.00 | 4.0 |
| KLTPS 1 to 3 | 3.52 | 10.25 | 14.0 | 10.00 | 4.0 |
| KLTPS 4 | 4.50 | 10.25 | 14.0 | 10.00 | 4.0 |
| Dhuvaran Oil | 3.44 | 10.25 | 14.0 | 10.00 | 4.0 |
| Dhuvaran gas 1 | 5.00 | 10.25 | 13.0 | 10.00 | 4.2* |
| Dhuvaran Gas 2 | 6.00 | 10.25 | 14.0 | 10.00 | 4.0 |
| Utran | 5.00 | 10.25 | 13.0 | 10.00 | 4.2* |
| Ukai Hydro | 3.63 | 10.25 | 14.0 | 10.00 | 4.0 |
| Kadana Hydro | 3.64 | 10.25 | 14.0 | 10.00 | 4.0 |
| Utran Extension | 6.00 | 10.50 | 14.0 | 10.00 | 4.0 |

### 6.6.10. Insurance expenses

The GSECL has submitted that insurance charges in respect of PPA based station as paid during 2006-07 are considered for the control period. In the case of other stations GSECL has proposed to recover insurance cost based on actual cost incurred towards insurance charges.

The Commission accordingly approves the insurance charges as projected by GSECL for the control period.

### 6.6.11 Tax on income

The GSECL has projected the tax on income on the basis of MAT rate of 11.33% on the return on equity as detailed in the Table below.

**Table 6.21**
**Tax on income projected by GSECL for the control period 2008-11**

(Rs. crore)

| Particulars | 2007-08 | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|
| ROE | 292.71 | 337.56 | 400.02 | 421.12 |
| MAT @ 11.33% | 33.16 | 38.25 | 45.32 | 47.71 |

**The Commission approves the tax on income as projected by GSECL for the control period 2008-11.**

The fixed costs as analysed and worked out for the control period based on approved financial parameters as in Table 6.20 above are given in the Tables 6.22 to 6.24 below.

**Table 6.22**

**The Station-wise fixed costs Approved by the Commission for the Control Period 2008-11**

**FY 2008-09** (Rs. Crores)

| Sl.No | Generating Station | Interest Guarantee Charges | Depreciation | Advance AD | Return on Equity | O & M Charges | Insurance Charges | Total | Interest on Working Capital | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 51.30 | 31.43 | | 22.77 | 106.07 | | **211.57** | 33.21 | **244.78** |
| 2 | Gandhinagar 1 to 4 | 56.31 | 42.84 | | 40.42 | 82.36 | | **221.93** | 30.87 | **252.80** |
| 3 | Gandhinagar 5 | 0.40 | 33.02 | | 26.84 | 19.55 | 2.29 | **82.10** | 8.77 | **90.87** |
| 4 | Wanakbori 1 to 6 | 54.24 | 38.73 | | 52.94 | 157.23 | - | **303.14** | 66.82 | **369.96** |
| 5 | Wanakbori 7 | 1.47 | 32.70 | | 26.23 | 19.34 | 2.21 | **81.95** | 8.23 | **90.18** |
| 6 | Sikka | 21.69 | 18.24 | | 20.29 | 29.95 | - | **90.17** | 13.79 | **103.96** |
| 7 | KLTPS 1 to 3 | 45.98 | 35.25 | | 45.22 | 26.83 | | **153.28** | 7.87 | **161.15** |
| 8 | KLTPS 4 | 25.94 | 15.48 | 10.46 | 18.07 | 9.36 | | **79.31** | 2.93 | **82.24** |
| 9 | Dhuvran Oil | 11.28 | 9.10 | | 7.15 | 27.45 | | **54.98** | 20.03 | **75.01** |
| 10 | Dhuvran gas 1 | 10.42 | 15.01 | | 12.52 | 7.32 | 1.63 | **46.90** | 4.97 | **51.87** |
| 11 | Dhuvran gas 2 | 17.23 | 20.76 | | 14.53 | 10.53 | | **63.05** | 8.19 | **71.24** |
| 12 | Utran | 10.00 | 13.96 | | 10.3 | 9.57 | 1.93 | **45.76** | 6.30 | **52.06** |
| 13 | Ukai Hydro | 4.95 | 4.42 | | 7.72 | 7.05 | | **24.14** | 0.47 | **24.61** |
| 14 | Kadana Hydro | 12.32 | 10.99 | | 32.55 | 11.03 | | **66.89** | 1.27 | **68.16** |
| 15 | Utran Extension | - | - | - | - | - | - | **-** | - | **-** |
| | **Total** | **323.53** | **321.93** | **10.46** | **337.55** | **523.64** | **8.06** | **1525.17** | **213.72** | **1738.89** |

## Table 6.23

## The Station-wise fixed costs Approved by the Commission for the Control Period 2008-11

**FY 2009-10** (Rs. Crores)

| Sl.No | Generating Station | Interest Guarantee Charges | Depreciation | Advance AD | Return on Equity | O & M Charges | Insurance Charges | Total | Interest on Working Capital | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 57.68 | 37.49 | | 28.16 | 110.10 | - | **233.43** | 34.67 | **268.10** |
| 2 | Gandhinagar 1 to 4 | 63.90 | 49.91 | | 47.01 | 85.49 | - | **246.31** | 31.59 | **277.90** |
| 3 | Gandhinagar 5 | - | 33.02 | | 26.84 | 20.33 | 2.39 | **82.58** | 8.82 | **91.40** |
| 4 | Wanakbori 1 to 6 | 59.41 | 43.82 | | 64.02 | 163.21 | - | **330.46** | 67.84 | **398.30** |
| 5 | Wanakbori 7 | 0.38 | 32.70 | | 26.23 | 20.11 | 2.30 | **81.72** | 8.24 | **89.96** |
| 6 | Sikka | 20.57 | 18.70 | | 21.02 | 31.09 | | **91.38** | 13.93 | **105.31** |
| 7 | KLTPS 1 to 3 | 44.33 | 36.63 | | 46.66 | 27.85 | | **155.47** | 7.96 | **163.43** |
| 8 | KLTPS 4 | 23.47 | 15.48 | | 18.07 | 9.71 | | **66.73** | 2.83 | **69.56** |
| 9 | Dhuvran Oil | 10.31 | 9.16 | | 7.15 | 28.50 | | **55.12** | 19.41 | **74.53** |
| 10 | Dhuvran gas 1 | 8.86 | 15.01 | | 12.52 | 7.61 | 1.70 | **45.70** | 4.95 | **50.65** |
| 11 | Dhuvran gas 2 | 15.59 | 20.76 | | 15.46 | 10.93 | | **62.74** | 8.17 | **70.91** |
| 12 | Utran | 9.05 | 13.96 | | 10.30 | 9.95 | 2.00 | **45.26** | 6.29 | **51.55** |
| 13 | Ukai Hydro | 4.48 | 4.42 | | 7.72 | 7.74 | - | **24.36** | 0.48 | **24.84** |
| 14 | Kadana Hydro | 11.15 | 10.99 | | 32.55 | 12.11 | | **66.80** | 1.27 | **68.07** |
| 15 | Utran Extension | 58.80 | 41.52 | 6.92 | 36.33 | 21.04 | | **164.61** | 13.10 | **177.71** |
| | **Total** | **387.98** | **383.57** | **6.92** | **400.04** | **565.77** | **8.39** | **1752.67** | **229.55** | **1982.22** |

