

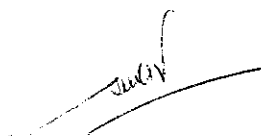
**BEFORE THE HON'BLE DELHI ELECTRICITY REGULATORY COMMISSION,  
NEW DELHI**

Petition No:

<b>IN THE MATTER OF</b>	Filing of Tariff Petition under section 62(2) of the Electricity Act, 2003 for truing up of tariff for FY 2017-18 and determination of ARR for the Financial Year 2019-20 for plant GTPS.
<b>AND</b>	
<b>IN THE MATTER OF</b>	<b>INDRAPRASTHA POWER GENERATION COMPANY LTD.</b> Regd. Office "Himadri", Rajghat Power House Complex, New Delhi – 110 002  <b>PETITIONER</b>

**I N D E X**

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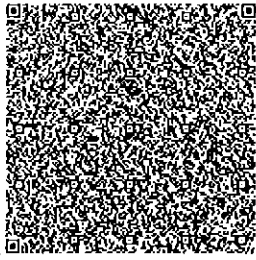
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**BEFORE THE HON'BLE DELHI ELECTRICITY REGULATORY COMMISSION, NEW DELHI**

**IN THE MATTER OF** Filing of Tariff Petition under section 62 of the Electricity Act, 2003 for truing up of tariff for FY 2017-18 and determination of ARR for the Financial Year 2019-20 for GTPS.

**AND**

**IN THE MATTER OF** Indraprastha Power Generation Company Limited  
Regd. Office "Himadri", Rajghat Power House Complex,  
New Delhi – 110 002

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### AFFIDAVIT VERIFYING DOCUMENTS/INFORMATION

I, Jagdish Kumar S/o Late Sh. Balbir Singh aged about 59 years, Residing at 190, II<sup>nd</sup> Floor, Avtar Enclave, Paschim Vihar, New Delhi-110063, do hereby solemnly affirm and state as follows:

1. That I am Director (Technical) of Indraprastha Power Generation Company Limited and conversant with the facts of the case.
2. That the statements made in the petition are based on the records of the company except in the case of estimates wherever made in the said documents, are based on the assumptions and believed by me to be true to the best of my knowledge and be read as part and parcel of this affidavit and the same are not reproduced here for the sake of brevity and nothing has been concealed there from.

*Jagdish Kumar*  
26/12/2018  
DEPONENT

#### VERIFICATION:

It is solemnly affirmed that the contents of above affidavit are true to the best of my knowledge and belief. No part of it is false and nothing has been concealed there from.

Verified at New Delhi on this .....day of December 2018.

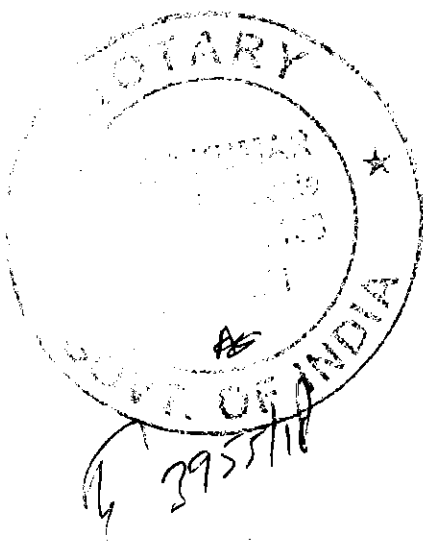
*Jagdish Kumar*  
26/12/2018  
DEPONENT

CABIN No. 33  
U.O. Lane, Azad Bhowan Road  
New Delhi-110 002

ATTESTED

*Azad Kumar*

BY NOTARY PUBLIC  
NEW DELHI (INDIA)  
AZAD KUMAR-Adv.



26 DEC 2018

**Tariff Petition for True-up of Expenses for FY 2017-18 and Approval of Aggregate  
Revenue Requirement & Tariff for FY 2019-20**

**BEFORE THE HON'BLE DELHI ELECTRICITY REGULATORY COMMISSION**

**Petition No. :**

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<b>AND</b>	
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*201*

THE APPLICANT ABOVE NAMED RESPECTFULLY SUBMITS

**Tariff Petition for True-up of Expenses for FY 2017-18 and Approval of Aggregate  
Revenue Requirement & Tariff for FY 2019-20**

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## **Chapter 1 : Background**

This Chapter deals with the background of this Petition.

### **1.1 Introduction**

- ❖ The Electricity Act, 2003 was notified on 10<sup>th</sup> June, 2003 repealing the Indian Electricity Act-1910, the Electricity (Supply) Act, 1948 and the E.R.C. Act, 1998. Among the tariff related provisions, the State Electricity Regulatory Commission (SERC) has to be guided by National Electricity Policy, National Tariff Policy and Central Electricity Regulatory Commission (CERC). As per Section 86 (1)(a) of the Electricity Act, the State Commission shall discharge the function of determining the tariff for generation, supply, transmission and wheeling of electricity, wholesale, bulk or retail as the case may be within the state. The generation, transmission and distribution tariff have to be determined separately.
  
- ❖ The Section 61 of the Electricity Act, 2003 provides as under in respect of Tariff Regulations:
  - a. *"The Appropriate Commission shall, subject to the provisions of this Act, specify the terms and conditions for the determination of tariff, and in doing so, shall be guided by the following, namely:-*
    - (a) *the principles and methodologies specified by the Central Commission for determination of the tariff applicable to generating companies and transmission licensees;*
    - (b) *the generation, transmission, distribution and supply of electricity are conducted on commercial principles;*
    - (c) *the factors which would encourage competition, efficiency, economical use of the resources, good performance and optimum investments;*
    - (d) *safeguarding of consumers' interest and at the same time, recovery of the cost of electricity in a reasonable manner;*
    - (e) *the principles rewarding efficiency in performance;*

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*(f) multi year tariff principles;*

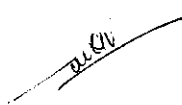
*(g) that the tariff progressively reflects the cost of supply of electricity and also, reduces cross-subsidies in the manner specified by the Appropriate Commission;*

*(h) the promotion of co-generation and generation of electricity from renewable sources of energy;*

*(i) the National Electricity Policy and tariff policy:*

Provided that the terms and conditions for determination of tariff under the Electricity (Supply) Act, 1948, the Electricity Regulatory Commission Act, 1998 and the enactments specified in the Schedule as they stood immediately before the appointed date, shall continue to apply for a period of one year or until the terms and conditions for tariff are specified under this section, whichever is earlier."

- ❖ The Delhi Electricity Regulatory Commission (hereinafter referred as 'DERC' or the "Commission") has notified "Delhi Electricity Regulatory Commission (Terms and Conditions for Determination of Tariff) Regulations, 2017" and Delhi Electricity Regulatory Commission Business Plan Regulations, 2017 on 31.01.2017 and are applicable w.e.f 01.02.2017 for the control period FY 2017-18 to FY 2019-20.
- ❖ IPGCL is filing the present petition in line with the provisions of above regulations for truing up of FY 2017-18 and Approval of ARR for FY 2019-20 with certain relaxations. It is further submitted that IPGCL is requesting the Hon'ble Commission to invoke its power of relaxation wherever required in the petition.



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**1.2 Brief Company Profile**

- ❖ “Indraprastha Power Generation Company Limited” (IPGCL) is a Generating Company engaged in the business of Power generation as per Companies Act, 1956 and is wholly owned by the Government of National Capital Territory of Delhi and presently operates Indraprastha Gas Turbine Power Station (GTPS) having capacity of 270 MW and was in operational since 1985-86.
- ❖ Pursuant to the applicable provisions of the Delhi Electricity Reforms Act, 2000, the Government of National Capital Territory of Delhi undertook the reform and restructuring of the erstwhile Delhi Vidyut Board (DVB), which was implemented through a statutory transfer scheme. Further all the assets, liabilities, rights and interest of DVB of I.P station, RPH Station and GTPS Station were transferred to IPGCL.
- ❖ Gas Turbine Power Station (GTPS) has a total capacity of 270 MW having six gas turbines of 30 MW each, using NG/RLNG as fuel and three Waste Heat Recovery Steam Turbines of de-rated capacity of 30 MW each. The gas Turbines of the station were set up in the year 1985-86 to meet the peak load demand of Delhi. The station was retrofitted with Steam Turbines in the year 1996.
- ❖ The station has Black Start facility and provision of radial feeding through underground cables to VVIP areas by directly supplying to Vidyut Bhawan (Ckt. I & II) and school lane (Ckt. I & II)- Substations of NDMC. This arrangement has been provided to VVIP areas to meet out emergency power requirement at the time of Black out. Additionally, Delhi Metro have also been provided with dedicated 66 KV feeder from GTPS station which have been only revival and rescue option during total grid failure as in 30<sup>th</sup> & 31<sup>st</sup> July, 2012.

## **Chapter 2 : Submissions**

This Chapter lays down the modality of making submissions to the Hon'ble Commission in support of the Prayers made out as under.

### **2.1 Submission Plan**

IPGCL propose to make submissions to the Hon'ble Commission in support of this Petition as under:

- ❖ Operational Parameters for the GTPS
- ❖ Financial Parameters for GTPS
- ❖ Capital Expenditure for GTPS
- ❖ Prayer

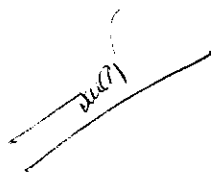
### **2.2 Brief of Submissions**

The present petition is filed as per DERC MYT Regulations, 2017 and Business plan regulation, 2017 which was framed for the control period from FY 2017-18 to 2019-20. The petitioner requests the Hon'ble Commission to give due considerations to the following facts while evaluating the present tariff petition.

- ❖ It is submitted that the norms for heat rate (kCal/kWh) in open cycle mode as specified in MYT Regulations is not achievable. The guaranteed heat rate at site conditions of 31.5°C is approximately 3188 Kcal/Kwh. Further, taking into account the correction factor of 5.70% on the guaranteed heat rate as recommended by the CEA, the corrected heat rate for simple cycle mode works out to 3370 kCal/kWh. However normative heat rate may be achieved only in the cases of continuous running without frequent start/stop and backing downs of the plant.
- ❖ It is submitted that Operation and Maintenance expenses on Gas Turbine repair is cyclic in nature as type of maintenance required in Gas Turbines depends upon no. of hours of use in given time period.

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- ❖ Further, it is submitted that due to part load operation and frequent start/stops SHR & APC will be on higher side. The reason of higher Heat rate is on account of erratic scheduling by SLDC due to frequent change of demands by DISCOMs. Therefore, IPGCL request the Commission to relax the norms of SHR in open cycle mode as the same is attributed to SLDC/DISCOMs. Also the actual PLF as against availability has been very less during FY 2017-18.
- ❖ It is submitted that SLDC Delhi has been backing down the generation of the stations depending on the requirement of power in Delhi. SLDC Delhi has been giving instructions to back down partially, thus resulting in non optimization of fuel consumption and higher Heat Rate and Auxiliary Power Consumption. **Therefore, Hon'ble Commission is requested to direct SLDC Delhi to back down any of the complete block of the station only and not partially. Further, it is requested that frequent backing down should not be resorted by SLDC.**
- ❖ Petitioner further submits that petitioner has challenged certain aspects of tariff order issued by Hon'ble Commission vide order dated 31.08.2017 in RP No. 59 of 2017 & RP no. 41 of 2018 against DERC tariff order dated 28.03.2018. Therefore, present petition is being submitted without prejudice to petitioner submission in above review petitions.
- ❖ The petitioner prays to the Hon'ble Commission to consider and relax the operational and financial parameters as requested in the petition.



### **Chapter 3 : Estimation of Variable Cost**

#### **3.1 Norms for Operation**

Petitioner has taken into consideration the actual performance parameters for FY 2017-18 based upon the same, petitioner has projected the parameters for FY 2019-20.

##### **3.1.1 Station Heat Rate**

- ❖ The Hon'ble Commission has approved the station heat rate of 2450 kCal/kWh in combined cycle operation and 3125kCal/kWh in open cycle mode for the Gas Turbine Power Station which is relatively high for FY 2017-18. Table 3-1 below depicts the SHR values for GTPS as achieved for FY 2017-18 and projected SHR for FY 2019-20.

**Table 3-1: Station Heat Rates (kCal/kWh)**

Description	FY 17-18	FY 19-20
Station Heat Rate (Combined Cycle)	2472	2450
Station Heat rate (Open Cycle)	3444	3125

- ❖ It is submitted that the turbines of the station are of 30 MW size and more than 32 years old. The guaranteed heat rate in simple cycle mode is 11688 kJ/kWh on NCV at compressor inlet temperature of 15°C and at atmospheric pressure of 1.019 BAR. The guaranteed heat rate at site conditions of 31.5°C is approximately 3188 Kcal/Kwh. Further, taking into account the correction factor of 5.70% on the guaranteed heat rate as recommended by the CEA, the corrected heat rate for simple cycle mode works out to 3370 kCal/kWh.
- ❖ Further, the Central Electricity Regulatory Commission in its latest tariff regulation for FY 2014-19 has fixed a heat rate of 3440 Kcal/Kwh in simple cycle mode for similar Assam gas station of NEEPCO having capacity of 291 MW (6 Gas Turbines of 33.5 MW and 3 STG of 30 MW), even though the station was commissioned in 1995-98. Further, CERC in its tariff regulation

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dt. 21.02.2014 had allowed 3440 kCal/Kwh for Assam GPS for FY 2014-15 to 2018-19.

- ❖ Station Heat Rate of IP-GTPS is also on higher side due to frequent backing by SLDC, resulting in partial operation. The backing down of the station resulted in partial operation of the units. It is further submitted that there has been substantial gap between Availability and PLF of the station due to backing down. The lower PLF has adversely affected the heat rate of the station.
- ❖ It is seen from the table 3-2 below that backing down and open cycle generation has been substantially high.