## Table 6.24

## The Station-wise fixed costs Approved by the Commission for the Control Period 2008-11

**FY 2010-11** (Rs. Crores)

| Sl.No | Generating Station | Interest Guarantee Charges | Depreciation | Advance AD | Return on Equity | O & M Charges | Insurance Charges | Total | Interest on Working Capital | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Ukai | 72.81 | 48.72 | | 32.74 | 114.33 | | **268.60** | 35.57 | **304.17** |
| 2 | Gandhinagar 1 to 4 | 63.80 | 53.18 | | 47.70 | 88.78 | | **253.46** | 31.98 | **285.44** |
| 3 | Gandhinagar 5 | - | 33.02 | | 26.84 | 21.15 | 2.48 | **83.49** | 8.88 | **92.37** |
| 4 | Wanakbori 1 to 6 | 71.47 | 52.81 | | 74.95 | 169.48 | - | **368.71** | 69.10 | **437.81** |
| 5 | Wanakbori 7 | - | 32.70 | | 26.23 | 20.92 | 2.39 | **82.24** | 8.25 | **90.49** |
| 6 | Sikka | 20.33 | 19.59 | | 22.17 | 32.28 | - | **94.37** | 14.11 | **108.48** |
| 7 | KLTPS 1 to 3 | 42.52 | 37.80 | | 47.64 | 28.92 | | **156.88** | 8.04 | **164.92** |
| 8 | KLTPS 4 | 21.24 | 15.48 | | 18.07 | 10.09 | | **64.88** | 2.80 | **67.68** |
| 9 | Dhuvran Oil | 9.33 | 9.16 | | 7.15 | 29.59 | | **55.23** | 20.09 | **75.32** |
| 10 | Dhuvran gas 1 | 7.3 | 15.01 | | 12.52 | 7.92 | 1.76 | **44.51** | 4.93 | **49.44** |
| 11 | Dhuvran gas 2 | 14.11 | 20.76 | | 15.46 | 11.35 | | **61.68** | 8.14 | **69.82** |
| 12 | Utran | 8.19 | 13.96 | | 10.30 | 10.35 | 2.08 | **44.88** | 6.29 | **51.17** |
| 13 | Ukai Hydro | 4.06 | 4.42 | | 7.72 | 8.50 | | **24.70** | 0.49 | **25.19** |
| 14 | Kadana Hydro | 10.08 | 10.99 | | 32.55 | 13.30 | | **66.92** | 1.28 | **68.20** |
| 15 | Utran Extension | 74.75 | 71.82 | 7.13 | 39.09 | 37.79 | | **230.58** | 17.83 | **248.41** |
| | **Total** | **419.99** | **439.42** | **7.13** | **421.13** | **604.75** | **8.71** | **1901.13** | **237.78** | **2138.91** |

The station wise fixed costs as projected by GSECL and as approved by the Commission are given in the Table 6.25 below.

## Table 6.25
**Total fixed cost projected by GSECL and approved by the Commission for the control period 2008-11** (Rs. crore)

| S.No | Station | Projected by GSECL | | | | Approved by the Commission | | |
|---|---|---|---|---|---|---|---|---|
| | | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2008-09 | 2009-10 | 2010-11 |
| 1 | Ukai | 237.07 | 248.67 | 280.81 | 319.19 | 244.78 | 268.10 | 304.17 |
| 2 | Gandhinagar 1 to 4 | 234.16 | 263.21 | 286.16 | 288.17 | 252.80 | 277.90 | 285.44 |
| 3 | Gandhinagar 5 | 90.91 | 91.01 | 91.61 | 92.59 | 90.87 | 91.40 | 92.37 |
| 4 | Wanakbori 1 to 6 | 365.19 | 374.64 | 403.23 | 443.76 | 369.96 | 398.30 | 437.81 |
| 5 | Wanakbori 7 | 91.82 | 90.38 | 90.16 | 90.70 | 90.18 | 89.96 | 90.49 |
| 6 | Sikka | 105.89 | 105.93 | 107.19 | 110.34 | 103.96 | 105.31 | 108.48 |
| 7 | KLTPS 1 to 3 | 163.16 | 164.70 | 166.93 | 168.33 | 161.15 | 163.43 | 164.92 |
| 8 | KLTPS 4 | 0 | 84.45 | 71.40 | 69.34 | 82.24 | 69.56 | 67.68 |
| 9 | Dhuvran Oil | 73.64 | 76.30 | 75.73 | 76.47 | 75.01 | 74.53 | 75.32 |
| 10 | Dhuvran gas 1 | 53.93 | 52.77 | 51.43 | 50.11 | 51.87 | 50.65 | 49.44 |
| 11 | Dhuvran gas 2 | 29.31 | 76.35 | 75.05 | 72.83 | 71.24 | 70.91 | 69.82 |
| 12 | Utran | 53.34 | 52.89 | 52.32 | 51.88 | 52.06 | 51.55 | 51.17 |
| 13 | Ukai Hydro | 24.75 | 24.98 | 25.19 | 25.50 | 24.61 | 24.84 | 25.19 |
| 14 | Kadana Hydro | 69.20 | 69.07 | 68.89 | 68.95 | 68.16 | 68.07 | 68.20 |
| 15 | Utran Extension | 0 | 0 | 182.11 | 254.02 | - | 177.71 | 248.41 |
| | **Total** | **1592.37** | **1775.44** | **2028.21** | **2182.18** | **1738.89** | **1982.22** | **2138.91** |
| 16 | Taxes on Income | 33.16 | 38.25 | 45.32 | 47.71 | 38.25 | 45.32 | 47.71 |
| | **Total Fixed Costs** | **1625.53** | **1813.69** | **2073.53** | **2229.89** | **1777.14** | **2027.54** | **2186.62** |

**6.6.12** The Commission approves the operational and financial parameters in this order and the station wise generation tariff for the control period as given in the Table 6.26 below.

## Table 6.26
**Station wise generation cost approved for the control period 2008-11**

| S. No | Station | 2008-09 | | 2009-10 | | 2010-11 | |
|---|---|---|---|---|---|---|---|
| | | Annual Fixed Charges (Rs.Crores) | Variable Charges (Rs./KWh) | Annual Fixed Charges (Rs.Crores) | Variable Charges (Rs./KWh) | Annual Fixed Charges (Rs.Crores) | Variable Charges (Rs./KWh) |
| | **Thermal** | | | | | | |
| 1 | Ukai 1 to 5 | 244.78 | 1.50 | 268.10 | 1.50 | 304.17 | 1.50 |
| 2 | Gandhinagar 1 to 4 | 252.80 | 1.75 | 277.90 | 1.75 | 285.44 | 1.75 |
| 3 | Gandhinagar 5 | 90.87 | 1.47 | 91.40 | 1.47 | 92.37 | 1.47 |
| 4 | Wanakbori 1 to 6 | 369.96 | 1.73 | 398.30 | 1.73 | 437.81 | 1.73 |
| 5 | Wanakbori 7 | 90.18 | 1.64 | 89.96 | 1.64 | 90.49 | 1.64 |
| 6 | Sikka | 103.96 | 1.99 | 105.31 | 1.99 | 108.48 | 1.99 |
| | **Lignite Based** | | | | | | |
| 7 | KLTPS 1 to 3 | 161.15 | 1.07 | 163.43 | 1.07 | 164.92 | 1.07 |
| 8 | KLTPS 4 | 82.24 | 0.98 | 69.56 | 0.98 | 67.68 | 0.98 |
| | **Oil and Gas based** | | | | | | |
| 9 | Dhuvran Oil 1 to 6 | 75.01 | 3.76 | 74.53 | 3.76 | 75.32 | 3.76 |
| 10 | Dhuvran gas 1 | 51.87 | 2.21 | 50.65 | 2.21 | 49.44 | 2.21 |
| 11 | Dhuvran gas 2 | 71.24 | 2.21 | 70.91 | 2.21 | 69.82 | 2.21 |
| 12 | Utran | 52.06 | 2.16 | 51.55 | 2.16 | 51.17 | 2.16 |
| 13 | Utran Extension | | 0 | 177.71 | 1.86 | 248.41 | 1.86 |
| | **Hydro** | | | | | | |
| 14 | Ukai Hydro | 24.61 | | 24.84 | | 25.19 | |
| 15 | Kadana Hydro | 68.16 | | 68.07 | | 68.2 | |
| | **Total** | **1738.89** | | **1982.22** | | **2138.91** | |
| | Tax on Income | 38.25 | | 45.32 | | 47.71 | |
| | **Total Fixed Charges** | **1777.14** | | **2027.54** | | **2186.62** | |
| | **Total Fuel Costs** | **4812.10** | | **5217.86** | | **5392.05** | |
| | **Total Cost** | **6589.24** | | **7245.40** | | **7578.67** | |
| | **Net Generation (Mu)** | **27758** | | **29992** | | **30962** | |
| | Fixed Charges (Rs./KWH) | 0.64 | | 0.68 | | 0.71 | |
| | Variable Charges(Rs./KWH) | 1.73 | | 1.74 | | 1.74 | |
| | **Generation tariff (Rs./KWH)** | **2.37** | | **2.42** | | **2.45** | |

# Chapter 7

# Capital Expenditure Plan

## 7.0 Capital Expenditure Plan

GSECL has submitted the capital expenditure plan for new generation schemes, renovation and modernization (Major and Minor) plans in progress and newly proposed. The capital expenditure plan submitted by GSECL for the control period 2008-09 to 2010-11 is discussed in this chapter.