**Table 3-2 : Details of Back down & Open cycle Generation**

Sr.No.	Parameters	UoM	FY 17-18	Remarks
A	Station Heat Rate	kCal/kWh	2483	
B	Heat Rate (OC)	kCal/kWh	3444	
C	Heat Rate (CC)	kCal/kWh	2472	
D	Gross Generation	MU	578.977	
E	Open Cycle Gen.	MU	6.837	Certified by SLDC
F	PAF	%	83.07	Certified by SLDC
G	PLF	%	24.48	
H	Backdown Gen.	%	58.59	$H = F - G$
I	Plant Capacity	MU	1964.77	$I = 270 \times 365 \times 24 \times F / 100 / 1000$
J	Back down Gen.	MU	1151	$J = I \times H$

**Tariff Petition for True-up of Expenses for FY 2017-18 and Approval of Aggregate Revenue Requirement & Tariff for FY 2019-20**

- ❖ It is clear that PLF has been on much lower side as compared to availability which has affected the station heat rate and auxiliary power consumption of the station.
- ❖ In view of the above, the Hon'ble Commission is requested to relax and allowed actual heat rate achieved by the Station in Combined Cycle mode and Open cycle mode for FY 2017-18. The backing down and open cycle generation also results in increase in auxiliary consumption. **The petitioner requests the Hon'ble Commission to approve the open cycle heat rate of 3444 kCal/kWh for FY 2017-18.**

### **3.1.2 Availability**

Table 3-3 below shows the Availability achieved for GTPS during FY 2017-18 and proposed Availability for FY 2019-20.

**Table 3-3 : Availability (%) for GTPS**

Description	UoM	FY 17-18	FY 19-20
Plant Availability	(%)	83.07	85

### **3.1.3 Auxiliary Power Consumption (APC)**

Table 3-4 depicts the achieved parameter for Auxiliary Power Consumption (%) in combined cycle mode during FY 2017-18 and proposed APC for FY 2019-20. It is reiterate that due to backing down and open cycle operation of plant, the APC has been increased in FY 2017-18. It is requested to Hon'ble Commission to relax APC for FY 17-18 and allow on actual basis.

**Table 3-4 : Auxiliary Power Consumption in CC mode**

Description	UoM	FY 17-18	FY 19-20
Auxiliary Consumption	(%)	3.78	2.50

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### 3.2 Gross Generation and Net Generation

On the basis of Availability as referred in the Table 3-3 and Auxiliary Power Consumption as referred in Table 3-4, Gross and Net Generation from the Power Station are as per the Table 3-5.

**Table 3-5 : Gross and Net Generation**

Sr.No.	Description	UoM	FY 17-18	FY 19-20	Remarks
A	Plant Capacity	MW	270	270	
B	PLF	%	24.48	85	
C	Gross Generation	MU	578.977	2015.928	
D	Aux. Cons.	%	3.78	2.5	Table 3-4
E	Aux. Cons.	MU	21.89	50.40	$E = C * D$
F	Net Gen.	MU	557.09	1965.53	$F = C - E$

### 3.3 Variable Cost for GTPS

#### 3.3.1 Fuel Consumption:

- ❖ GT Power Station of IPGCL runs on the Natural Gas supplied by GAIL and Liquid Fuel supplied by IOCL. The total contracted quantity of Gas (APM+PMT+LNG) for GTPS is 1.44 MMSCMD which is sufficient to run six gas turbines. Out of the total allocation, the contracted quantity of R-LNG is 0.60 MMSCMD and balance comes from APM, Non-APM and PMT. However, these quantities are further subject to daily cuts in the range of 20-25% depending on the availability of gas at ONGC platform. The reduced allocation of domestic gas is compensated through SPOT RLNG by making monthly Gas Sale Purchase Notice (GSPN) with Gail India Limited. MoP&NG has further allocated 0.23 MMSCMD non-APM ONGC gases whose supply has been commenced from mid October, 2011.

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- ❖ Earlier due to importance of plant, Hon'ble Commission has approved the conversion of two Gas Turbines on dual fuel system in FY 2008-09. Thus two out of six gas turbines of the station can run on liquid fuel.
- ❖ The Petitioner has an agreement with GAIL for supply of 0.6 MMSCMD R-LNG. As per the agreement with GAIL, the contracted quantity is subject to Take or Pay clause. Accordingly, the Petitioner is to bear the cost of this contracted quantity even in case there is no or part consumption of contracted quantity and the same shall be paid by the DISCOMs as per terms and conditions of PPA clause 5.3 signed between petitioner and its beneficiaries. Petitioner is also using spot R-LNG, subject to quantum of scheduling and requirement of spot R-LNG to meet the shortage of gas.
- ❖ The total gas consumption for GT Power station for FY 2017-18 and projected for FY 19-20 is shown as below:

**Table 3-6 : Total Gas Consumption of GTPS**

Particulars	Unit	FY 17-18	FY 19-20
APM Gas	MMSCM	78.939166	529.30
PMT Gas	MMSCM	10.263049	
R-LNG Gas	MMSCM	24.211365	
NAPM Gas	MMSCM	37.353785	
SPOT Gas	MMSCM	1.76592	
Total Gas Consumption	MMSCM	<b>152.53329</b>	

The estimation of 529.30 MMSCM gas has been worked out @ GCV of 9331.256 kCal/SCM at 85% PLF.

**Tariff Petition for True-up of Expenses for FY 2017-18 and Approval of Aggregate Revenue Requirement & Tariff for FY 2019-20**

### **3.3.2 Projected Fuel Cost FY 2019-20**

Fuel Cost for FY 2019-20 has been calculated as per DERC Business Plan Regulation, 2017 by considering heat rate of 2450 kCal/kWh in combined cycle mode and 3125 kCal/kWh @ Normative PLF. However, the weighted average price of the Gas has been taken for preceding three months i.e. August to October, 2018 in line with the DERC Regulations for FY 2019-20. The weighted average landed price of gas from August to October, 2018 for GTPS is 17.477 Rs/SCM and weighted average GCV is 9331.256 kCal/SCM. The detailed calculation is attached and placed as **Annexure 'A'**.

### **3.3.3 Energy Charge Rate and Fuel Cost**

The details of total gas consumption, rate per SCM and total cost of the gas for FY 2017-18 as per actual and fuel cost estimated for FY 2019-20 is depicted in the following table:

**Table 3-7 : Energy Charge Rate and Fuel Cost**

<b>Particulars</b>	<b>Unit</b>	<b>FY 17-18</b>	<b>FY 19-20</b>
Total Gas Cons.	MMSCM	152.533	529.30
Average Gas Price	Rs./ SCM	12.426	17.477
Weighted Average GCV	kCal/ SCM	9425.986	9331.256
Total Gas Cost	Rs. Crores	189.54	925.07
Net Generation	MU	557.09	1965.53
<b>Variable Cost - CC</b>	<b>Rs./kWh</b>	<b>3.402</b>	<b>4.706</b>

The weighted average landed price of gas for FY 17-18 for GTPS is 12.426 Rs/SCM and weighted average GCV is 9425.986 kCal/SCM. The detailed calculation is attached and placed as **Annexure 'B'**. The recovery of energy charges has been done as per the formula specified in generation tariff regulations of DERC, 2017 for FY 17-18.

## **Chapter 4 : Estimation of Fixed Cost**

### **4.1 Parameters for Fixed Cost**

As per DERC (Terms and conditions for determination of tariff) Regulation 2017 and Business Plan regulation 2017, the annual fixed cost (AFC) of a Generating Entity shall consist of the following components as specified in these Regulations:

- (a) Return on Capital Employed;
- (b) Depreciation; and
- (c) Operation and Maintenance expenses.
- (d) Fixed Auxiliary Consumption Expenses

### **4.2 Operation and Maintenance Expenses**

Hon'ble Commission has specified Normative Operation and Maintenance expenses in DERC Business Plan Regulation, 2017 as per the table below for plant GTPS for the control period from FY 2017-18 to FY 2019-20 is as follows:

**O&M Expenses (Rs. Lakh/ MW)**

Station	2017-18	2018-19	2019-20
GTPS	29.66	31.32	33.08

Accordingly, the O & M expenses for FY 2017-18 and FY 2019-20 are as under:

**Table 4-1: O & M Expenses**

S.No.	Particulars	UoM	FY 17-18 (As per DERC BPR 2017 )	FY 19-20
A	O&M expenses	Rs Cr.	80.08	89.32
B	Total O&M Expenses	Rs Cr.	80.08	89.32

**Tariff Petition for True-up of Expenses for FY 2017-18 and Approval of Aggregate Revenue Requirement & Tariff for FY 2019-20**

#### **4.3 Capital Expenditure**

- ❖ Hon'ble Commission has approved the Opening Gross Fixed Asset of Rs. 425.14 Cr in the beginning of FY 2017-18 in its tariff order dated 31.08.2017. Accordingly, the GFA of PPS-I from FY 2017-18 to FY 19-20 is reproduced as under:-

**Table 4-2: Capital Expenditure**

S.No.	Particulars	Unit	FY 2017-18	FY 2018-19	FY 2019-20
A	Opening GFA	Rs in Cr.	425.14	425.14	425.94
B	Addition	Rs in Cr.	0.00	0.80	0
C	Deletion	Rs in Cr.	0.00	0	0
D	Closing GFA	Rs in Cr.	425.14	425.94	425.94
E	Average GFA	Rs in Cr.	425.14	425.94	425.94

#### **4.4 Depreciation**

- ❖ Depreciation for FY 2017-18 has been calculated as per DERC regulation 2017 is as under:-

*"80. The salvage value of the asset shall be considered as 10% and depreciation shall be allowed up to maximum of 90% of the capital cost of the asset;*

*Provided that any depreciation disallowed on account of lower availability of the generating station or generating unit or transmission system as the case may be, shall not be allowed to be recovered at a later stage during the useful life and the extended life.*

*81. Land other than the land held under lease shall not be a depreciable asset and its cost shall be excluded from the capital cost while computing depreciable value of the asset.*

*82. In case of existing assets, the balance depreciable value as on 1st April of any financial year shall be worked out by deducting the cumulative*

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*depreciation as admitted by the Commission up to 31st March of the preceding financial year from the gross depreciable value of the assets.*

*83. The Depreciation for Life extension projects/scheme shall be allowed in the manner as indicated in Regulation 51 of these Regulations."*

- ❖ GTPS was commissioned in the 1996 in combined cycle and shall complete its useful life by 2021. Since cumulative depreciation has reached 70% of the total depreciation, the petitioner has spread the remaining depreciable value over the remaining life of the asset. The depreciation allowed by Hon'ble Commission till FY 2016-17 is Rs 338.83 Cr.
- ❖ Accordingly, depreciation calculated for FY 2017-18 & FY 2019-20 is as follows:-

**Table 4-3: Details of Depreciation**

S.No.	Particulars	Unit	FY 17-18	FY 19-20	Remarks
A	Average GFA	Rs in Cr.	425.14	425.94	Table 4-4
B	Opening Accumulated Depreciation	Rs in Cr.	338.83	360.85*	As per DERC tariff order dt 31.08.2017
C	Balance Depreciation	Rs in Cr.	43.80	22.50	C = 90% of A - B
D	Remaining useful life at the opening of FY 2017-18	Years	4	2	
E	Depreciation	Rs in Cr.	10.95	11.25	E = C/D

\* A depreciation of Rs 11.07 Crore has been considered for FY 18-19

- ❖ The Hon'ble Commission is requested to approve the Depreciation for FY 2017-18 and as projected for FY 2019-20.

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**4.5 Requirement of Loan and Equity**

Since accumulated depreciation over and above 70% of Gross Fixed asset during FY 2017-18, the remaining value is treated as 100% equity. Accordingly, petitioner has treated the net fixed asset as opening equity. The following estimation is without prejudice to petitions submission against commission tariff order dated 31.08.2017 in RP No. 59 of 2017 & RP no. 41 of 2018 against DERC tariff order dated 28.03.2018.

**Table 4-4: Requirement of Loan & Equity**

S.No.	Particulars	Unit	FY 2017-18	FY 2019-20	Remarks
A	Opening GFA	Rs Cr	425.14	425.94	Table 4-4
B	Opening Accumulated Depreciation	Rs Cr	338.83	360.85	Table 4-5
C	Opening NFA	Rs Cr	86.31	65.09	$C = A - B$
D	Opening Equity	Rs Cr	86.31	65.09	$D = C$
E	Opening Loan Requirement	Rs Cr	0.00	0.00	
F	Depreciation for the year	Rs Cr	10.95	11.25	Table 4-5
G	Closing NFA	Rs Cr	75.36	53.84	$G = C - F$
H	Closing Equity	Rs Cr	75.36	53.84	$H = G$
I	Closing Loan	Rs Cr	0.00	0.00	
J	Average Loan	Rs Cr	0.00	0.00	$J = (E+I)/2$
K	Average Equity	Rs Cr	80.84	59.47	$K = (D+H)/2$

*[Signature]*

Tariff Petition for True-up of Expenses for FY 2017-18 and Approval of Aggregate Revenue Requirement & Tariff for FY 2019-20

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**4.6 Working Capital**

- ❖ Petitioner has calculated the Interest on Working Capital as per DERC Tariff Regulations, 2017 which reads as under:

*"(2) Open-cycle Gas Turbine/Combined Cycle thermal generating stations as follows:*

*(a) Fuel Cost for 30 days corresponding to the Normative Annual Plant Availability Factor, duly taking into account mode of operation of the generating station on gas fuel and liquid fuel;*

*(b) liquid fuel stock for 15 days corresponding to the normative annual plant availability factor, and in case of use of more than one liquid fuel, cost of main liquid fuel duly taking into account mode of operation of the generating stations of gas fuel and liquid fuel;*

*(c) Maintenance spares @ 30% of Operation and Maintenance expenses specified in this Regulation;*

*(d) Receivables equivalent to two months of capacity charge and energy charge for sale of electricity calculated on normative plant availability factor, duly taking into account mode of operation of the generating station on gas fuel and liquid fuel; and*

*(e) Operation and maintenance expenses for one month.*

*85. Rate of Interest On Working Capital shall be considered as the bank rate as on 1st April of the year plus margin as specified by the Commission for the Control Period and shall be trued up on the basis of prevailing bank rate as on 1st April of the respective financial year:*

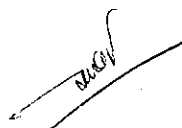
*Provided that the rate of interest availed through open tendering process (Competitive Bidding) among Scheduled Banks, Financial Institutions etc., shall not be trued up.*

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*86. Interest on working capital shall be payable on normative basis notwithstanding that the Utility has availed any loan for the working capital."*

- ❖ The petitioner submits that the fuel cost has increased steeply since FY 2014-15. The increase in price of fuel had substantial impact on certain components considered in the computation of working capital. Therefore interest on working capital has considerably increased in comparison to the interest allowed by the Commission.
- ❖ Petitioner has taken fuel cost for working capital by taking average of three months from Jan-17 to March-17 as per DERC tariff Regulation 2017 for FY 2017-18. Accordingly, the weighted average landed price of gas for the period is 11.252 Rs/SCM and weighted average GCV is 9310.329 kCal/SCM. The detailed calculation is attached and placed as **Annexure 'C'**. Thus, Fuel Cost arrived @ Normative parameters is Rs 595.27 Cr.
- ❖ Accordingly, working capital for FY 17-18 and estimated for FY 19-20 is as under:



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**Table 4-5: Requirement of Working Capital**

S.No.	Particulars	Unit	FY 17-18	FY 19-20	Remarks
A	Fuel expenses for 1 month	Rs Cr	49.61	77.09	Table 4-7(F)
B	Liquid Fuel for 1/2 month	Rs Cr	35.52	30.52	DERC tariff order
C	Maintenance spares @ 30% of O&M	Rs Cr	24.02	26.79	Table 4-1
D	O&M expenses for 1 month	Rs Cr	6.67	7.44	Table 4-1
E	Annual Fixed Cost for the year	Rs Cr	136.18	148.83	Table 4-11
F	Fuel Cost for the year	Rs Cr	595.27	925.07	Fuel Cost is Calculated at Normative PLF considering 2.5% APC
G	Receivables equivalent to 2 months of capacity and energy charge	Rs Cr	121.91	178.98	$G = (E+F)/6$
H	Total Working Capital	Rs Cr	237.73	320.83	$H = A+B+C+D+G$

❖ Therefore, the Hon'ble Commission is requested to allow working capital as per above for FY 2017-18 & FY 2019-20.