## 7.1 Generation schemes

GSECL has submitted proposals covering new generation projects under execution and those newly proposed. The capital expenditure submitted for the control period 2008-09, 2009-10 and 2010-11 are as given in Table 7.1 below:

**Table 7.1**
**Capital Expenditure for new Generation Projects**

(Rs. Lakhs)

| Stations | Means of Financing | 2008-09 | 2009-10 | 2010-11 | Total during the control period |
|---|---|---|---|---|---|
| Ukai – 6 | Debt | 23310 | 79310 | 31570 | 134190 |
| | Equity | 9990 | 33990 | 13530 | 57510 |
| | Total | 33300 | 113300 | 45100 | 191700 |
| Sikka Extension | Debt | 33390 | 94290 | 8610 | 136290 |
| | Equity | 14310 | 40410 | 3690 | 58410 |
| | Total | 47700 | 134700 | 12300 | 194700 |
| KLTPS – 4 | Debt | 1960 | 350 | 0 | 2310 |
| | Equity | 840 | 150 | 0 | 990 |
| | Total | 2800 | 500 | 0 | 3300 |
| Wind Project | Debt | 420 | 0 | 0 | 420 |
| | Equity | 180 | 0 | 0 | 180 |
| | Total | 600 | 0 | 0 | 600 |
| Utran Extension | Debt | 41300 | 10430 | 0 | 51730 |
| | Equity | 17700 | 4470 | 0 | 22170 |
| | Total | 59000 | 14900 | 0 | 73900 |
| **Total** | **Debt** | **100380** | **184380** | **40180** | **324940** |
| | **Equity** | **43020** | **79020** | **17220** | **139260** |
| | **Total** | **143400** | **263400** | **57400** | **464200** |

The current status of the projects is stated to be as under;

(1) Ukai TPS –6 (1X500 MW) – (Coal based)

This is an extension at the existing station. Provision is made for payment to BHEL, the EPC contractor (Main and balance of plant equipment, civil works etc)

The unit is programmed to be commissioned during 2010-11.

(2) Sikka TPS units 3&4 (2X250 MW) –(Coal based)

Provision is made for payment to BHEL, the EPC contractor (Main and balance of plant equipment, Civil works etc)

The units are programmed to be commissioned during 2010-11.

(3) KLTPS –4 (1X75 MW) – (Lignite)

This is an extension at the existing station. The provision made is for payment to BHEL and balance payment to the contractor.

(4) Utran Extension Unit –II (350+MW) – (Gas based)

EPC contract for stage –I unit is awarded. Provision in made for payment to EPC contractor and other minor non- EPC works/ expenses.

(5) Wind Energy (10 MW)

Wind Energy project is commissioned during in May 2008. Provision is made during 2008-09 for payment to Suzlon Energy Ltd. towards, supply, erection and commissioning of wind energy project.

## 7.2 Major and Minor Renovation and Modernization (R&M) schemes

GSECL has programmed major and minor renovation and modernization (R&M) schemes during the years 2008-09 to 2010-11 at various stations. The capital expenditure proposed for the programme of the stations during these years is as given below:

**Major R&M Schemes:**

Details of Renovation and Modernisation schemes undertaken at various stations of GSECL are as given in Table 7.2 below:

**Table 7.2**

**Details of Major R&M Schemes**

(Rs. Lakhs)

| Stations | Means of Financing | 2008-09 | 2009-10 | 2010-11 | Total during the control period |
|---|---|---|---|---|---|
| Ukai | Debt | 1859 | 16940 | 16800 | 35599 |
| | Equity | 797 | 7260 | 7200 | 15257 |
| | Total | 2656 | 24200 | 24000 | 50856 |
| Gandhinagar | Debt | 14910 | 10636 | 0 | 25546 |
| | Equity | 6390 | 4558 | 0 | 10948 |
| | Total | 21300 | 15194 | 0 | 36494 |
| Wanakbori | Debt | 280 | 16940 | 16800 | 34020 |
| | Equity | 120 | 7260 | 7200 | 14580 |
| | Total | 400 | 24200 | 24000 | 48600 |
| KLTPS | Debt | 0 | 0 | 0 | 0 |
| | Equity | 0 | 0 | 0 | 0 |
| | Total | 0 | 0 | 0 | 0 |
| **Total** | **Debt** | **17049** | **44516** | **33600** | **95165** |
| | **Equity** | **7307** | **19078** | **14400** | **40785** |
| | **Total** | **24356** | **63594** | **48000** | **135950** |

Some important remarks pertaining to the major R&M Capex.

- Gandhinagar TPS: For BOP, the tenderization process is under progress. Hence estimated amount shall be changed accordingly on the basis of actual cost as per the purchase orders for BOP packages.

- Ukai TPS: RLA study is to be conducted during COH of respective unit to finalise R&M activities. Hence tentative expenditure to be incurred for R&M / LE works for the said unit is considered.

Major R&M works as proposed above, plant wise, action plan of R&M has been explained in Annexure –2 attached to the GSECL's petition.

**Minor R&M Works:**

Details of Minor R&M works comprising works which are of capital nature to be done at various stations of GSECL are as given in Table 7.3 below:

**Table 7.3**
**Details of Minor R&M Schemes**

(Rs. Lakhs)

| Stations | Means of Financing | 2008-09 | 2009-10 | 2010-11 | Total during the control period |
|---|---|---|---|---|---|
| Ukai TPS | Debt | 1209 | 558 | 346 | 2112 |
| | Equity | 134 | 62 | 38 | 265 |
| | Total | 1343 | 620 | 384 | 2347 |
| Gandhi Nagar 1-4 | Debt | 540 | 63 | 0 | 603 |
| | Equity | 130 | 7 | 0 | 137 |
| | Total | 671 | 70 | 0 | 741 |
| Dhuvran Oil | Debt | 0 | 0 | 0 | 0 |
| | Equity | 0 | 0 | 0 | 0 |
| | Total | 0 | 0 | 0 | 0 |
| Wanakbori 1-6 | Debt | 992 | 198 | 503 | 1693 |
| | Equity | 110 | 22 | 56 | 188 |
| | Total | 1103 | 220 | 559 | 1882 |
| Sikka | Debt | 297 | 385 | 249 | 932 |
| | Equity | 33 | 43 | 28 | 104 |
| | Total | 330 | 428 | 277 | 1035 |
| KLTPS 1-3 | Debt | 49 | 958 | 617 | 1624 |
| | Equity | 21 | 128 | 69 | 217 |
| | Total | 70 | 1085 | 686 | 1841 |
| Ukai HPS | Debt | 2033 | 77 | 0 | 2109 |
| | Equity | 598 | 9 | 0 | 607 |
| | Total | 2631 | 85 | 0 | 2716 |
| **Total** | **Debt** | **5120** | **2238** | **1715** | **9074** |
| | **Equity** | **1027** | **270** | **191** | **1487** |
| | **Total** | **6147** | **2508** | **1906** | **10561** |

Minor R&M works as proposed above, station wise, has been explained in detail with each of the activity, reasons to take up this activity and likely benefits of this activity have been attached as Annexure-1 in the petition.

## 7.3 Commissions Analysis

The Commission has examined the proposal of GSECL for capital expenditure on new generation projects and major and minor R&M schemes.

### 7.3.1 New Generation Projects

The new generation project of 10 MW wind energy at village Bayath, District Kutch was commissioned during May 2008.

The new generation plant at KLTPS (1X75 MW) was commissioned (testing) during October 2008.