*[Handwritten signature]*

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**4.7 Return on Capital Employed**

- ❖ Commission has specified the methodology for allowing Return on Capital Employed in Tariff Regulations, 2017 as follows:

*"65. Return on Capital Employed shall be used to provide a return to the Utility, and shall cover all financing costs except expenses for availing the loans, without providing separate allowances for interest on loans and interest on working capital.*

*66. The Regulated Rate Base (RRB) shall be used to calculate the total capital employed which shall include the Original Cost of Fixed Assets (OCFA) and Working Capital. Capital work in progress (CWIP) shall not form part of the RRB. Accumulated Depreciation, Consumer Contribution, Capital Subsidies / Grants shall be deducted in arriving at the RRB.*

*67. The RRB shall be determined for each year of the Control Period at the beginning of the Control Period based on the approved capital investment plan with corresponding capitalisation schedule and normative working capital."*

- ❖ Return on Capital Employed (RoCE) for the year "i" shall be computed in the following manner:

$$\text{RoCE} = \text{WACC}_i * \text{RRB}_i$$

Where,

WACC<sub>i</sub> is the Weighted Average Cost of Capital for each year of the Control Period;

RRB<sub>i</sub> – Average Regulated Rate Base for the i<sup>th</sup> year of the Control Period.

- ❖ The WACC for each year of the Control Period shall be computed at the start of the Control Period in the following manner:

$$\text{WACC} = [D/(D+E)] * r_d + [E/(D+E)] * r_e$$

Where, D is the amount of Debt derived as per these Regulations;

E is the amount of Equity derived as per these Regulations;

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- ❖ Where equity employed is in excess of 30% of the capital employed, the amount of equity for the purpose of tariff shall be limited to 30% and the balance amount shall be considered as notional loan. The amount of equity in excess of 30% treated as notional loan. The interest rate on excess equity shall be the weighted average rate of interest on the actual loans of the Licensee for the respective years. Where actual equity employed is less than 30%, the actual equity and debt shall be considered; Provided that the Working capital shall be considered 100% debt financed for the calculation of WACC;

$r_d$  is the Cost of Debt;

$r_e$  is the Return on Equity.

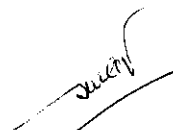
- ❖ Further, Commission has specified Margin for Rate of Interest on loan in Business Plan Regulations, 2017 as follows:

***"5. MARGIN FOR RATE OF INTEREST ON LOAN***

*(1) Margin for rate of interest in terms of Regulation 4(2) of the DERC (Terms and Conditions for Determination of Tariff) Regulations, 2017 for the Generating Entity shall be allowed over and above 1 (one) year Marginal Cost of Fund based Lending Rate (MCLR) of SBI for computation of rate of interest on loan"*

<b><i>Table 1: Margin for Rate of Interest on Loan (%)</i></b>				
<b><i>Sr. No.</i></b>	<b><i>Generating Station</i></b>	<b><i>2017-18</i></b>	<b><i>2018-19</i></b>	<b><i>2019-20</i></b>
<b><i>1</i></b>	<b><i>Gas Turbine Power Station</i></b>	<b><i>2.34%</i></b>	<b><i>2.11%</i></b>	<b><i>2.01%</i></b>

- ❖ In view of the above the regulated rate base for FY 2017-18 and estimated for FY 19-20 is derived as follows:-



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**Table 4-6: Estimation of RRB**

S.No.	Particulars	Unit	FY 17-18	FY 19-20	Remarks
A	Opening GFA	Rs in Cr.	425.14	425.94	Table 4-4
B	Opening Accumulated Depreciation	Rs in Cr.	338.83	360.85	Table 4-6
C	Opening RRB	Rs in Cr.	86.31	65.09	$C = A - B$
D	Working Capital	Rs in Cr.	237.73	320.83	Table 4-7
E	Depreciation for the year	Rs in Cr.	10.95	11.25	Table 4-5
F	Net Addition	Rs in Cr.	0	0	Table 4-4
G	Closing RRB	Rs in Cr.	313.09	374.67	$G = C + D + F - E$
H	Average RRB	Rs in Cr.	318.57	380.30	$H = (C + D + G) / 2$

❖ In this regard it is to submit that petitioner has considered the rate of interest on loan by considering the Bank Rate as Marginal Cost of Fund based Lending Rate (MCLR) of SBI as notified by the State Bank of India and margin as approved in Business Plan Regulations, 2017. Accordingly rate of interest on loan has been approved at 10.34% on the basis of SBI MCLR of 8% as on 1st April, 2017 plus margin of 2.34% for FY 2017-18 and rate of interest on loan has been calculated @ 10.26% by taking average rate of MCLR from April-18 to October-18 i.e 8.25% plus margin of 2.01% for FY 2019-20.

❖ Petitioner has considered the base rate of return on equity at 14% and the same has been grossed up with rate of income tax at 33.99%. Accordingly grossed up rate of return on equity has been computed at 21.21% for FY 2017-18. Petitioner has considered the base rate of return on equity at 14% and the same has been grossed up with rate of income tax at 21.54%.

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Accordingly grossed up rate of return on equity has been computed at 17.84% for FY 2019-20.

Source:- [http://incometaxmanagement.com/Pages/Taxation-System/Income-Tax-Rates-Minimum-Alternate-Tax\[MAT\].html](http://incometaxmanagement.com/Pages/Taxation-System/Income-Tax-Rates-Minimum-Alternate-Tax[MAT].html)

- ❖ Accordingly, Petitioner has computed Weighted Average Cost of Capital (WACC) and Return on Capital Employed (RoCE) as follows:

**Table 4-7: WACC and RoCE**

S.No.	Particulars	Unit	FY 17-18	FY 19-20	Remarks
A	Average RRB	Rs in Cr.	318.57	380.30	Table 4-8
B	Average Loan Requirement for Capital Investment	Rs in Cr.	0.00	0.00	Table 4-6
C	Loan for Working Capital Requirement	Rs in Cr.	237.73	320.83	Table 4-7
D	Total Loan	Rs in Cr.	237.73	320.83	D = B+C
E	Average Equity	Rs in Cr.	80.84	59.47	Table 4-6
F	Cost of Debt, Rd	%	10.34	10.26	
G	Return on Equity, Re	%	21.21	17.84	
H	WACC	%	13.10	11.45	As per DERC Regulation, 2017
I	RoCE	Rs in Cr.	41.73	43.53	I = A * H

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**4.8 Fixed Auxiliary Consumption Expenses**

Commission has allowed Fixed Auxiliary Consumption (0.5%) @ Normative PLF. Accordingly, Petitioner has calculated Fixed Auxiliary Consumption Expenses for FY 2017-18 and projected for FY 2019-20 is as follows:

**Table 4-8: Fixed Auxiliary Consumption Expenses**

S.No.	Particulars	Unit	FY 17-18	FY 19-20	Remarks
A	Plant Capacity	MW	270	270	
B	Normative PLF	%	85	85	
C	Gross Generation	MU	2010.42	2015.928	$C = \frac{A \times B \times 365 \times 24}{1000 / 100}$
D	Fixed Auxiliary Consumption	%	0.5	0.5	As Per BPR 2017
E	Fixed Auxiliary Consumption	MU	10.05	10.08	$E = C \times D$
F	Energy Charge Rate	Rs/kWh	3.402	4.71	Table 3-7
G	Fixed Auxiliary Consumption	Rs Cr	3.42	4.74	$G = E \times F / 10$

*20/11*

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**4.9 Summary of Fixed Cost**

The DERC tariff regulation 2017 has following provisions regarding fixed cost which reads as under:-

*"99. The annual fixed cost (AFC) of a Generating Entity shall consist of the following components as specified in these Regulations: Return on Capital Employed; Depreciation; and Operation and Maintenance expenses."* Accordingly, the Annual Fixed Cost for FY 2017-18 & FY 2019-20 is depicted as under:-

**Table 4-9: Annual Fixed Cost**

S.No.	Particulars	Unit	FY 17-18	FY 19-20	Remarks
A	Return on Capital Employed	Rs Cr	41.73	43.53	Table 4-9
B	Depreciation	Rs Cr	10.95	11.25	Table 4-5
C	Operation and Maintenance Expenses	Rs Cr	80.08	89.32	Table 4-1
D	Fixed Auxiliary Consumption	Rs Cr	3.42	4.74	Table 4-10
E	Annual Fixed Cost	Rs Cr	136.18	148.83	E = A+B+C+D
F	Net Generation	MU	557.09	1965.53	Table 3-7
G	Fixed Cost Per Unit	Rs/ kWh	2.44	0.76	G = E/F*10

On the basis of above submissions, the Hon'ble Commission is requested to true-up the total fixed cost for FY 2017-18 and allow expenditure for FY 2019-20 as per the above submission.

*24/09*

## **Chapter 5 : CAPEX Scheme of GTPS**

### **5.1 RLA Study of GTPS**

As per direction of Hon'ble Commission in various previous orders, the petitioner is working on to finalise the RLA study of the station. In this regard it is to submit that gas turbines of the station were commissioned in the year 1986-95. Identification of equipment for conducting RLA with the objective to restore rated capacity and efficiency for plant GTPS was conducted by NTPC. The NTPC team visited the IPGCL plant from 27/02/18 to 04/04/2018 and submitted the study report to the management of IPGCL along with amount of work for life extension in the interest of consumers of Delhi and proposed the following recommendations:-

"The total revival of all the systems needs huge investment. The GT combine cycle heat rate of 2100 kCal/kWh is not expected from this model. We propose two pronged approach which may be adopted depending upon fund availability:

1) IPGCL power plant having strategic importance being in capital region and having its black start GB (initial cranking of GB are with diesel engine) which can feed the grid within minutes of black out. In three GB operating system are already changed to the latest version Mark Vie and AVR to DVR changing also done in these units. Therefore, after the present PPA is expired it is prudent to keep these three units as black start, peaking power and balancing power station. These units also used as black start facility to the adjacent Pragati power station.

2) Complete renovation and modernization of the combine cycle equipments and auxiliaries after doing RLAs as described above. Higher model gas turbine (Frame 6F model with same foot print) may also be looked into which will have less than 2000 kCal/kWh heat rate."

Copy of the study report is enclosed as **Annexure 'D'**.

In view of the NTPC recommendations as above, Hon'ble Commission is requested to take note of the above, further course of options to Exercised by petitioner for

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increasing reliability and extending Life of the station in Larger Interest Of Consumers of Delhi and ensure Reliable Supply to VVIP area and to work as Starting station for Grid revival in case of Back outs or total grid failure.

**5.2 Expenditure on Installation & Commissioning of pipeline for taking treated water from STP of DJB to GTPS for FY 18-19.**

Govt. of India Tariff Policy 2016 has provision that all the power plants falling within 50 Km radius of Municipality has to necessarily use sewage treated water for its raw water requirement. The content of the provisions are reproduced as under:

*"(5). The thermal power plant (s) including the existing plants located within 50 KM radius of sewage treatment plant of Municipality / local bodies / similar organizations shall in order of their closeness to the sewage treatment plant, mandatorily use treated sewage water produced by these bodies and the associated cost on this account be allowed as a pass through in the tariff. Such thermal plants may also ensure back up source of water to meet their requirement in the event of shortage of supply by sewage treatment plant. The associated cost on this account shall be factored into the fixed cost so as not to disturb the merit order of such thermal plant. The shutdown of sewage treatment plant will be taken in consultation with the developer of the power plants."*

Accordingly, Central Electricity Regulatory Commission in its Tariff Regulations 2014, has already allowed water charges as additional charge under Regulation 29 (2). The relevant part of the same is reproduced as under:

*"29(2) The water charges and capital spares for the thermal generating stations shall be allowed separately:*

*Provided that water charges shall be allowed based on water consumption depending upon the type of the plant, type of cooling water system etc., subject to prudence check. The details regarding the same shall be furnished along with petition:*

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*Provided that generating station shall submit the detail of year wise capital spares consumed at the time of truing up with appropriate justification for incurring the same and substantiating that the same is not funded through compensatory allowance or special allowance are claimed as part of additional capitalization or consumption of stores and spares and renovation and modernization."*

In this regard it is to submit that Earlier Barrage at ITO was being maintained by Haryana Irrigation Department for meeting the water requirements of GTPS and its O&M expenses were shared /reimbursed by Petitioner. Besides this, water charges were also paid to Delhi Jal Board for domestic and industrial water consumption in the form of water charges by Petitioner.