The contracts for new projects at Sikka (2X250 MW) and Ukai (1X500 MW) (Coal based) are finalized and EPC contracts are entrusted to BHEL. The units of Sikka TPS are programmed to be commissioned during 2010-11 and at Ukai TPS during 2011-12.

EPC contract for additional unit at Uttaran Stage –II (350+MW) (Gas based) is finalized and awarded. Advance payment made and site handed over for execution of the project with 25th May 2007 as zero date and August 2009 as completion schedule.

The proposed additional capacity is essential to meet the growing demand. The State is facing power shortage and purchasing power from traders and other sources at high cost.

The additional units at KLTPS are lignite based utilizing locally available lignite. The additional units of Uttaran are gas based and will utilize natural gas and LNG. The other two projects at Sikka and Ukai are coal based. Sikka TPS would utilize imported coal with a blend of indigenous coal, Ukai TPS would utilize indigenous coal,. The two units are extension of the existing generating stations utilizing existing infrastructure to some extent.

The Capital cost indicated for new generating stations / units during the control period 2008-09 to 2010-11 are accepted and as detailed in Table 7.4 below.

**Table 7.4**

**Capital expenditure for new projects**

(Rs. crores)

| S. No | Project | Capacity (MW) | Estimate Cost | Budget Provision for | | | Commissioning Schedule |
|---|---|---|---|---|---|---|---|
| | | | | 2008-09 | 2009-10 | 2010-11 | |
| 1 | Ukai TPS-6 (Coal) | 1X500 | 2210 | 333 | 1133 | 451 | 2011-12 |
| 2 | Sikka TPS (Coal) | 2X250 | 2255 | 477 | 1347 | 123 | 2010-11 |
| 3 | KLTPS-4 (Lignite) | 1X75 | 490 | 28 | 5 | - | Commissioned |
| 4 | Wind project | 10 | 52 | 6 | - | - | Commissioned |
| 5 | Utran Extension | 350+ | 1197 | 590 | 149 | - | 2009-10 |
| | Total | | 6204 | 1434 | 2634 | 574 | |

### 7.5.2 Renovation and Modernisation (R & M) schemes

7.5.2.1 GSECL has taken up Major Renovation & Modernization of the following generating stations (already overdue)

1. Ukai TPS-1 & 2 (2X120 MW), 3,4, 5 (2X200 MW, 1X210 MW)
2. GandhiNagar TPS-1 & 2 (2X120 MW)
3. Wanakbori TPS-1,2,3 (3X210 MW)
4. KLTPS - 1,2 (2X70 MW)

The performance of some of the units is below the norms and R&M of such units is overdue and should be taken up. The Commission has also given directions repeatedly to take up R&M of the old units, to improve their performance. CEA has also been pressing for taking up R&M of some of the units and has approved the R&M of such units.

GSECL has sponsored study relating to RLA, major R&M and LE of various units to BHEL. The pay back period for the major R&M programme as stated is about 4 to 5 years. It justifies the investment fully.

The Commission accepts the estimated expenditure and budget provisions for Major R&M works for the control period 2008-09 to 2010-11 as detailed in Table 7.5 below.

**Table 7.5**

**Capital Expenditure for Major R&M Works**

(Rs. crores)

| S. No | Station | Capital Expenditure | | | | | | Total during the Control Period | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2008-09 | | 2009-10 | | 2010-11 | | | |
| | | Loan | Equity | Loan | Equity | Loan | Equity | Loan | Equity |
| 1 | Ukai | 18.59 | 7.97 | 169.4 | 72.6 | 168 | 72 | 355.99 | 152.57 |
| 2 | Gandhinagar | 149.1 | 63.9 | 106.36 | 45.58 | 0 | 0 | 255.46 | 109.48 |
| 3 | Wanakbori | 2.8 | 1.2 | 169.4 | 72.6 | 168 | 72 | 340.2 | 145.8 |
| 4 | KLTPS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **5** | **Total** | **170.49** | **73.07** | **445.16** | **190.78** | **336** | **144** | **951.65** | **407.85** |

7.5.2.2 GSECL has also sought approval for other Minor (R&M) capital works which are required to be undertaken for performance improvement of plants. The commission approves the expenditure for other Minor (R&M) capital works during the control period as in Table 7.6 below:

**Table 7.6**

**Capital Expenditure for Minor (R&M) Works**

(Rs.crores)

| S. No | Station | Capital Expenditure | | | | | | Total during the Control Period | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2008-09 | | 2009-10 | | 2010-11 | | | |
| | | Loan | Equity | Loan | Equity | Loan | Equity | Loan | Equity |
| 1 | Ukai TPS | 12.09 | 1.34 | 5.58 | 0.62 | 3.46 | 0.38 | 21.12 | 2.35 |
| 2 | Gandhi Nagar 1-4 | 5.7 | 1.3 | 0.63 | 0.07 | 0 | 0 | 6.03 | 1.37 |
| 3 | Dhuvaran Oil | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 | Wanakbori 1-6 | 9.92 | 1.1 | 1.98 | 0.22 | 5.03 | 0.56 | 16.93 | 1.88 |
| 5 | Sikka | 2.97 | 0.33 | 3.85 | 0.43 | 2.49 | 0.28 | 9.32 | 1.04 |
| 6 | KLTPS 1-3 | 0.49 | 0.21 | 9.58 | 1.28 | 6.17 | 0.69 | 16.24 | 2.17 |
| 7 | Ukai HPS | 20.33 | 5.98 | 0.77 | 0.09 | 0 | 0 | 21.09 | 6.07 |
| **8** | **Total** | **51.20** | **10.27** | **22.38** | **2.70** | **17.15** | **1.91** | **90.74** | **14.87** |

The commission accepts the capital investment plan for the control period 2008-09 to 2010-11 as detailed above for new generation projects, Major and Minor R&M works. The debt equity ratio of investment is at 70:30 and is in line with the regulations of the Commission.

# COMMISSION'S ORDER

The Commission approves the Operational and Financial parameters as discussed in this order (which are subject to revision, if any) and the station-wise Generation Tariff of Gujarat State Electricity Corporation Limited as presently arrived at for the control period 2008-09 to 2010-11 as below:

| S.No | Station | 2008-09 | | 2009-10 | | 2010-11 | |
|---|---|---|---|---|---|---|---|
| | | Annual Fixed Charges (Rs.Crores) | Variable Charges (Rs./KWh) | Annual Fixed Charges (Rs.Crores) | Variable Charges (Rs./KWh) | Annual Fixed Charges (Rs.Crores) | Variable Charges (Rs./KWh) |
| | **Thermal** | | | | | | |
| 1 | Ukai 1 to 5 | 244.78 | 1.50 | 268.10 | 1.50 | 304.17 | 1.50 |
| 2 | Gandhinagar 1 to 4 | 252.80 | 1.75 | 277.90 | 1.75 | 285.44 | 1.75 |
| 3 | Gandhinagar 5 | 90.87 | 1.47 | 91.40 | 1.47 | 92.37 | 1.47 |
| 4 | Wanakbori 1 to 6 | 369.96 | 1.73 | 398.30 | 1.73 | 437.81 | 1.73 |
| 5 | Wanakbori 7 | 90.18 | 1.64 | 89.96 | 1.64 | 90.49 | 1.64 |
| 6 | Sikka | 103.96 | 1.99 | 105.31 | 1.99 | 108.48 | 1.99 |
| | **Lignite Based** | | | | | | |
| 7 | KLTPS 1 to 3 | 161.15 | 1.07 | 163.43 | 1.07 | 164.92 | 1.07 |
| 8 | KLTPS 4 | 82.24 | 0.98 | 69.56 | 0.98 | 67.68 | 0.98 |
| | **Oil and Gas based** | | | | | | |
| 9 | Dhuvran Oil 1 to 6 | 75.01 | 3.76 | 74.53 | 3.76 | 75.32 | 3.76 |
| 10 | Dhuvran gas 1 | 51.87 | 2.21 | 50.65 | 2.21 | 49.44 | 2.21 |
| 11 | Dhuvran gas 2 | 71.24 | 2.21 | 70.91 | 2.21 | 69.82 | 2.21 |
| 12 | Utran | 52.06 | 2.16 | 51.55 | 2.16 | 51.17 | 2.16 |
| 13 | Utran Extension | 0 | 0 | 177.71 | 1.86 | 248.41 | 1.86 |
| | **Hydro** | | | | | | |
| 14 | Ukai Hydro | 24.61 | | 24.84 | | 25.19 | |
| 15 | Kadana Hydro | 68.16 | | 68.07 | | 68.2 | |
| | **Total** | **1738.89** | | **1982.22** | | **2138.91** | |