Now ,in View of New Provisions for sewage water uses for Power Plant lying within Municipal Boundary .Petitioner is also working to arrange sewage water for GTPS in similar lines as had already been provided to PPS-I plant and Hon'ble Commission is already allowing recover of expenditure of sewage treated water for PPS-I since long. It is, therefore, requested to allow the same in case of GTPS from the date same is availed on year to year basis and Expenditure incurred in providing Sewage water supply facility up to GTPS plant from sewage Water plant situated near Delhi Secretariat as part of Capital expenditure. The capital expenditure to be incurred in erection & Commissioning of pumping station, pipelines etc is around Rs 53 lakhs.

**5.3 Replacement of Remote Terminal Unit (RTU) under CAPEX at GTPS for FY 18-19.**

The real time SCADA data of GTPS is presently available to SLDC through SIC(Supervisory Interface Control) panel installed at GT control room under ULDC phase-1 scheme in the year 2002 by PGCIL. The digital and analog data is provided through cable laid from the SIC panel in GT control room to IP Extension control room of DTL, where the RTU and communication equipments are installed.

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Presently, the data of GTPS is very irregular/intermittent which is mainly due to the outdated transducers, CMRs and the aged long length cables lay out from GTPS control room to IP Extension control room. The matter was discussed in June 2017 in OCC meeting of NRPC to provide reliable and efficient data communication from GTPS to SLDC. NRPC/PGCIL vide their letter dated 01.07.2016 had already directed NR constituents to replace their RTU/equipment installed under ULDC phase-1 since they have outlived their life and no OEM support is available for them. This has also been repeatedly discussed in the various Telecommunication, SCADA and Telemetry (TeST) sub- committee meeting. It was also instructed in the meeting that the equipments have to be replaced by the utilities of their own for which NRPC has already issued final RTU specification.

In view of the statutory provisions with regards to provide real time operation data to SLDC for efficient grid operation, Petitioner has to provide RTU and communication for delivering real time data to SLDC. Therefore, a new advance Remote terminal system (RTU) is to be replaced for providing reliable and efficient data communication from GTPS to SLDC. The new advance RTU system will be procured and install by Power Grid Corporation of India Limited (PGCIL) and the technical specifications of the installation have been approved by NRPC. A MOU is being signed by IPGCL with PGCIL for complete installation and execution of new RTU. The estimated cost of RTU replacement is Rs 27 lac and the final cost will be confirmed after actual award and execution of project.

Hon'ble Commission is therefore requested to allow the expenditure under capex Scheme e in the FY 2018-19. The Intimation of same has already been sent to Hon'ble Commission wide Petitioners letter No. Comml./DERC/2018-19/F.12/66 dated: 29.08.2018.

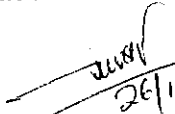
*[Signature]*

## **Chapter 6 : Prayer**

### **6.1 Prayer**

Petitioner respectfully prays to the Hon'ble Commission;

- ❖ To admit this petition.
- ❖ To true up the tariff for FY 2017-18 and approve the ARR for FY 2019-20.
- ❖ To approve the operational and financial parameters as proposed for FY 2017-18.
- ❖ To grant any other relief as Hon'ble Commission may consider appropriate.  
The petitioner craves leave of the Hon'ble Commission to allow further submissions, addition and alteration to this Petition as may be necessary from time to time.
- ❖ Pass any other order as Hon'ble Commission may deem fit and appropriate under the circumstances of the case and in the interest of justice.

  
26/12/2018  
(JAGDISH KUMAR)

**DIRECTOR (TECH.)**

**Indraprastha Power Generation Company Limited**

**PETITIONER**

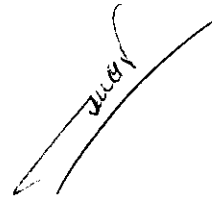
# Annexure 'A'

GTPS			Aug-18			Sep-18			Oct-18			Total (Aug-18 - Oct 18)
Gas	Particulars	Ist Fortnight	IIInd Fortnight	Total	Ist Fortnight	IIInd Fortnight	Total	Ist Fortnight	IIInd Fortnight	Total		
APM	Quantity	2190000	2400000	4590000	2190424	2250000	4440424	2100000	2240000	4340000	13370424	
	Amount	22378339	24514892	46893231	22586433	23537495	46123928	24699597	26155444	50855041	143872200	
	GCV	9286.608	9283.078	9284.762	9270.045	9404.525	9338.187	9420.492	9352.304	9385.298	9335.138749	
NAPM	Quantity	2798196.56	3095312	5893508.56	1241469.65	1560522.74	2801992.39	1970395	2050000	4020395	12715895.95	
	Amount	32975377	36476497	69451874	14758553	18798886	33557439	26312521	27184107	53496628	156505941	
	GCV	9283.15	9283.078	9283.112	9276.947	9400.54	9345.780	9419.762	9353.958	9386.209	9329.517324	
PMT	Quantity	362818.17	146007.28	508825.45	17393.35	34110.71	51504.06	19399.93	11659.63	31059.56	591389.07	
	Amount	6147172	2495932	8643104	298850	603279	902129	351401	207582	558983	10104216	
	GCV	9337.521	9282.6	9321.761	9227.768	9405.223	9345.295	9462.098	9302.802	9402.299	9328.040777	
RLNG	Quantity	2128486.27	3037055.72	5165541.99	64598	446494.56	511092.56	1539733.07	1085305.37	2625038.44	8301672.99	
	Amount	74998259	108396825	183395084	2299805	16279093	18578898	58293920	40592532	98886452	300860434	
	GCV	9278.854	9286.54	9283.373	9268.49	9392.394	9376.734	9441.485	9355.646	9405.995	9327.894646	
Total	Quantity	7479501	8678375	16157876	3513885	4291128.01	7805013.01	5629528	5386965	11016493	34979382.01	
	Amount	136499147	171884146	308383293	39943641	59218753	99162394	109657439	94139665	203797104	611342791	
	GCV	9285.577	9284.282	9284.881	9272.246	9401.819	9343.484	9426.122	9353.500	9390.610	9331.256	
	Average Rate	18.250	19.806	19.086	11.367	13.800	12.705	19.479	17.475	18.499	17.477	

*24/11/18*

## Annexure 'B'

Month	GTPS					
	Total QTY in MMSCM	Total Value	GCV	GCV*Quantity	Wt. Avg. GCV	Wt. Avg LPPF
Apr-17	11.133442	15.9	9501.61	105785.6238	9501.61	12.425
May-17	12.92036901	11.68	9624.47	124351.7039	9624.47	
Jun-17	13.92509401	14.47	9651.7	134400.8299	9651.7	
Jul-17	11.38901529	11.57	9362.7	106631.9335	9362.7	
Aug-17	11.15244499	12.71	9212.82	102745.4683	9212.82	
Sep-17	21.72449	36.01	9389.76	203987.7472	9389.76	
Oct-17	15.89186502	22.87	9534.37	151518.9211	9534.37	
Nov-17	13.666421	14.7	9385.84	128270.8409	9385.84	
Dec-17	8.87260601	9.67	9349.7	82956.20441	9349.7	
Jan-18	11.59140002	16.46	9340.36	108267.8491	9340.36	
Feb-18	8.45350001	10.286	9354.15	79075.30712	9354.15	
Mar-18	11.812679	13.204	9293.79	109784.558	9293.79	
Total	152.5333264	189.53		1437776.987	9425.986	



## Annexure 'C'

GTPS		Jan-17			Feb-17			Mar-17			Total
	Particulars	Ist Fortnight	Ilnd Fortnight	Total	Ist Fortnight	Ilnd Fortnight	Total	Ist Fortnight	Ilnd Fortnight	Total	(July 18 - Sept 18)
Gas APM	Quantity	3100000	3560000	6660000	4050000	3510000	7560000	4026628.78	3848699	7875327.78	22095327.780
	Amount	25704556	29293131	54997687	34368321	29759559	64127880	33743650	32315148	66058798	185184365.000
	GCV	9186.57	9116.264	9148.989	9380.29	9372.004	9376.443	9381.569	9399.78	9390.469	9312.883
NAPM	Quantity	2472360	1490700.92	3963060.92	2648955	2294531.52	4943486.52	1954650.16	1624696	3579346.16	12485893.600
	Amount	23941873	14346615	38288488	26252231	22719725	48971956	19218437	15977190	35195627	122456071.000
	GCV	9183.89	9127.104	9162.530	9380.29	9372.036	9376.459	9407.79	9409.562	9408.594	9317.770
PMT	Quantity	296182.26	306202.93	1786883.18	579245.17	542304.05	1121549.22	760167.69	506342.92	1266510.61	4174943.010
	Amount	4792094	4889079	19138709	9392116	8771884	18164000	12138448	8008176	20146624	57449333.000
	GCV	9191.63	9118.698	9137.799	9371.145	9371.438	9371.287	9408.761	9407.858	9408.400	9282.612
RLNG	Quantity	1720971.42	338012.33	2059983.75	278743.83	114589.43	393333.26	240003.92	2345440.08	2585444	5037761.010
	Amount	42562931	8305830	50868761	6960224	2860170	9820394	6171785	59815108	65986893	126676048.000
	GCV	9166.977	9136.67	9162.002	9369.595	9356.582	9365.804	9396.867	9411.839	9410.449	9305.420
Spot	Quantity	29401.31	12144.82	41546.13	0	0	0	0	0	0	41546.130
	Amount	1037530	429521	1467051	0	0	0	0	0	0	1467051.000
	GCV	9081.153	9132.561	9096.181	0	0	0.000	0	0	0.000	9096.181
Total	Quantity	7618914.99	5707061	14510473.98	7556944	6461425	14018369	6981450.55	8325178	15306628.55	43835471.53
	Amount	98038984	57264176	164760696	76972892	64111338	141084230	71272320	116115622	187387942	493232868
	GCV	9181.065	9120.469	9153.005	9379.195	9371.694	9375.738	9392.397	9405.578	9399.566	9310.329
	Average Rate	12.868	10.034	11.355	10.186	9.922	10.064	10.209	13.948	12.242	11.252



Identification of equipment for conducting RLA  
with the objective to restore rated capacity and  
efficiency

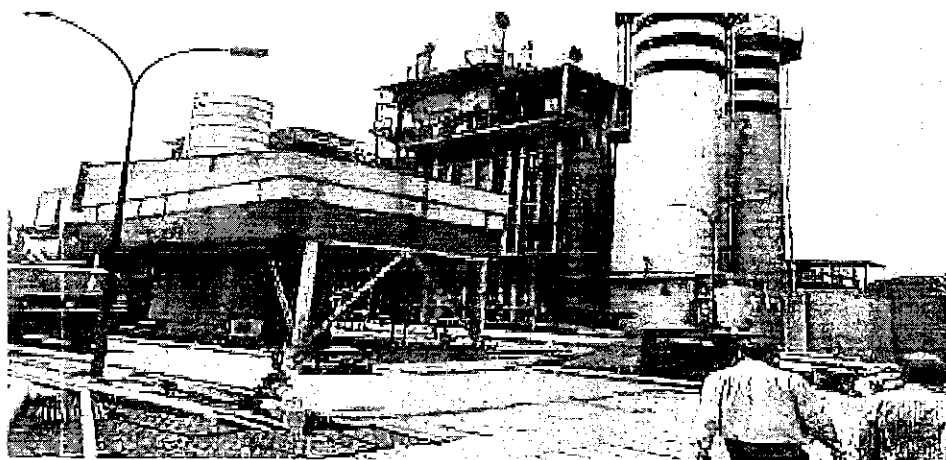
## **INDRAPRASTHA POWER GENERATION COMPANY LTD.**

(A Government of NCT of Delhi Undertaking)

By

NTPC Consultancy

A-28, Sector- 24, NOIDA, UP





परामर्श

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अनुमोदित

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## 2.0 EXECUTIVE SUMMARY

### Study of plant equipment and system with the objective to restore rated capacity and efficiency.

The NTPC team with each area expert have visited the IPGCL plant four times between 27/02/18 to 04/04/18 and conducted the study and it is found that proper maintenance will bring back the normal loading capacity(except heat rate) as deliberated in subsequent pages.

The team also interacted with M/S GE and M/S BGGTS experts to have their opinions and suggestions in this regard.

### ii. Identification and listing of equipment and systems for which detailed RLA is required to achieve rated capacity and efficiency.

#### 1) Status of efficiency of the equipment

	Load (MW Design 100MW)	GT Heat rate Open cycle(Kcal/KWh) (Design:3010Kcal/KWh)	GT heat rate combine cycle (Kcal/KWh)	GT efficiency (%)	Combine cycle efficiency (%)	Comp. efficiency (%)	HISG efficiency (%)	NOx level (ppm)
GT#1	26.8	3321.92	2491.41	75.88	34.51	85.5	77.90	41
GT#2	25.77	3396.80	2416.95	75.31	35.58	85.88	78.13	53
STG#1	21							
GT#3	29.8	3396.31	2750.27	75.32	31.26	89.75	77.90	43
GT#4	29	3235.05	2606.81	76.58	33.00	89.08	78.05	49
STG#2	14							
GT#5	29.2	3339.45	2387.59	75.75	36.01	84.01	75.42	36
GT#6	26.2	3572.09	2482.46	74.07	34.64	83.73	77.69	54
STG#3	23.2							

	Load(MW)	Efficiency	Cond. yac (kg/cm2)	Condenser loss (kg/cm2)	GT effectiveness
STG#1	21	79%	0.87	0.033	52%
STG#2		Not calculated as few stages are removed			
STG#3	23.2	76%	0.89	0.033	

2) The GTs open cycle heat rate are in the range of 3230 to 3570Kcal/KWh which is much above the design 3010 Kcal/KWh.

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- 3) The combine cycle design heat rate was not available as the HRSGs were installed later on. As per our expertise and GE, it is around 2300Kcal/KWh. Here the combined cycle Heat rate are 2380 to 2750 Kcal/KWh.
- 4) HRSG efficiency are in the range of 75 to 78%, much below the normal value of 85%.
- 5) Compressor efficiency are 83-89%. It should be >90%
- 6) The reason for the deteriorated efficiency, heat rate and APC are deliberated in detailed report
- 7) NOx values are in the range of 35 to 55ppm well within 75ppm as provided to us by the department.
- 8) Considering the operating condition and efficiency of the equipment it is suggested to do RLA and R&M of:
  - All Gas Turbine shafts and casings,
  - All HRSG headers,
  - All gas turbine generators and generator transformers as listed below,
  - Cooling tower civil structure

All the GTs have already crossed or about to reach 1.5lakh EOH and HRSGs have crossed or about to reach 1laks running hours where RLA are to be conducted as above.

The Generator transformers of GT#1,2,4,5,6 and STG#1,2,3 having only 50% of life remaining as per perfural test. Therefore RLA of these equipments to be carried out.

III. Prefeasibility study to achieve module capacity (2GT's, HRSG and STG) minimum 90MW, HR 2100Kcal/Kwh or better APC 2.5% or better keeping NOx emission within 75ppm.

To gain back the losses and to sustain for another 10-12 years the recommendations /corrective actions are to be implemented as below:

GT:

- a) GT compartment is very hot. Flange leakages on turbine/compressor are suspected.
- b) Compressor bleed valves are to be checked for passing. As the area is very hot passing could not be ascertained. These valves may be brought outside the GT compartment (which normally remains hot) for regular monitoring.
- c) The effectiveness of Offline wet washing of compressor should be studied before and after the washing, every time, in terms of increase in load and reduction in HR. 2-3% improvement in load is to be expected after the wash.



#### HRSG:

- a) The higher exhaust temperature, less steam flow and pressure is indicative of Scale formation inside the tubes of HRSG. To avoid it in future, SWAS should be made functional for continuous monitoring of at least basic critical parameters of boiler water/steam.
- b) HRSG inside insulation suspected deteriorating. The heat loss at the HRSG body surface is high.
- c) Bypass stack temperature should be made available for regular monitoring to find damper passing, if any, when unit is running in Combined Cycle. (However at present no passing is observed as measured with thermovision camera)

#### STG and BOP:

- a) Steam pressure and flow from HRSG is less than the design value as mentioned above in HRSG (a).
- b) Inter stage diaphragm seals clearance may be more (to be checked in next overhauling)
- c) Turbine bypass line downstream side temperature are more indicating the valves are passing
- d) Condenser vac. low due to:
  - more heat load - LLVT tank temp. about 150deg C, High energy drains are passing,
  - dirty tubes - CW water turbidity is high - side stream filtration system is recommended
  - poor CT performance
  - suspected air ingress in the condenser - helium leak detection or/and flood test are recommended.
- e) Algae deposits/growth in Cooling tower distribution channel are observed which may flow and deposit in condenser tubes.
- f) Six of the CT valves are found open when one/two GTs are in service leading to higher power consumption of CW pumps and less effectiveness of Cooling towers.
- g) CT desludging is not taking place properly. Desludge pumps are to be installed where the sediments are more (at CT # 1 and 8 side). During available opportunity, CT sumps may be cleaned one by one. This will result in better condenser performance.
- h) CW Impeller coating (under progress) will reduce APC
- i) CT shafts changing to light weight carbon Composite material and CT blades to FRP aerofoil design in phased manner for APC saving and better performance.

The combine cycle design heat rate was not available as the HRSGs were installed later on. As per our expertise and GE, with the present model combined cycle set up, the heat rate will be around 2300Kcal/KWh and for achieving 2100Kcal/KWh and better, model enhancement is required.

OFM may be approached for any possible upgrades/substitute options available with foot print replacement for any significant improvement in Load, Heat rate and APC.

It is expected that Heat rate and APC will improve and the output of the machines would increase substantially after attending of the above mentioned issues.

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### Electrical, C&I and Chemistry systems

- a) Earth fault observed in almost all the battery banks. Station may procure earth fault locator for identification and removal of earth fault.
- b) GT side LT switch gear has become obsolete and spares are either costly or not available.
- c) Generator transformers of GT#1,2,5,6 have only 1/3<sup>rd</sup> life is remaining and GT#4, STGT#1,2,3 have only 50% life remaining as per Perflural tests. Therefore RLA of these transformers are recommended.
- d) Air Ingress, DO(Dissolve Oxygen) monitoring not being done due to which we could not ascertain it. It is suggested to carry out air ingress test by Helium gas leak detection test or flood test.
- e) Side stream filtration system may be installed for filter out the high turbidity in CW water.

### Common issues:

Many of the online parameters are either not available or not showing the correct values. e.g. total air flow, inlet air filter DP, CW inlet and outlet temperatures of condenser, Condenser vacuum, individual unit gas flow, bypass stack temperature, etc. The gauges and field instruments need to be calibrated from time to time as per schedule and marked on the instruments/gauges.

### Recommendation:

The total revival of all the systems need huge investment. The GT combine cycle heat rate of 2100kCal/kWhr is not expected from this model. We propose two pronged approach which may be adopted depending upon fund availability:

- 1) IPGCL power plant having strategic importance being in capital region and having its black start GTs (initial cranking of GTs are with diesel engine) which can feed the grid within minutes of black out. In three GTs operating system are already changed to the latest version Mark Vii and AVR to DVR changing also done in these units. Therefore, after the present PPA is expired it is prudent to keep these three units as black start, peaking power and balancing power station. These units also used as black start facility to the adjacent Pragati power station.
- 2) Complete renovation and modernization of the combine cycle equipments and auxiliaries after doing RLAs as described above. Higher model gas turbine (Frame 6F model with same foot print) may also be looked into which will have less than 2000Kcal/KWh heat rate.



PGCL power plant having strategic importance being in capital having system direct feeding to Delhi metro and its black start GTs (initial cranking of GTs are with diesel engine) which can feed the grid within minutes of black out.

The present PPA expires in 2021 and the company is proposing to run it beyond 2021 for at least 10 more years with improved efficiency.

The plant has six gas turbines of 30MW each and three STGs of 30MW each. The GTs were commissioned in 1986-87 and the STs in 1995-96.

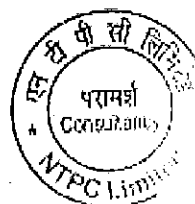
The GT inspections are being carried out in regular intervals and GT critical spares are replaced as per OEM recommendations.

HSGs were introduced in 1995-96 for combined cycle operation. But due to frequent tubes failures, the entire boiler tubes were replaced with higher quality material tubes in phased manner after 10 years by the OEM M/S BHEL. Now, the tube failure rates have come down.

The company is facing the problem of plant running with higher heat rate of about 2500Kcal/KWh, APC of 3.5%. And the unit load reduced by about 10%.

Accordingly this contract has been awarded to NTPC to find the ways and means to get back the rated parameters.

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#### 4.0 BRIEF ABOUT IPGCL PLANT

##### History

Due to background of frequent grid failures in northern region causing power cut in VIP areas of New Delhi, GTPS was conceived, as a open cycle peaking and quick black start station with naphtha/diesel fuel.

GT 1 May 1986

GT2 May 1986

GT3 June 1986

GT4 July 1986

GT5 Aug 1986

GT6 Nov 1986

Each GT having 30MW capacity

Gas conversion of all the units carried out in July 89 to Feb 90

Combined cycle HRSG/STG Installation:

STG#1	March 1995
STG#2	Oct 1995
STG#3	March 1996

Each rated for 34 MW

STG was later de rated to 30 MW.

##### Tariff normative Parameters:

GC Heat Rate	3125 Kcal /KWH GCV
CC Heat Rate	2450 Kcal /KWH GCV
Auxiliary Consumption	2%
Availability	85%

##### Present status

- Three modules of 2x30 MW frame 6B ALSTHOM / GE gas turbines and 1x 30 MW steam turbine BHEL make. Total installed capacity 270MW.
- Present open cycle heat rate is of the order of 3300 – 3400 Kcal / KWh for all the GTs.
- Combined cycle heat rate is of the order of 2450 to 2500 Kcal/KWh.
- APC around 3.5 %.
- Circulating water system consists of 5x 7500 Cubic meter/hr CW pumps with 8 cells cooling tower. Auxiliary cooling water system with 3x 450 cubic meter / hr ACW pumps.
- Power evacuation through seven 66 KV radial feeders serving to NDMC and DMRC and east Delhi area. Grid connectivity through two 160 MVA 66/220 KV IBTs.

Page 8 of 19

January

परीक्षा केंद्र, दिल्ली  
प्रमुख परीक्षार्थी  
दस्तावेज (ओ एन डी एन)  
आवेदन संख्या: 10 & 11  
दिनांक: 12/01/2019



- Control system for GTs is Mark IV for all GTs at the beginning and changed to Mark V in GT#1,4 and 6 in 2009. For HRSGs Procontrol P 13 /42.
- Gas Turbine Generators – 43 MVA, 10.5 KV air cooled open loop with PMG exciter and AVR / DVR.
- Steam turbine Generators – 43 MVA closed loop water cooled with PMG exciter and AVR / DVR.
- As per regulation PPA completing in 2021 after a lapse of 25 years from the commissioning of STGs.
- Initial source of water for the power plant is Yamuna River. Later in 2015 it has tied up with adjacent Pragati power for water requirement which uses the sewerage treated water from Delhi gate. This tie up is sufficient for 50% of the full plant capacity. More than this if required the plant has to take from original source Yamuna river.
- The gas is sourced from GAIL HB Pipeline.

#### Major renovations carried out

- Mark V installed on GT 1, 4 and 6
- DVR installed on GT 1, 4, 6 and STG 3
- Boiler tubes replaced in all HRSGs, 8-10 years back.
- STG 3 – Rotor and Turbine Internals replaced in 2013
- STG 1 – Rotor replaced in 2008

वि.सं. १०००/२००८  
आ.सं. १०००/२००८  
अवर प्रबन्धक (अ.प्र.प्र.)  
Addl. General Manager (A.G.M.)  
परामर्श संपन्न/Consultancy wing  
एम.डी. न.सी. लि. मुंबई / NTPC Limited



## 5.0 PURPOSE OF THE PRESENT STUDY

The output of the plant is reduced by about 10% from the rated output and heat rate increased considerably to 2500Kcal/KWh, APC 3.0% and above. Therefore it has become imperative to find out where the losses are and to rectify the same and restore the rated capacity and efficiency.

Therefore as a first step, it is to find out which equipment are required to undergo RLA study for further action for restoration of the capacity and efficiency.

Accordingly, NTPC has been awarded this contract for technical assessment of the plant covering

- 1) Study of Plant Equipment and system with the objective to restore capacity and efficiency
- 2) Identification and listing of equipment and systems for which detailed RLA is required to achieve rated capacity and efficiency
- 3) Prefeasibility study to achieve Module capacity (2 GTs, HRSG and STG) minimum 90MW, HR 2100Kcal/kWh or better APC 2.5% or better keeping the NOx emission within 75ppm.

## 6.0 METHODOLOGY

The following team was formed for the purpose:

- |    |                       |                     |
|----|-----------------------|---------------------|
| 1) | Dinesha Subrahmanya.S | - Project manager   |
| 2) | Sandeep Gupta         | - Gas Turbine       |
| 3) | DKS Rautela           | - HRSG, STG and BOP |
| 4) | Deepak Acharya        | - C&I               |
| 5) | HSS Senger            | - Chemistry         |
| 6) | Harish Kumar          | - Electrical        |


The team visited the plant four times on 27/02/18, 23/03/18, 02/04/18 and 04/04/18 for comprehensive study and collection of data.

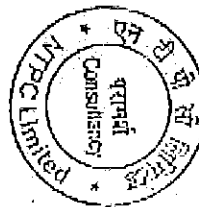
The study was carried out in totality covering all the areas and each area study was conducted by the experts and the recommendations are attached.

The team also interacted with M/S GE and M/S BGGTS experts to have their opinions and suggestions in his regard.

All the above are compiled and this report is made.

20/01

  
General Manager (O & M)  
Power S&S/Consultancy Wing  
NTPC Limited



## 7.0 MAJOR OBSERVATIONS AND RECOMMENDATIONS

### GAS TURBINES:

EOH as of as of 31/01/2016:

GT#1 - 151831hrs

GT#4 - 135813hrs

GT#2 - 142722hrs

GT#5 - 168474hrs

GT#3 - 151350hrs

GT#6 - 105781hrs

Efficiency and HR calculation:

	Compressor efficiency(%)	Open cycle Heat rate(Kcal/KWh) = (ccp flow x GCW/Generation(KW)	Efficiency(%) = 860x 100/HR	Combine cycle heat rate(Kcal/KWh)
GT#1	86.5	10792x9234.407/30000 = 3321.87	25.88	10792x9234.407/40000 = 2491.84
GT#2	85.88	10874x9289.115/29600 = 3396.50	25.31	10874x9289.115/41600 = 2418.95
GT#3	89.75	10214x9273.436/29800 = 3196.31	25.32	10214x9273.436/36800 = 2750.27
GT#4	85.08	10065x9121.075/29000 = 3235.05	26.58	10065x9121.075/36000 = 2606.01
GT#5	84.01	10235x9277.129/30100 = 3133.45	25.75	10235x9277.129/42100 = 2397.59
GT#6	83.21	9988x9370.120/26200 = 3572.09	24.07	9988x9370.120/37700 = 2482.46

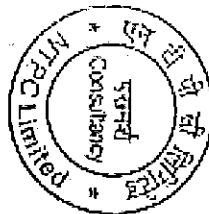
Compressor efficiency calculations:

GT#	UNIT	SYMBOL	GT1	GT2	GT3	GT4	GT5	GT6
Compressor temp	degC	t1	41.00	41	41	38	31	33
Compressor temp	C	t1	314.00	314.00	314.00	311.00	306.00	306.00
Compressor temp	C	t2	367.00	367	355	369	364	367
Compressor temp	K	t2	640.00	640.00	628.00	642.00	637.00	635.00
Compressor pressure	mbar		1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
Compressor pressure	mbar		0.979	0.979	0.979	0.979	0.979	0.979
Compressor pressure	Pa		0.979	0.979	0.979	0.979	0.979	0.979
Compressor pressure	Pa		8.86	8.74	8.85	9	9.06	8.9
Compressor ratio		p2/p1	10.07	9.95	10.06	10.21	10.28	10.11
Compressor ratio			1.38	1.38	1.38	1.38	1.38	1.38
Compressor ratio		c-1/r	0.28	0.28	0.28	0.28	0.28	0.28
Compressor ratio		T2s = 100x[(T2-T1)/(T2-T1)]	596.00	593.98	595.53	592.62	584.06	581.47
Efficiency	%		86.50	85.08	89.75	85.08	84.01	83.21

GT#3 compressor efficiency is normal and all other are less, may be due to fouling, bleed valves passing. Heat rate are high for all GTs and efficiency low.