The order shall come into force with effect from 1st February 2009.

| Sd/- | Sd/- | Sd/- |
|---|---|---|
| **DR. P K MISHRA**<br>**Chairman** | **K P GUPTA**<br>**Member** | **DR. MANMOHAN**<br>**Member** |

Date: 17 January 2009

Ahmedabad

# Annexure - 6.1

## Fuel costs ( Coal, Lignite & Secondary Oil) - Ukai 1-5

| Sl. No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 5361 | 5510 | 5510 |
| 2 | Heat Rate | B | Kcal/kWh | 2775 | 2775 | 2775 |
| 3 | Specific Oil Consumption | C | ML/kWh | 2.00 | 2.00 | 2.00 |
| 4 | Calorific Value of Oil | D | KCal/Litre | 10400 | 10400 | 10400 |
| 5 | Calorific Value of Coal | E | KCal/Kg. | 4102 | 4102 | 4102 |
| 6 | Overall Heat | F=(A * B ) | G. Cal. | 14876775 | 15290250 | 15290250 |
| 7 | Heat from Oil | G=(A*C*D)/1000 | G. Cal | 111509 | 114608 | 114608 |
| 8 | Heat from Coal | H=(F-G) | G. Cal | 14765266 | 15175642 | 15175642 |
| 9 | Actual Oil Consumption | I =A*C | KL | 10722 | 11020 | 11020 |
| 10 | Actual Coal Consumption | J=(H*1000/E) | MT | 3599529 | 3699571 | 3699571 |
| 11 | Indigenous Coal including transit loss of 1.2% | J1=J*0.31/0.988 | MT | 1129407 | 1160797 | 1160797 |
| 12 | Washed Coal | J2=J*0.69 | MT | 2483675 | 2552704 | 2552704 |
| 13 | Cost of Oil per KL | K | Rs./KL | 19934 | 19934 | 19934 |
| 14 | Cost Of Indigenous Coal Per MT | L1 | Rs./MT | 1963 | 1963 | 1963 |
| 15 | Cost Of Washed Coal Per MT | L2 | Rs./MT | 1976 | 1976 | 1976 |
| 16 | Total Cost of Oil | $M=I*K/10^5$ | Rs. Lakhs | 2137 | 2197 | 2197 |
| 17 | Cost of Indigenous coal | $N1=J\ 1*\ L1\ /\ 10^5$ | Rs. Lakhs | 22170 | 22786 | 22786 |
| 18 | Cost of Washed Coal | $N2=J2\ *\ L2\ /\ 10^5$ | Rs. Lakhs | 49077 | 50441 | 50441 |
| 19 | Cost of Coal | N=N1+N2 | Rs. Lakhs | 71248 | 73228 | 73228 |
| **20** | **Total Fuel Cost** | **O = (M + N)** | **Rs. Lakhs** | **73385** | **75425** | **75425** |
| 21 | Fuel cost / Unit Gross | O/(A*10) | Rs/KWh | 1.37 | 1.37 | 1.37 |
| 22 | Auxiliary consumption (percent) | P | % | 9.00 | 9.00 | 9.00 |
| 23 | Auxiliary consumption | Q = (A*P) / 100 | MU | 482 | 496 | 496 |
| 24 | Net Generation | R = A - Q | MU | 4879 | 5014 | 5014 |
| 25 | Fuel cost / Unit Net | O/(R*10) | Rs / KWh | 1.50 | 1.50 | 1.50 |

The ratio of indigenous coal and washed coal is 31:69

# Annexure -6.2

## Fuel costs ( Coal, Lignite & Secondary Oil) - Gandhinagar - 1-4

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 3758 | 4047 | 4336 |
| 2 | Heat Rate | B | Kcal/kWh | 2855 | 2855 | 2855 |
| 3 | Specific Oil Consumption | C | ML/kWh | 3.50 | 3.50 | 3.50 |
| 4 | Calorific Value of Oil | D | KCal/Litre | 10400 | 10400 | 10400 |
| 5 | Calorific Value of Coal | E | KCal/Kg. | 4711 | 4711 | 4711 |
| 6 | Overall Heat | F=(A * B ) | G. Cal. | 10729090 | 11554185 | 12379280 |
| 7 | Heat from Oil | G=(A*C*D)/1000 | G. Cal | 136791 | 147311 | 157830 |
| 8 | Heat from Coal | H=(F-G) | G. Cal | 10592299 | 11406874 | 12221450 |
| 9 | Actual Oil Consumption | I =A*C | KL | 13153 | 14165 | 15176 |
| 10 | Actual Coal Consumption | J=(H*1000/E) | MT | 2248418 | 2421328 | 2594237 |
| 11 | Indigenous Coal including transit loss of 1.4% | J1= J*0.28/0.986 | MT | 638496 | 687598 | 736700 |
| 12 | Washed Coal | J2 = J*0.49 | MT | 1101725 | 1186451 | 1271176 |
| 13 | Imported Coal | J3 = J*0.23 | MT | 517136 | 556905 | 596674 |
| 14 | Cost of Oil per KL | K | Rs./KL | 19967 | 19967 | 19967 |
| 15 | price of Indigenous coal per MT | L1 | Rs./MT | 2511 | 2511 | 2511 |
| 16 | Price of Washed coal per MT | L2 | Rs./MT | 2232 | 2232 | 2232 |
| 17 | Price of Imported coal per MT | L3 | Rs./MT | 2917 | 2917 | 2917 |
| 18 | Total Cost of Oil | $M=I * K / 10^5$ | Rs. Lakhs | 2626 | 2828 | 3030 |
| 19 | Price of Indigenous Coal | $N1=J1*L1/10^5$ | Rs. Lakhs | 16033 | 17266 | 18499 |
| 20 | Price of Washed Coal | $N2=J2*L2/10^5$ | Rs. Lakhs | 24591 | 26482 | 28373 |
| 21 | Price of Imported Coal | $N3=J3*L3/10^5$ | Rs. Lakhs | 15085 | 16245 | 17405 |
| 22 | Cost of Coal | N = N1+N2+N3 | Rs. Lakhs | 55708 | 59992 | 64276 |
| **23** | **Total Fuel Cost** | **O = (M + N)** | **Rs. Lakhs** | **58334** | **62820** | **67306** |
| 24 | Fuel cost / Unit Gross | O/(A*10) | Rs/KWh | 1.55 | 1.55 | 1.55 |
| 25 | Auxiliary consumption (percent) | P | % | 11.12 | 11.12 | 11.12 |
| 26 | Auxiliary consumption | Q = (A*P) / 100 | MU | 418 | 450 | 482 |
| 27 | Net Generation | R = A - Q | MU | 3340 | 3597 | 3854 |
| 28 | Fuel cost / Unit Net | O/(R*10) | Rs / KWh | 1.75 | 1.75 | 1.75 |