In view of EOH exceeding 1.5 lakh hours and operating conditions it is recommended to have RIA study of all the GT shafts and casings (the blades are already being replaced as per EOH).

प्रमाणित किया गया  
08/05/2016  
अध्यक्ष, एनटीपीसी  
एनटीपीसी लिमिटेड  
एनटीपीसी लिमिटेड



S. No	Activity/Observations	Recommendations
11	Offline wet washing of GT	The efficiency and performance measurements before and after every wet washing was found missing. This is required to be done for finding the effectiveness of wet washing. 2-3% improvement in load should be visible.
12	Compressor bleed valves suspected passing.	It require either topping/replacement and relocation to outside the compartment

### HRSGs:

#### Efficiency calculation

	Efficiency= (Flue gas input temp-Flue gas output temp)/(Flue gas input temp - Ambient temp)
HRSG=1	(546-146)/(546-33) = 77.90%
HRSG=2	(555-144)/(555-33) = 78.13%
HRSG=3	(545-152)/(545-41) = 77.90%
HRSG=4	(556-154)/(556-41) = 78.05%
HRSG=5	(558-162)/(558-33) = 75.42%
HRSG=6	(552-155)/(552-41) = 77.69%

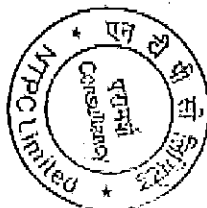
Efficiency of the HRSGs are ranging from 75% to 78% which is less compare to the normal design

S. No	Activity/Observations	Recommendations
13	Bypass stack temperature monitoring	This gives heat loss in bypass stack during CC operation
14	Water chemistry of DM water not being monitored	Scale formation inside tubes lead to less heat exchange and higher exhaust temperature, less steam flow and pressure.
15	SWAS system not functioning	SWAS should be made functional for continuous monitoring of atleast basic critical parameters
16	WHRB heat loss especially at SH zone is considerable	Indicating inside insulations deteriorated.
17	DM make up high at 3-4%	Leakages to be identified and arrested.

Since all the HRSGs have almost completed 1 lakh running hours, it is recommended to do RIA study on all the HRSG tubes and headers along with scale thickness survey. This is also mandatory in view of BE regulations.

निदेशक, परीक्षा एवं  
प्रशिक्षण, एन टी सी  
आर. ए. सी. रोड, नए बंगला  
अवर, General Manager (O & M)  
एन टी सी लिमिटेड / NTPC Limited





### Condenser performance test:

Condenser vacuum loss in STG#3 is approx. 0.033 Kg/cm<sup>2</sup>. (CW temperature are measured with temperature gun as the local indicators suspected not functioning properly). Condenser vac. loss in STG#1 also taken as approximately same as all the conditions are approximately same.

The reason for the loss seems to be

- 1) High condenser load and low CW flow.
- 2) Turbine bypass valves to be checked for any passing. Also high energy drain valves which are found to be passing needs to be attended.
- 3) Condenser water box and tubes needs to be checked for any choking which is affecting the CW flow.
- 4) CW pump performance to be checked for any deficiency.

### CT effectiveness:

$\text{range}/(\text{range} + \text{approach})$

$= (41-29)/((41-29) + (29-18))$

$= 12/(12+11)$

$= 52\%$ . This is much below normal value 65%.

CT civil structure has become weak. Complete revamp of CT with RLA for the civil structure is recommended.

### IV) ELECTRICAL

Sl. No	System	Observations and Recommendations for Life Extension/ Reliability	Remarks
1	Transformer – GT, STG	• Perforal test results are summarised as per annexure - A. Results are not OK for few XFMR (Refer annexure -A)	OTI/ WTI Calibration data to be done and action to be taken on that basis
2.	Generator – GT	Running hours crossed 1.5laks hrs.	
3.	Battery/ DC System – GT	All batteries were replaced in the year 2011 to 2015.	Earth fault was observed in almost all battery banks. Station may procure the E/F locator for Identification and removal of E/F
4.	415 V/ LT SWGR	GT side LT SWGR is has become obsolete and spares are not available (very expensive also. Specially the DC EOP module).	Suggested for replacement and that one MCC could be located outside the GT Container Cubicle in case of layout related issue.

For approval,  
 Director (Operations)  
 NTPC Limited  
 New Delhi

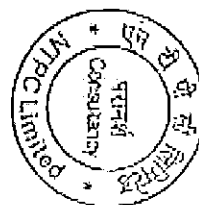


Figure-A

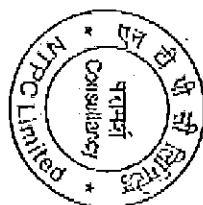
Periodic Test Results of Transformers

Transformer	2-Furfural (mg/Kg or ppm)	Remarks
GT#1	1.6	Only 1/3 <sup>rd</sup> of life is remaining as the value > 1ppm
GT#2	2.37	
GT#5	3.08	
GT#6	4.54	
GT#3	0.004	Normal life can be expected as value < 0.01 ppm
GT#4	0.111	
ST#1	0.855	
ST#2	0.246	
ST#3	0.032	Only 50% of life is remaining as the value 0.01 to 1ppm

## V) CONTROL AND INSTRUMENTATION

Sl. No.	System/Equipment	Assessment	Recommendation
1)	Procontrol Diagnostic & Programming station	In GTP5 Procontrol Diagnostic & Programming station (SK06) which is an essential tool for troubleshooting, editing & software programming, entering parameter etc. of processor module, bus coupler & drive module.	Diagnostic & Programming station (SK06) is to be made available
2)	Operating system	The server computer of HMI is on Windows 2000 platform, which is obsolete and service support is not available	The HMI server operating system needs to be upgraded.
3)	Turbovisory System (ST)	Bentley Nevada make 3300 monitoring system of Turbovisory installed in module 1 & 2 is obsolete, only module 3 turbovisory system has been upgraded with 3500.	Bentley Nevada make 3300 monitoring system of Turbovisory installed in module 1 & 2 is obsolete and needs to be upgraded.
4)	C&I Lab	One room has marked as C&I lab with few calibration equipment. Most of the calibration standards are very old and never been calibrated from 3rd party and do not meet the calibration traceability. There is no identified bench/setup for pressure, temperature calibration and electronic test bench.	The C&I Lab needs to have separate calibration & test benches. The Calibration lab should be fully equipped with all calibration standards as per required range and meet calibration traceability (3 <sup>rd</sup> party calibration).

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DIRECTOR GENERAL  
NTPC LIMITED  
Gurgaon  
10/07/2019

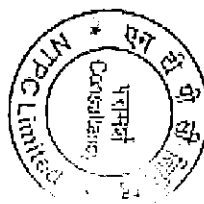


## CHEMISTRY

The proper cycle chemistry contributes to the high availability, efficiency, and long term reliability of power stations. If the cycle chemistry is not carefully controlled and monitored within pre-defined limits, corrosion, deposition and other forms of metal damage can result throughout the plant system. Most cycle chemistry related degradation phenomena are regarded as long term. Therefore, proper management of cycle chemistry is a key factor in the success of any power station.

1. Cooling water system is having large amount of sludge and CW system turbidity level is also high, which may be because of atmospheric dust loading. This makes whole CW system to operate with less efficiency because of sludge accumulation in condenser tubes as well as in basin.
  - a. In order to avoid this problem, it is suggested that Side stream filtration system (SSFS) may be installed to remove sludge and suspended solids from the system.
  - b. The pumping systems along with two each Sand filters & ACFs are available in the existing abandoned DM plant can be utilized for the same.
  - c. For the basin capacity of 10000 M<sup>3</sup>, SSFS with 2% recirculation requirement will be sufficient to keep the CW system clean.
  - d. It will improve efficiency as well as frequent jet cleaning of condensers.
2. Laboratory should be strengthened with optimum level of lab instruments.
  - a. Existing boiler, feed, condensate, steam sample rack has been provided at Drum level and the samples are having high temperature, which cause inaccurate sampling and incorrect analysis thereof.
  - b. It is suggested that adequate primary cooling as well as secondary cooling of sample is required so as to get samples at 25°C.
  - c. For better control, adequate supervision and frequent monitoring is possible if sample rack is provided at ground level.
3. It is suggested that available SWAS should be commissioned with minimum pH and conductivity meters for boiler, feed, steam and condensate samples.

प्रमुख निदेशक, रतन  
विद्युत निगम लिमिटेड  
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& (एन टी पी सी)  
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### 8.0 CONCLUSION

All the recommendations when implemented, the units will near the rated capacity. The leakages and passing are avoidable. Cycle water quality affects the heat transfer in boiler in long run. Cooling water quality affects condenser performance and Intern STG load.

Cooling tower area more attention is required. Operation of valves to be optimised. CT shafts may be changed to light weight Carbon composite material and CT blades to FRP aerofol design in phased manner for APC saving and better performance.

Instrumentation is the nerves of the power plant. Without its good health and calibration for accuracy from time to time, it is difficult to monitor the losses.

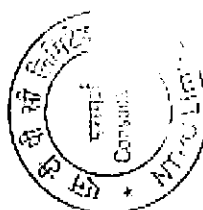
The HRSGs were installed later on and the base heat rate for combine cycle is not available. With the present systems and the improvements, as per our experience and discussion with GE the combined heat rate for this unit best possible is about 2250 to 2300 kcal/kWh.

In view of the running hours of GTs are exceeded 1.5 lakhs hours or nearing it and STGs one lakh hours or nearing it and looking at the running conditions of the equipment with lower efficiencies it is suggested to have RLA of all the systems as detailed in executive summary.

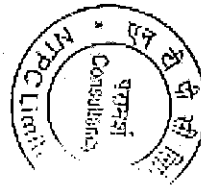
In view of the high cost involved for total revival and HR better than 2100 kcal/kWh, it is suggested to keep it as balance power, peaking power black start power station with three GTs in open cycle with minimum investment.

NTPC shall extend full support through consultancy services for any help in this regard.

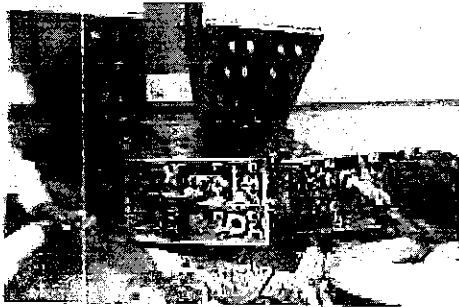
*Jul 04*



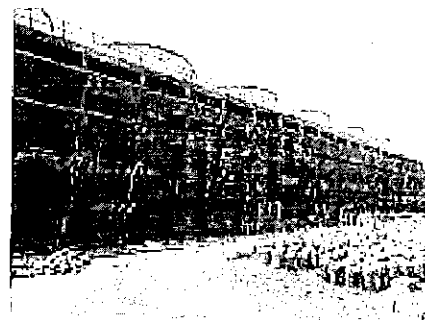
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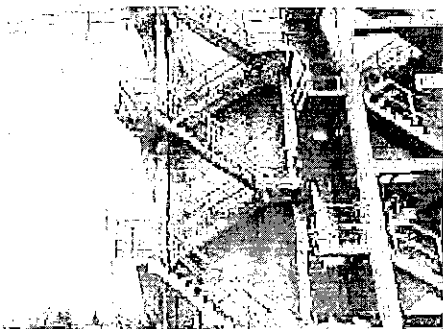
## 9.0 PHOTO GALLERY



Generator cooler mud deposit



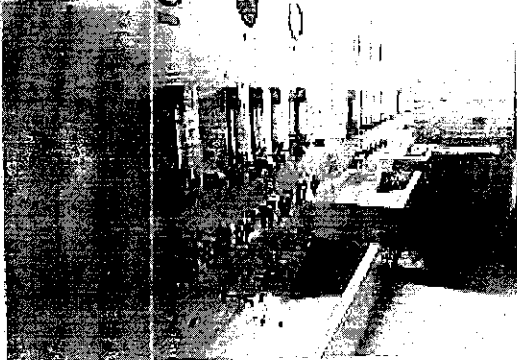
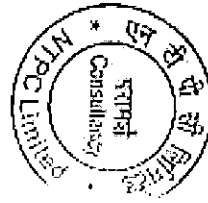
Cooling tower six cells in service when two units in service



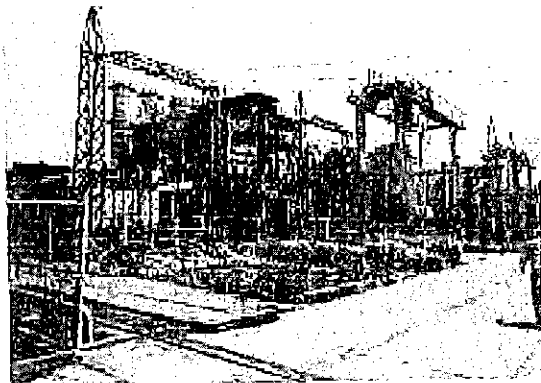
Cooling tower structure became weak

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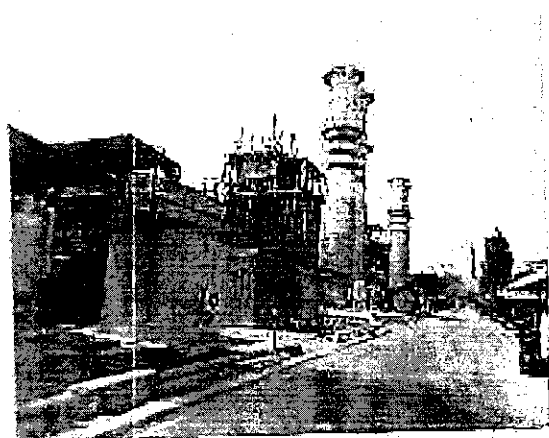
विदेशी सुपरवाइजर, एन  
 DRASHA SUBRAMANIAM  
 अपर म्यानेजर (ओ & एम)  
 Arch. General Manager (O & M)  
 एन टी पी सी लिमिटेड / NTPC Limited



SWAS not functioning



IPGCL power plant



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 दिनेश सुब्रह्मण्यम, एम  
 दिनेश सुब्रह्मण्यम  
 ज्येष्ठ प्रशासक (ओ एंड एम)  
 2000 General Mgt. (O & M)  
 प्रभाग, एन. सी. विंग / NTPC Limited  
 एन. सी. विंग / NTPC Limited