The ratio of Indigenous coal, washed coal and imported coal is 28:49:23

# Annexure - 6.3

## Fuel costs ( Coal, Lignite & Secondary Oil) - Gandhinagar - 5

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 1692 | 1692 | 1692 |
| 2 | Heat Rate | B | Kcal/kWh | 2460 | 2460 | 2460 |
| 3 | Specific Oil Consumption | C | ML/kWh | 3.5 | 3.5 | 3.5 |
| 4 | Calorific Value of Oil | D | KCal/Litre | 10400 | 10400 | 10400 |
| 5 | Calorific Value of Coal | E | KCal/Kg. | 4714 | 4714 | 4714 |
| 6 | Overall Heat | F=(A * B ) | G. Cal. | 4162320 | 4162320 | 4162320 |
| 7 | Heat from Oil | G=(A*C*D)/1000 | G. Cal | 61589 | 61589 | 61589 |
| 8 | Heat from Coal | H=(F-G) | G. Cal | 4100731 | 4100731 | 4100731 |
| 9 | Actual Oil Consumption | I =A*C | KL | 5922 | 5922 | 5922 |
| 10 | Actual Coal Consumption | J=(H*1000/E) | MT | 869905 | 869905 | 869905 |
| 11 | Indigenous Coal including transit loss of 1.4% | J1=J*0.28/0.986 | MT | 247032 | 247032 | 247032 |
| 12 | Washed Coal | J2=J*0.51 | MT | 443651 | 443651 | 443651 |
| 13 | Imported Coal | J3=J*0.21 | MT | 182680 | 182680 | 182680 |
| 14 | Cost of Oil per KL | K | Rs./KL | 19967 | 19967 | 19967 |
| 15 | price of Indigenous coal per MT | L1 | Rs./MT | 2511 | 2511 | 2511 |
| 16 | Price of Washed coal per MT | L2 | Rs./MT | 2232 | 2232 | 2232 |
| 17 | Price of Imported coal per MT | L3 | Rs./MT | 2917 | 2917 | 2917 |
| 18 | Total Cost of Oil | $M=I * K / 10^5$ | Rs. Lakhs | 1182 | 1182 | 1182 |
| 19 | Price of Indigenous Coal | $N1=J1*L1/10^5$ | Rs. Lakhs | 6203 | 6203 | 6203 |
| 20 | Price of Washed Coal | $N2=J2*L2/10^5$ | Rs. Lakhs | 9902 | 9902 | 9902 |
| 21 | Price of Imported Coal | $N3=J3*L3/10^5$ | Rs. Lakhs | 5329 | 5329 | 5329 |
| 22 | Cost of Coal | N=N1+N2+N3 | Rs. Lakhs | 21434 | 21434 | 21434 |
| **23** | **Total Fuel Cost** | **O = (M + N)** | **Rs. Lakhs** | **22616** | **22616** | **22616** |
| 24 | Fuel cost / Unit Gross | O/(A*10) | Rs/KWh | 1.34 | 1.34 | 1.34 |
| 25 | Auxiliary consumption (percent) | P | % | 9.00 | 9.00 | 9.00 |
| 26 | Auxiliary consumption | Q = (A*P) / 100 | MU | 152 | 152 | 152 |
| 27 | Net Generation | R = A - Q | MU | 1540 | 1540 | 1540 |
| 28 | Fuel cost / Unit Net | O/(R*10) | Rs / KWh | 1.47 | 1.47 | 1.47 |

The ratio of indigenous coal, washed coal and imported coal is 28:51:21

# Annexure - 6.4

## Fuel costs ( Coal, Lignite & Secondary Oil) - Wanakbori 1-6 TPS

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 20010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 9382 | 9382 | 9382 |
| 2 | Heat Rate | B | Kcal/kWh | 2650 | 2650 | 2650 |
| 3 | Specific Oil Consumption | C | ML/kWh | 1.00 | 1.00 | 1.00 |
| 4 | Calorific Value of Oil | D | KCal/Litre | 10400 | 10400 | 10400 |
| 5 | Calorific Value of Coal | E | KCal/Kg. | 3793 | 3793 | 3793 |
| 6 | Overall Heat | F=(A * B ) | G. Cal. | 24862300 | 24862300 | 24862300 |
| 7 | Heat from Oil | G=(A*C*D)/1000 | G. Cal | 97573 | 97573 | 97573 |
| 8 | Heat from Coal | H=(F-G) | G. Cal | 24764727 | 24764727 | 24764727 |
| 9 | Actual Oil Consumption | I =A*C | KL | 9382 | 9382 | 9382 |
| 10 | Actual Coal Consumption | J=(H*1000/E) | MT | 6529061 | 6529061 | 6529061 |
| 11 | Indigenous Coal including transit loss of 1.5% | J1=J*0.54/0.985 | MT | 3579384 | 3579384 | 3579384 |
| 12 | Washed Coal | J2=J*0.46 | MT | 3003368 | 3003368 | 3003368 |
| 13 | Cost of Oil per KL | K | Rs./KL | 21564 | 21564 | 21564 |
| 14 | Cost Of Indigenous Coal Per MT | L1 | Rs./MT | 2178 | 2178 | 2178 |
| 15 | Cost Of Washed Coal Per MT | L2 | Rs./MT | 2242 | 2242 | 2242 |
| 16 | Total Cost of Oil | $M=I * K / 10^5$ | Rs. Lakhs | 2023 | 2023 | 2023 |
| 17 | Cost of Indigenous coal | $N1=J 1* L1 / 10^5$ | Rs. Lakhs | 77959 | 77959 | 77959 |
| 18 | Cost of Washed Coal | $N2=J2 * L2 / 10^5$ | Rs. Lakhs | 67336 | 67336 | 67336 |
| 19 | Cost of Coal | N=N1+N2 | Rs. Lakhs | 145294 | 145294 | 145294 |
| **20** | **Total Fuel Cost** | **O = (M + N)** | **Rs. Lakhs** | **147318** | **147318** | **147318** |
| 21 | Fuel cost / Unit Gross | O/(A*10) | Rs/KWh | 1.57 | 1.57 | 1.57 |
| 22 | Auxiliary consumption (percent) | P | % | 9.00 | 9.00 | 9.00 |
| 23 | Auxiliary consumption | Q = (A*P) / 100 | MU | 844 | 844 | 844 |
| 24 | Net Generation | R = A - Q | MU | 8538 | 8538 | 8538 |
| 25 | Fuel cost / Unit Net | O/(R*10) | Rs / KWh | 1.73 | 1.73 | 1.73 |

The ratio of indigenous coal and washed coal is 54:46

# Annexure - 6.5

## Fuel costs ( Coal, Lignite & Secondary Oil) - Wanakbori - 7 TPS

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 1692 | 1692 | 1692 |
| 2 | Heat Rate | B | Kcal/kWh | 2460 | 2460 | 2460 |
| 3 | Specific Oil Consumption | C | ML/kWh | 3.5 | 3.5 | 3.5 |
| 4 | Calorific Value of Oil | D | KCal/Litre | 10400 | 10400 | 10400 |
| 5 | Calorific Value of Coal | E | KCal/Kg. | 3816 | 3816 | 3816 |
| 6 | Overall Heat | F=(A * B ) | G. Cal. | 4162320 | 4162320 | 4162320 |
| 7 | Heat from Oil | G=(A*C*D)/1000 | G. Cal | 61589 | 61589 | 61589 |
| 8 | Heat from Coal | H=(F-G) | G. Cal | 4100731 | 4100731 | 4100731 |
| 9 | Actual Oil Consumption | I =A*C | KL | 5922 | 5922 | 5922 |
| 10 | Actual Coal Consumption | J=(H*1000/E) | MT | 1074615 | 1074615 | 1074615 |
| 11 | Indigenous Coal including transit loss of 1.5% | J1=J*0.53/0.985 | MT | 578219 | 578219 | 578219 |
| 12 | Washed Coal | J2=J*0.47 | MT | 505069 | 505069 | 505069 |
| 13 | Cost of Oil per KL | K | Rs./KL | 21564 | 21564 | 21564 |
| 14 | Cost Of Indigenous Coal Per MT | L1 | Rs./MT | 2178 | 2178 | 2178 |
| 15 | Cost Of Washed Coal Per MT | L2 | Rs./MT | 2242 | 2242 | 2242 |
| 16 | Total Cost of Oil | $M=I * K / 10^5$ | Rs. Lakhs | 1277.020 | 1277.020 | 1277.020 |
| 17 | Cost of Indigenous coal | $N1=J 1* L1 / 10^5$ | Rs. Lakhs | 12594 | 12594 | 12594 |
| 18 | Cost of Washed Coal | $N2=J2 * L2 / 10^5$ | Rs. Lakhs | 11324 | 11324 | 11324 |
| 19 | Cost of Coal | N=N1+N2+N3 | Rs. Lakhs | 23917 | 23917 | 23917 |
| **20** | **Total Fuel Cost** | **O = (M + N)** | **Rs. Lakhs** | **25194** | **25194** | **25194** |
| 21 | Fuel cost / Unit Gross | O/(A*10) | Rs/KWh | 1.49 | 1.49 | 1.49 |
| 22 | Auxiliary consumption (percent) | P | % | 9.00 | 9.00 | 9.00 |
| 23 | Auxiliary consumption | Q = (A*P) / 100 | MU | 152 | 152 | 152 |
| 24 | Net Generation | R = A - Q | MU | 1540 | 1540 | 1540 |
| 25 | Fuel cost / Unit Net | O(R/*10) | Rs / KWh | 1.64 | 1.64 | 1.64 |