	TARIFF FILING FORMS (GENERATING STATIONS) FOR DETERMINATION OF TARIFF		PART-I
	Check List of Forms and other information/documents for tariff filing for Generating Stations		
S No.	Form No.	Title of Tariff Filing Forms (Thermal)	Tick
1	Form-1	Summary Sheet	√
2	Form-1(I)	Statement Showing Claimed Capital Cost	√
3	Form-1(II)	Statement Showing Return on Equity	√
4	Form-2	Plant Characteristics	√
5	Form-3	Normative Parameters Considered for tariff Computations	√
6	Form- 4	Details of Foreign Loans	N/A
7	Form-4A	Details of Foreign Equity	N/A
8	Form-5	Abstract of Admitted Capital cost for the existing Projects	√
9	Form-5A	Abstract of Capital Cost Estimates and Schedule of Commissioning for the New projects	N/A
10	Form-5B	Break-up of Capital Cost for Coal/Lignite based Projects	N/A
11	Form-5C	Break-up of Capital cost for Gas / Liquid fuel based Projects	N/A
12	Form-5D	Break-up of Construction / Supply / Service / packages	N/A
13	Form-5E	Details of variables, parameters, optional package etc. for New Project	N/A
14	Form-5Ei	In case there is cost over run	N/A
15	Form-5Eii	In case there is time over run	N/A
16	Form-6	Financial Package upto COD	N/A
17	Form-7	Details of Project Specific Loans	N/A
18	Form-8	Details of Allocation of Corporate loans to various projects	N/A
19	Form-9A	Statement of Additional Capitalization after COD	N/A
20	Form-9B	Statement of Additional Capitalization during lag end of the useful life of Project	N/A
21	Form-9Bi	Details of Assets De-capitalised during the period	√
22	Form-9C	Statement showing reconciliation of ACE claimed with capital additions as per books	√
23	Form-9D	Statement of Capital cost	√
24	Form-9E	Statement of Capital Works in progress	N/A
25	Form-10	Financing of Additional Capitalization	N/A
26	Form-11	Calculation of Depreciation	√
27	Form-12	Statement of Depreciation	√
28	Form-13	Calculation of Weighted Average Rate of Interest on Actual Loans	N/A
29	Form-13A	Calculation of Interest on Normative Loan	√
30	Form-13B	Calculation of Interest on working capital	√
31	Form-13C	Other Income as on COD	N/A
32	Form-13D	Incidental expenditure during Construction upto Scheduled COD and upto Actual COD	N/A
33	Form-13E	Expendiure under different packages upto Scheduled COD and up to Actual COD	N/A
34	Form-14	Draw Down Schedule for Calculation of IDC & Financing Charges	N/A
35	Form-14A	Actual Cash Expenditure	N/A
36	Form-15	Details/ Information to be submitted in respect of Fuel for Computation of Energy Charges <sup>1</sup>	√
37	Form-16	Details / information to be Submitted in respect of Capital Spares	N/A

38	Form-17	Liability Flow Statement	N/A
39	Form-18	Employee Expenses	✓
40	Form-18 (a)	Employee Strength	✓
41	Form-19	A & G Expenses	✓
42	Form-19 (a)	Legal Expenses	✓
43	Form-20	R & M Expenses	✓
44	Form-21	Variable Charges for Gas Power Plant	✓
<b>Other Information / Documents</b>			
	<b>Sl.No.</b>	<b>Information / Document</b>	<b>Tick</b>
	1	Certificate of Incorporation, Certificate for Commencement of Business, Memorandum of Association, & Articles of Association ( For new Station setup by a Company making tariff application for the first time to CERC	
	2	A. Stationwise and Corporate audited Balance Sheet and Profit & Loss Accounts with all the Schedules & annexure on COD of the Station for the new station & for the relevant years. B. Stationwise and Corporate audited Balance Sheet and Profit & Loss Accounts with all the Schedules & annexures for the existing stations for the relevant years.	
	3	Copies of relevant loan Agreements	
	4	Copies of the approval of Competent Authority for the Capital Cost and Financial package	
	5	Copies of the Equity participation agreements and necessary approval for the foreign equity	
	6	Copies of the BPSA/PPA with the beneficiaries, if any	
	7	Detailed note giving reasons of time and cost over run, if applicable. List of supporting documents to be submitted: a. Detailed Project Report b. CPM Analysis c. PERT Chart and BAR Chart d. Justification for cost and time overrun	
	8	Generating company shall submit copy of cost audit report along with cost accounting records, cost detailed, statements, schedules etc. for the generating units wise / stage wise / station wise and subsequently consolidated at company level as submitted to the Govt. of India for first two years i.e. 2014-15 and 2015-16 at the time of mid term true-up in 2016-17 and for balance period of tariff period 2014-19 at the time of final true-up in 2019-20. In case of initial tariff filing the latest cost audit report should be furnished.	
	9	Any other relevant information ( please specify )	
	10	Re-conciliation with balance-sheet of any actual additional capitalisation and amongst stages of a generating station.	
Note1: Electronic copy of the petition (in words format) and detailed calculation as per these formats ( in excel format ) and any other information submitted shall also be furnished in the form of CD/ Floppy disc			

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## Summary Sheet

Name of the Company : Indraprastha Power Generation Company Limited

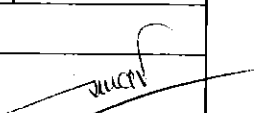
Name of the Power Station: Gas Turbine Power Station

Place (Region / District / State): Delhi

S.No.	Particulars	Unit	2017-18	2019-20
1	2	3	4	5
1.1	Depreciation	Rs. Crore	10.95	11.25
1.2	Interest on Loan	Rs. Crore	-	0.06
1.3	Return on Equity <sup>1</sup>	Rs. Crore	27.05	22.80
1.4	Interest on Working Capital	Rs. Crore	27.34	36.90
1.5	O & M Expenses(Actual)	Rs. Crore	69.62	89.32
1.7	Compensation allowance (if applicable)	Rs. Crore	0.000	0.000
1.8	Special allowance (if applicable)	Rs. Crore	0.000	0.000
	<b>Total</b>	Rs. Crore	134.96	160.31
2.1	Landed Fuel Cost (Domestic : Gas)	Rs./SCM	9.789	11.64
	(%) of Fuel quantity	(%)	83	76
2.2	Landed fuel cost ( Imported: Gas)	Rs./SCM	25.273	36.241
	(%) of Fuel quantity	(%)	17.0	23.7
2.3	Secondary Fuel Oil Cost	Rs./Unit		
	Energy charges Rate ex-bus (paise/Kwh) from Natural Gas (Combined Cycle)	Rs./Unit	3.387	4.706
	Energy charges Rate ex-bus (paise/Kwh) from Natural Gas ( Open Cycle)	Rs./Unit	4.563	5.882
Petitioner				

<b>Form-1(I)</b>			
<b>Statement Showing Claimed Capital Cost</b>			
<b>Name of the Petitioner: Indraprastha Power Generation Company Limited</b>			
<b>Name of the Generating Station: Gas Turbine Power Station</b>			
<b>Place (Region / District / State): Delhi</b>			
<b>(Rs in Crore)</b>			
<b>Sl. No.</b>	<b>Particulars</b>	<b>2017-18</b>	<b>2019-20</b>
1	2	3	4
A	Opening Capital Cost	425.14	425.94
B	Addl: Addition during the year/ period	0.00	0.00
C	Less: Decapitalization during the year / Period	0.00	0.00
D	Less: Liability Reversal during the year /period	0.00	0.00
E	Add: Discharges during the year/ period	0.00	0.00
F	<b>Closing Capital Cost</b>	425.14	425.94
G	<b>Average Capital Cost</b>	<b>425.14</b>	<b>425.94</b>
<b>Petitioner</b>			

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FORM-1(II)			
Statement Showing Return on Equity			
Name of the Company : Indraprastha Power Generation Company Limited			
Name of the Power Station: Gas Turbine Power Station			
Place (Region / District / State): Delhi			
(Rs in Crore)			
Sl. No.	Particulars	2017-18	2019-20
1	2	3	4
A	Opening Equity	127.54	127.78
B	Add: Increase due to Addition during the year/ period	0	0
C	Less: Decrease due to Decapitalization during the year / Period	0.00	0.00
D	Less: Decrease due to reversal during the year /period	0.00	0.00
E	Add: Increase due to Discharges during the year/ period	0.00	0.00
F	Closing Equity	127.54	127.78
G	Average Equity	127.54	127.78
H	Rate of RoE	21.21%	17.84%
I	Return of Equity	27.05	22.80
<b>Assumption:</b>			
1	MAT @ 21.34% for FY 2017-18 and @ 21.54% for FY 2019-20		
		 <b>Petitioner</b>	

FORM-2

## Plant Characteristics

Name of the Company : Indraprastha Power Generation Company Limited

Name of the Power Station: Gas Turbine Power Station

Place (Region / District / State): Delhi

Units(s)/ Block(s) Parameters	GT-1	GT-2	GT-3	GT-4	GT-5	GT-6	STG-I	STG-II	STG-III
Installed Capacity (MW)	30	30	30	30	30	30	30	30	30
Schedule COD as per Investment Approval									
Actual COD / Date of taken Over (as applicable)	14.05.1986	28.05.1986	24.05.1986	31.07.1986	31.08.1986	15.11.1986	20.03.1995	31.10.1995	26.03.1996
Pit Head or Non pit Head	NA	NA	NA	NA	NA	NA	NA	NA	NA
Name of the Boiler Manufacture	NA	NA	NA	NA	NA	NA		BHEL	
Name of Turbine Generator Manufacture	GE						BHEL		
Main Streams pressure at Turbine inlet (kg/Cm <sup>2</sup> abs) <sup>1</sup>							40	40	40
Main Steam temperature at Turbine inlet (°C) <sup>1</sup>							500	500	500
Reheat Steam Pressure at turbine Inlet (kg/Cm <sup>2</sup> ) <sup>1</sup>							NA	NA	NA
Reheat Steam temperature at Turbine inlet (°C) <sup>1</sup>							NA	NA	NA
Main Steam flow at Turbine inlet under MCR condition (tons/hr) <sup>2</sup>							110	110	110
Main Steam flow at Turbine inlet under VWO condition (tons/hr) <sup>2</sup>							115.5	115.5	115.5
Unit Gross electrical output under MCR/Rated condition (MW) <sup>2</sup>							32.5	32.5	32.5
Unit Gross electrical output under VWO condition (MW) <sup>2</sup>							34.125	34.125	34.125
Guaranteed design Gross Turbine Cycle Heat Rate (kCal/kWh) <sup>3</sup>	3188	3188	3188	3188	3188	3188	2805	2805	2805
Condition on which design turbine cycle heat rate guaranteed	Temp=31.5°C, Altitude 216m, Net Frequency 50 Hz								
%MCR	NA	NA	NA	NA	NA	NA	100	100	100
% Makeup Water Consumption	NA	NA	NA	NA	NA	NA	0	0	0
Design Capacity of Make up water system									
Design Capacity of inlet cooling system							25000 Cubic meter per hour		
Design Cooling Water Temperature (°C)	NA	NA	NA	NA	NA	NA	32.5	32.5	32.5
Back Pressure	NA	NA	NA	NA	NA	NA	0.101		



## Normative Parameters considered for Tariff Computations

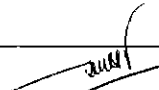
Name of the Company : Indraprastha Power Generation Company Limited

Name of the Power Station: Gas Turbine Power Station

Place (Region / District / State): Delhi

Particulars	Unit	2017-18	2019-20
1	2	3	4
Base Rate of Return on Equity	%	14.00	14.00
Effective Tax Rate <sup>4</sup>	%	33.99	21.54
Target Availability	%	85%	85%
Auxiliary Energy Consumption	%	2%	2%
Gross Station Heat Rate	kCal/kWh	2450	2450
Specific Fuel Oil Consumption	ml/kWh	NA	NA
Cost of Coal/ Lignite for WC <sup>1</sup>	in Months	NA	NA
Cost of Main Secondary Fuel Oil for WC <sup>1</sup>	in Months	NA	NA
Fuel Cost for WC <sup>2</sup>	in Months	1	1
Liquid Fuel Stock for WC <sup>2</sup>	in Months	NA	NA
O&M Expenses	Rs. in lakh/MV	29.66	33.08
Maintenance Spares for WC	% of O&M	30	30
Receivables for WC	in Months	2	2
Storage capacity of Primary fuel	MT	NA	NA
SBI Base Rate	%	10.34%	10.26%
Blending ratio of domestic coal/ imported coal		NA	NA

<sup>1</sup>For Coal / Lignite based generating stations<sup>2</sup>For Gas Turbine/ Combined Cycle generating stations duly taking into account the mode of operation on gas fuel and liquid fuel.<sup>3</sup>Mention relevant date<sup>4</sup>Effective tax rate is to be computed in accordance with Regulation 25 i.e. actual tax(or advance tax)/ gross income, where gross income refers the profit before tax.
  