The ratio of indigenous coal and washed coal is 53:47

# Annexure - 6.6

## Fuel costs ( Coal, Lignite & Secondary Oil) - Sikka TPS

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 1577 | 1577 | 1577 |
| 2 | Heat Rate | B | Kcal/kWh | 3100 | 3100 | 3100 |
| 3 | Specific Oil Consumption | C | ML/kWh | 2.77 | 2.77 | 2.77 |
| 4 | Calorific Value of Oil | D | KCal/Litre | 10400 | 10400 | 10400 |
| 5 | Calorific Value of Coal | E | KCal/Kg. | 4905 | 4905 | 4905 |
| 6 | Overall Heat | F=(A * B ) | G. Cal. | 4888700 | 4888700 | 4888700 |
| 7 | Heat from Oil | G=(A*C*D)/1000 | G. Cal | 45430 | 45430 | 45430 |
| 8 | Heat from Coal | H=(F-G) | G. Cal | 4843270 | 4843270 | 4843270 |
| 9 | Actual Oil Consumption | I =A*C | KL | 4368 | 4368 | 4368 |
| 10 | Actual Coal Consumption | J=(H*1000/E) | MT | 987415 | 987415 | 987415 |
| 11 | Indigenous Coal including transit loss of 2% | J1=J*0.75/0.980 | MT | 755675 | 755675 | 755675 |
| 12 | Imported Coal | J2=J*0.25 | MT | 246854 | 246854 | 246854 |
| 13 | Cost of Oil per KL | K | Rs./KL | 27194 | 27194 | 27194 |
| 14 | Cost Of Indigenous Coal Per MT | L1 | Rs./MT | 2833 | 2833 | 2833 |
| 15 | Cost Of Imported Coal Per MT | L2 | Rs./MT | 2193 | 2193 | 2193 |
| 16 | Total Cost of Oil | $M=I * K / 10^5$ | Rs. Lakhs | 1187.913 | 1187.913 | 1187.913 |
| 17 | Cost of Indigenous coal | $N1=J 1* L1 / 10^5$ | Rs. Lakhs | 21408 | 21408 | 21408 |
| 18 | Cost of Imported Coal | $N2=J2 * L2 / 10^5$ | Rs. Lakhs | 5414 | 5414 | 5414 |
| 19 | Cost of Coal | N=N1+N2 | Rs. Lakhs | 26822 | 26822 | 26822 |
| **20** | **Total Fuel Cost** | **O = (M + N)** | **Rs. Lakhs** | **28010** | **28010** | **28010** |
| 21 | Fuel cost / Unit Gross | O(A*10) | Rs/KWh | 1.78 | 1.78 | 1.78 |
| 22 | Auxiliary consumption (percent) | P | % | 10.70 | 10.70 | 10.70 |
| 23 | Auxiliary consumption | Q = (A*P) / 100 | MU | 169 | 169 | 169 |
| 24 | Net Generation | R = A - Q | MU | 1408 | 1408 | 1408 |
| 25 | Fuel cost / Unit Net | O/(R*10) | Rs / KWh | 1.99 | 1.99 | 1.99 |

The ratio of indigenous coal and imported coal is 75:25

# Annexure - 6.7

## Fuel costs ( Coal, Lignite & Secondary Oil) - KLTPS - 1 - 3

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 1356 | 1356 | 1356 |
| 2 | Heat Rate | B | Kcal/kWh | 3300 | 3300 | 3300 |
| 3 | Specific Oil Consumption | C | ML/kWh | 3.00 | 3.00 | 3.00 |
| 4 | Calorific Value of Oil | D | KCal/Litre | 10735 | 10735 | 10735 |
| 5 | Calorific Value of Lignite | E | KCal/Kg. | 2946 | 2946 | 2946 |
| 6 | Overall Heat | F=(A * B ) | G. Cal. | 4474800 | 4474800 | 4474800 |
| 7 | Heat from Oil | G=(A*C*D)/1000 | G. Cal | 43670 | 43670 | 43670 |
| 8 | Heat from Lignite | H=(F-G) | G. Cal | 4431130 | 4431130 | 4431130 |
| 9 | Actual Oil Consumption | I =A*C | KL | 4068 | 4068 | 4068 |
| 10 | Actual Lignite Consumption including Transit Loss of 0% | J=(H*1000/E) | MT | 1504117 | 1504117 | 1504117 |
| 11 | Cost of Oil per KL | K | Rs./KL | 24129 | 24129 | 24129 |
| 12 | Cost of Lignite per MT | L | Rs./MT | 780.00 | 780.00 | 780.00 |
| 13 | Total Cost of Oil | $M=I * K / 10^5$ | Rs. Lakhs | 981.57 | 981.57 | 981.57 |
| 14 | Total Cost of Lignite | $N=J * L / 10^5$ | Rs. Lakhs | 11732 | 11732 | 11732 |
| **15** | **Total Fuel Cost** | **O = (M + N)** | **Rs. Lakhs** | **12714** | **12714** | **12714** |
| 16 | Fuel cost / Unit Gross | O/(A*10) | Rs/KWh | 0.94 | 0.94 | 0.94 |
| 17 | Auxiliary consumption (percent) | P | % | 12.25 | 12.25 | 12.25 |
| 18 | Auxiliary consumption | Q = (A*P) / 100 | MU | 166 | 166 | 166 |
| 19 | Net Generation | R = A - Q | MU | 1190 | 1190 | 1190 |
| 20 | Fuel cost / Unit Net | O(R*10) | Rs / KWh | 1.07 | 1.07 | 1.07 |

# Annexure - 6.8

## Fuel costs ( Coal, Lignite & Secondary Oil) - KLTPS - 4

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 526 | 526 | 526 |
| 2 | Heat Rate | B | Kcal/kWh | 3000 | 3000 | 3000 |
| 3 | Specific Oil Consumption | C | ML/kWh | 3.00 | 3.00 | 3.00 |
| 4 | Calorific Value of Oil | D | KCal/Litre | 10735 | 10735 | 10735 |
| 5 | Calorific Value of Lignite | E | KCal/Kg. | 2946 | 2946 | 2946 |
| 6 | Overall Heat | F=(A * B ) | G. Cal. | 1578000 | 1578000 | 1578000 |
| 7 | Heat from Oil | G=(A*C*D)/1000 | G. Cal | 16940 | 16940 | 16940 |
| 8 | Heat from Coal | H=(F-G) | G. Cal | 1561060 | 1561060 | 1561060 |
| 9 | Actual Oil Consumption | I =A*C | KL | 1578 | 1578 | 1578 |
| 10 | Actual Lignite Consumption including Transit Loss of 0% | J=(H*1000/E) | MT | 529891 | 529891 | 529891 |
| 11 | Cost of Oil per KL | K | Rs./KL | 24129 | 24129 | 24129 |
| 12 | Cost of Lignite per MT | L | Rs./MT | 780.00 | 780.00 | 780.00 |
| 13 | Total Cost of Oil | $M=I * K / 10^5$ | Rs. Lakhs | 380.76 | 380.76 | 380.76 |
| 14 | Total Cost of Lignite | $N=J * L / 10^5$ | Rs. Lakhs | 4133 | 4133 | 4133 |
| **15** | **Total Fuel Cost** | **O = M + N** | **Rs. Lakhs** | **4514** | **4514** | **4514** |
| 16 | Fuel cost / Unit Gross | O/(A*10) | Rs/KWh | 0.86 | 0.86 | 0.86 |
| 17 | Auxiliary consumption (percent) | P | % | 12.25 | 12.25 | 12.25 |
| 18 | Auxiliary consumption | Q = (A*P) / 100 | MU | 64 | 64 | 64 |
| 19 | Net Generation | R = A - Q | MU | 462 | 462 | 462 |
| 20 | Fuel cost / Unit Net | O/R*10) | Rs / KWh | 0.98 | 0.98 | 0.98 |

# Annexure - 6.9

## Fuel costs ( Coal, Lignite & Secondary Oil) - Dhuvran (Oil) TPS

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 1484 | 1484 | 1484 |
| 2 | Heat Rate | B | Kcal/kWh | 3200 | 3200 | 3200 |
| 3 | Specific gas Consumption | C | SCM/kWh | 0 | 0 | 0 |
| 4 | Calorific Value of gas | D | KCal/Kg | 0 | 0 | 0 |
| 5 | Calorific Value of Oil | E | Kcal/ L | 10355 | 10355 | 10355 |
| 6 | Overall Heat | F=(A * B ) | G. Cal. | 4748800 | 4748800 | 4748800 |
| 7 | Heat from Gas | G=(A*C*D)/10 | G. Cal | 0 | 0 | 0 |
| 8 | Heat from Oil | H=(F-G) | G. Cal | 4748800 | 4748800 | 4748800 |
| 9 | Actual Gas Consumption | $I = A*C*10^5$ | SCM | 0 | 0 | 0 |
| 10 | Actual Oil Consumption | J=(H*1000/E) | KL | 458600 | 458600 | 458600 |
| 11 | Cost of Gas per SCM | K | Rs./SCM | 0 | 0 | 0 |
| 12 | Cost of Oil per KL | L | Rs./KL | 10754 | 10754 | 10754 |
| 13 | Total Cost of gas | $M=I * K / 10^5$ | Rs. Lakhs | 0 | 0 | 0 |
| 14 | Total Cost of Oil | $N=J * L / 10^5$ | Rs. Lakhs | 49318 | 49318 | 49318 |
| **15** | **Total Fuel Cost** | **O = M + N** | **Rs. Lakhs** | **49318** | **49318** | **49318** |
| 16 | Fuel cost / Unit Gross | O/(A*10) | Rs/KWh | 3.32 | 3.32 | 3.32 |
| 17 | Auxiliary consumption (percent) | P | % | 11.50 | 11.50 | 11.50 |
| 18 | Auxiliary consumption | Q = (A*P) / 100 | MU | 171 | 171 | 171 |
| 19 | Net Generation | R = A - Q | MU | 1313 | 1313 | 1313 |
| 20 | Fuel cost / Unit Net | O/(R*10) | Rs / KWh | 3.76 | 3.76 | 3.76 |

# Annexure - 6.10

## Fuel Costs - Dhuvaran Gas-1

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 840 | 840 | 840 |
| 2 | Heat Rate | B | Kcal/kWh | 1950 | 1950 | 1950 |
| 3 | Calorific value of gas | C | Kcal/SCM | 9834 | 9834 | 9834 |
| 4 | Over All heat | D=A*B | G. Cal | 1638000 | 1638000 | 1638000 |
| 5 | Gas Consumption | E=D/C | M. SCM | 166.56 | 166.56 | 166.56 |
| 6 | Price of Gas | F | Rs./SCM | 10.82 | 10.82 | 10.82 |
| **7** | **Total Cost of Gas** | **G=E*F*10** | **Rs. Lakhs** | **18022** | **18022** | **18022** |
| 8 | % of Auxiliary consumption | H | % | 3.00 | 3.00 | 3.00 |
| 9 | Auxiliary consumption | I=A*H/100 | MU | 25.20 | 25.20 | 25.20 |
| 10 | Net Generation | J=A-I | MU | 814.80 | 814.80 | 814.80 |
| 11 | Fuel cost / Unit Gross | K=G/A*10 | Rs./kWh | 2.15 | 2.15 | 2.15 |
| 12 | Fuel cost / Unit Net | L=G/J*10 | Rs./kWh | 2.21 | 2.21 | 2.21 |

# Annexure - 6.11

## Fuel Costs - Dhuvaran Gas-2

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 887 | 887 | 887 |
| 2 | Heat Rate | B | Kcal/kWh | 1950 | 1950 | 1950 |
| 3 | Calorific value of gas | C | Kcal/SCM | 9834 | 9834 | 9834 |
| 4 | Over All heat | D=A*B | G. Cal | 1729650 | 1729650 | 1729650 |
| 5 | Gas Consumption | E=D/C | M. SCM | 175.88 | 175.88 | 175.88 |
| 6 | Price of Gas | F | Rs./SCM | 10.82 | 10.82 | 10.82 |
| **7** | **Total Cost of Gas** | **G=E*F*10** | **Rs.Lakhs** | **19031** | **19031** | **19031** |
| 8 | % of Auxiliary consumption | H | % | 3.00 | 3.00 | 3.00 |
| 9 | Auxiliary consumption | I=A*H/100 | MU | 26.61 | 26.61 | 26.61 |
| 10 | Net Generation | J=A-I | MU | 860.39 | 860.39 | 860.39 |
| 11 | Fuel cost / Unit Gross | K=G/A*10 | Rs./kWh | 2.15 | 2.15 | 2.15 |
| 12 | Fuel cost / Unit Net | L=G/J*10 | Rs./kWh | 2.21 | 2.21 | 2.21 |

# Annexure - 6.12

## Fuel Costs - Utran Gas

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 1088 | 1088 | 1088 |
| 2 | Heat Rate | B | Kcal/kWh | 2150 | 2150 | 2150 |
| 3 | Calorific value of gas | C | Kcal/SCM | 9796 | 9796 | 9796 |
| 4 | Over All heat | D=A*B | G. Cal | 2339200 | 2339200 | 2339200 |
| 5 | Gas Consumption | E=D/C | M. SCM | 238.79 | 238.79 | 238.79 |
| 6 | Price of Gas | F | Rs./SCM | 9.46 | 9.46 | 9.46 |
| **7** | **Total Cost of Gas** | **G=E*F*10** | **Rs. Lakhs** | **22590** | **22590** | **22590** |
| 8 | % of Auxiliary consumption | H | % | 4.00 | 4.00 | 4.00 |
| 9 | Auxiliary consumption | I=A*H/100 | MU | 43.52 | 43.52 | 43.52 |
| 10 | Net Generation | J=A-I | MU | 1044.48 | 1044.48 | 1044.48 |
| 11 | Fuel cost / Unit Gross | K=G/A*10 | Rs./kWh | 2.08 | 2.08 | 2.08 |
| 12 | Fuel cost / Unit Net | L=G/J*10 | Rs./kWh | 2.16 | 2.16 | 2.16 |

# Annexure - 6.13

## Fuel Costs - Uttran Gas (Extension)

| Sl.No. | Item | Derivation | Unit | 2008-09 | 2009-10 | 2010-11 |
|---|---|---|---|---|---|---|
| 1 | Generation (Gross) | A | MU | 0 | 1905 | 2628 |
| 2 | Heat Rate | B | Kcal/kWh | 0 | 1850 | 1850 |
| 3 | Calorific value of gas | C | Kcal/SCM | 0 | 9796 | 9796 |
| 4 | Over All heat | D=A*B | G. Cal | 0 | 3524250 | 4861800 |
| 5 | Gas Consumption | E=D/C | M. SCM | 0.00 | 359.76 | 496.30 |
| 6 | Price of Gas | F | Rs./SCM | 0.00 | 9.46 | 9.46 |
| **7** | **Total Cost of Gas** | **G=E*F*10** | **Rs. Lakhs** | **0.00** | **34034** | **46950** |
| 8 | % of Auxiliary consumption | H | % | 0.00 | 4.00 | 4.00 |
| 9 | Auxiliary consumption | I=A*H/100 | MU | 0.00 | 76.20 | 105.12 |
| 10 | Net Generation | J=A-I | MU | 0.00 | 1828.80 | 2522.88 |
| 11 | Fuel cost / Unit Gross | K=G/A*10 | Rs./kWh | 0.00 | 1.79 | 1.79 |
| 12 | Fuel cost / Unit Net | L=G/J*10 | Rs./kWh | 0.00 | 1.86 | 1.86 |

---

Government Central Press, Gandhinagar.