 Petitioner

FORM-5		
Abstract of Admitted Capital Cost for the existing Projects		
Name of the Company : Indraprastha Power Generation Company Limited		
Name of the Power Station: Gas Turbine Power Station		
Place (Region / District / State): Delhi		
Last date of order of Commission for the project	Date (DD-MM-YYYY)	31.08.2017
Reference of petition no. in which the above order was passed	Petition No.	15/2017
Following details (whether admitted and/ or considered) as on the last date of the period for which tariff is approved, in the above order by the Commission:		
Capital cost	(Rs. in Crore)	425.14
Amount of un-discharged liabilities included in above (& forming part of admitted capital cost)		
Amount of un-discharged liabilities corresponding to above admitted capital cost (but not forming part of admitted capital cost being allowed on cash basis)		
Gross normative debt		
Cumulative Repayment		
Net Normative debt		
Cumulative depreciation		338.83
Freehold land		
		 Petitioner

## Details of assets De-capitalised during the period

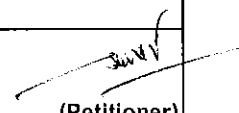
Name of the Company : Indraprastha Power Generation Company Limited

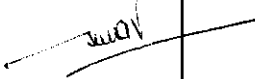
Name of the Power Station: Gas Turbine Power Station

COD					
S.N o.	Name of the Asset	Nature of De- capitalisation (whether claimed under exclusion or as additional capital expenditure)	Original value of the asset capitalised in rupees	Year Put to use	Depreciation recovered till date of De-capitalization in rupees
1	2	3	4	5	6
1	DL4CU 3206	Sale of Car	-1,52,718.13	01-07-2002	1,45,082.22
2	VIBRATION PICK UP,GT,GE,PG6461B,FR6	Capital Spare	-12,71,250.00	20-09-2016	2,51,601.56
3	SHROUD,STG 1,329A3228G004,GT,GE	Capital Spare	-87,44,200.00	14-03-2017	1,45,736.67
4	PLUG,BORESCOPE HOLE,213B1342P001,GT,GE	Capital Spare	-42,000.00	28-12-2013	26,150.94
5	SPRING,279A1674P001,GT,GE,PG6461B,FR6	Capital Spare	-1,800.00	28-12-2013	1,134.91
6	INSUL COVER,188C9473G002,GT,GE	Capital Spare	-1,93,568.73	01-04-2012	1,40,536.21
	INSUL COVER,188C9473G003,GT,GE	Capital Spare	-30,827.93	01-04-2012	22,381.91
8	WATER PUMP,SFT DRIVEN,302A1543P003,GT,GE	Capital Spare	-8,99,157.10	01-04-2012	6,73,341.38
9	RATCHET MOTOR,225A9643P001,GT,GE,PG6461B	Capital Spare	-6,29,032.61	05-10-2013	3,70,038.29
10	KLOZURE,114A5747P001,GT,GE,PG6461B	Capital Spare	-2,838.80	19-06-2015	1,282.20
11	KLOZURE,298A548P033,GT,GE,PG6461B	Capital Spare	-8,360.16	01-04-2012	6,117.42
12	BUSHING,114A3441P002,GT,GE,PG6461B	Capital Spare	-69,702.86	19-06-2015	31,482.45
13	TRANSDUCER,LINEAR,311A5178P002,GT,GE	Capital Spare	-4,43,855.00	19-06-2015	1,92,696.47
14	SOLENOID VALVE,114A8218P026,GT,GE,FR6	Capital Spare	-3,20,582.00	23-11-2013	2,06,795.17
15	OIL DEFLECTOR,138C8965G005,GT,GE,PG6461B	Capital Spare	-7,53,853.56	25-06-2015	2,84,972.84
16	HARDWARE KIT 1,ROTOR,227B9417G005,GT,GE	Capital Spare	-18,69,265.13	29-12-2017	77,886.05
17	HARDWARE KIT 2,ROTOR,213B1442G003,GT,GE	Capital Spare	-22,62,794.63	29-12-2017	94,283.11
18	FLAME DETECTOR/SCANNER,261A1812P013,GT	Capital Spare	-10,00,000.00	30-12-2016	2,70,833.34
19	GEARBOX,AUMA,GS315 R	Capital Spare	-8,38,634.99	13-01-2016	3,27,391.61
20	BEARING NO:1,91600532P301,GB,TRL65VX	Capital Spare	-6,91,598.28	05-03-2018	17,733.29
21	BEARING NO:2,91600532P302,GB,TRL65VX	Capital Spare	-7,78,782.95	05-03-2018	19,968.79
22	BEARING NO:3,91600532P303,GB,TRL65VX	Capital Spare	-7,78,782.95	05-03-2018	10,668.26
23	NTRON SWITCH,336A4940DNP516TX,GE,MK6e	Capital Spare	-54,248.72	09-07-2014	48,823.85
24	PCAA ASSY/CORE ANLG,IS230PCAAH1A,GE,MK6e	Capital Spare	-12,11,279.92	02-01-2017	1,00,940.00
25	IO PACK,DISCRETE,IS220PDIOH1A,GE,MK6e	Capital Spare	-5,35,405.92	02-01-2017	44,617.16
26	TERM BOARD,IS200TREGH1B,PNL,GE,MK6e	Capital Spare	-5,43,498.00	07-10-2013	4,89,148.20
27	TERM BOARD,IS200TBAIH1C,PNL,GE,MK6e	Capital Spare	-5,08,633.00	15-07-2015	2,52,091.71
28	POWER SUPPLY,U1000770,24VDC,ALSTOM,DVR	Capital Spare	-2,58,060.00	26-02-2016	96,772.51
29	RELAY MODULE,C0403750,5/24VDC,4A,DVR	Capital Spare	-71,491.15	01-04-2012	53,944.80
30	MEASUREMENT TREATMENT CARD,C1001820,DVR	Capital Spare	-8,31,451.66	05-03-2015	7,48,306.50
31	CURRENT MODULE,C0401900,DVR	Capital Spare	-1,17,587.76	01-04-2012	90,741.23
32	PULSE GENERATOR CARD,L54E60000311,DVR	Capital Spare	-14,77,204.71	16-09-2015	4,43,161.41
33	LCD TOUCH SCREEN,H1000890,DVR,ALSTOM	Capital Spare	-1,59,962.00	12-05-2015	88,571.95
34	SF6CB,2000A,72.5KV,3P,40KA	Capital Spare	-8,15,628.45	05-11-2015	2,40,985.53
35	SF6CB,2500A,11KV,40KA,HPA12/2540C,ABB	Capital Spare	-12,31,964.00	17-08-2017	1,16,387.23
36	Cplg Bolts between rotor and load gear	Capital Spare	-7,25,000.01	21-03-2011	5,22,040.97
37	SERVO AMPLIFIER,DS3800HSAA,PNL,GE,MK IV	Capital Spare	-3,26,604.95	01-04-2012	2,72,916.46
38	OPERATOR INTERFACE,DS3800PIMB,GE,MK IV	Capital Spare	-11,31,150.00	01-04-2012	8,79,352.92
39	SYNC RELAY,ED5401711000,PNL,GE,MK IV	Capital Spare	-36,950.93	01-04-2012	27,038.31
40	MCRPR CARD,HMPF,DS3800HMPF,PNL,GE,MK IV	Capital Spare	-3,66,808.53	01-04-2012	2,78,874.97
41	CARD GIT,L54E1423AG00,AVR,ALSTOM	Capital Spare	-7,95,625.00	01-04-2012	5,91,269.26
42	BREAKER,25751081,AVR,ALSTOM	Capital Spare	-15,254.46	01-04-2012	11,423.43
43	RELAY,E/F,AREVA,MX31PG2A	Capital Spare	-2,18,260.50	01-04-2012	1,59,708.89

OTE: Yearwise detail need to be submitted.

(Petitioner)

FORM-9C			
Statement showing reconciliation of ACE claimed with the capital additions as per books			
Name of the Company : Indraprastha Power Generation Company Limited			
Name of the Power Station: Gas Turbine Power Station			
COD		(Rs in Crore)	
S.No.	Particulars	2017-18	2019-20
1	2	3	4
	Closing Gross Block	425.14	425.94
	Less: Opening Gross Block	425.14	425.94
	<b>Total additions as per books</b>	0	0
	<b>Less: Additions pertaining to other stages (give stagewise break-up)</b>	0	0
	Net additions pertaining to instant project / unit / stage	0	0
	Less: Exclusions (items not allowable / not claimed)	0	0
	<b>Net Additional Capital Expenditure claimed</b>	0	0
NOTE : Reason for exclusion of any expenditure shall be given in clear terms.			
<div style="text-align: right;">   (Petitioner) </div>			

FORM-9D			
Name of the Company : Indraprastha Power Generation Company Limited			
Name of the Power Station: Gas Turbine Power Station			
Statement of Capital Cost			
(To be given for relevant dates and year wise)			
		(Rs in Crore)	
S.No.	Particulars	2017-18	2019-20
A	a) Opening Gross Block Amount as per books	425.14	425.94
	b) Amount of Capital liabilities in A(a) above	0.00	0.00
	c) Amount of IDC in A(a) above	0.00	0.00
	d) Amount of FC in A(a) above	0.00	0.00
	e) Amount of FERV in A(a) above	0.00	0.00
	f) Amount of Hedging cost in A(a) above	0.00	0.00
	g) Amount of IEDC in A(a) above	0.00	0.00
B	a) Addition in Gross Block amount during the period (Direct purchases)	0.00	0.00
	b) Amount of Capital liabilities in B(a) above	0.00	0.00
	c) Amount of IDC in B(a) above	0.00	0.00
	d) Amount of FC in B(a) above	0.00	0.00
	e) Amount of FERV in B(a) above	0.00	0.00
	f) Amount of Hedging cost in B(a) above	0.00	0.00
	g) Amount of IEDC in B(a) above	0.00	0.00
C	a) Addition in Gross Block amount during the period (Transferred from CWIP)	0.00	0.00
	b) Amount of Capital liabilities in C(a) above	0.00	0.00
	c) Amount of IDC in C(a) above	0.00	0.00
	d) Amount of FC in C(a) above	0.00	0.00
	e) Amount of FERV in C(a) above	0.00	0.00
	f) Amount of Hedging cost in C(a) above	0.00	0.00
	g) Amount of IEDC in C(a) above	0.00	0.00
D	a) Deletion in Gross Block amount during the period	0.00	0.00
	b) Amount of Capital liabilities in D(a) above	0.00	0.00
	c) Amount of IDC in D(a) above	0.00	0.00
	d) Amount of FC in D(a) above	0.00	0.00
	e) Amount of FERV in D(a) above	0.00	0.00
	f) Amount of Hedging cost in D(a) above	0.00	0.00
	g) Amount of IEDC in D(a) above	0.00	0.00
E	a) Closing Gross Block amount as per books	425.14	425.94
	b) Amount of Capital liabilities in E(a) above	0.00	0.00
	c) Amount of IDC in E(a) above	0.00	0.00
	d) Amount of FC in E(a) above	0.00	0.00
	e) Amount of FERV in E(a) above	0.00	0.00
	f) Amount of Hedging cost in E(a) above	0.00	0.00
	g) Amount of IEDC in E(a) above	0.00	0.00
Note:			
1. Relevant date/s means date of COD of unit/s/station and financial year start date and end			
 (Petitioner)			

## Calculation of Depreciation

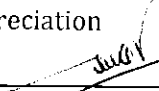
Name of the Company : Indraprastha Power Generation Company Limited

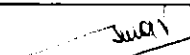
Name of the Power Station: Gas Turbine Power Station

Sl. No.	Name of the Assets <sup>1</sup>	Gross Block as on 31 st March of the previous control period or as on COD, whichever is later and subsequently for each	Depreciation rate as per DERC'S Depreciation rate schedule	(Amount in Rs.Cr)
				Depreciation amount for Each year
	1	2	3	4= Col. 2X Col. 3
1	land*			
2	Building			
3	and so on			
4				
5				
6				
	Total as on Fy 17-18	425.14	2.58%	10.95
	Weighted Average Rate of Depreciation (%)			

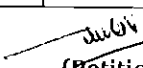
\* Provide details of freehold land and lease hold land separately

<sup>1</sup> Name of the Assets should conform to the description of the assets mentioned in Depreciation Schedule appended to the Notification

  
 (Petitioner)

<b>FORM-12</b>				
<b>Statement of Depreciation</b>				
<b>Name of the Company : Indraprastha Power Generation Company Limited</b>				
<b>Name of the Power Station: Gas Turbine Power Station</b>				
		(Rs in Crore )		
<b>Sl. No.</b>	<b>Particulars</b>	<b>2017-18</b>	<b>2018-19</b>	<b>2019-20</b>
1	2	3	4	5
	<b>Depreciation on Capital Cost</b>			
	Opening Capital Cost	425.14	425.14	425.94
	Closing Capital Cost	425.14	425.94	425.94
	<b>Average Capital Cost</b>	<b>425.14</b>	<b>425.54</b>	<b>425.94</b>
	Freehold land			
	Rate of depreciation	2.58%	2.60%	2.64%
	Depreciable Value@90%	382.626	382.986	383.346
	Balance useful life at the beginning of the period	4	3	2
	Remaining depreciable value	43.80	33.21	22.50
	<b>Depreciation (for the period)</b>	<b>10.95</b>	<b>11.07</b>	<b>11.25</b>
	<b>Depreciation (annualised)</b>	<b>10.95</b>	<b>11.07</b>	<b>11.25</b>
	Cumulative depreciation at the end of the period	338.83	349.78	360.85
	Less: Cumulative depreciation adjustment on account of un-discharged liabilities deducyed as on 31st, March of the previous control period/ Station COD	0	0	0
	Less: Cumulative depreciation adjustment on account of de-capitalisation	0	0	0
	Net Cumulative depreciation at the end of the period	349.78	360.85	372.10
	 <b>Petitioner</b>			

FORM-13A			
Calculation of Interest on Normative Loan			
Name of the Company : Indraprastha Power Generation Company Limited			
Name of the Power Station: Gas Turbine Power Station			
Particulars	(Rs in Crore)		
	2017-18	2018-19	2019-20
1	3	4	6
Gross Normative Loan -Opening	0.00	0.00	0.56
Cumulative repayment of Normative Loan upto previous year	0.00	0.00	0.00
<b>Net Normative Loan- Opening</b>	<b>0.00</b>	<b>0.00</b>	<b>0.56</b>
Add: Increase due to addition during the Year/ Period	0.00	0.56	0.00
Less: Decrease due to De- Capitalisation during the Year/ Period	0	0	0
Less: Decrease due to Reversal during the Year/ Period	0	0	0
Add: Increase due to discharge during the Year/ Period	0	0	0
Less: Repayment(s) of Loans during the year	-	-	-
<b>Net Normative Loan- Closing</b>	<b>0.00</b>	<b>0.56</b>	<b>0.56</b>
<b>Average Normative Loan</b>	<b>0.00</b>	<b>0.28</b>	<b>0.56</b>
Weighted average rate of interest	10.34%	10.36%	10.26%
Interest on Loan	0.00	0.03	0.06

  
 (Petitioner)

## Calculation of Interest on Working Capital

Name of the Company : Indraprastha Power Generation Company Limited

Name of the Power Station: Gas Turbine Power Station

Sl. No.	Particulars	(Rs in Crore)	
		2017-18	2019-20
1	2	3	4
1	Cost of Coal/ Lignite <sup>1</sup>		
2	Cost of Main Secondary Fuel Oil <sup>1</sup>		
3	Fuel cost for 1 month <sup>2</sup>	49.61	77.09
4	Liquid Fuel Stock <sup>2</sup>	35.52	30.52
5	O&M Expenses for 1 month	6.67	7.44
6	Maintenance Spares @ 30% of O&M expenses	24.02	26.79
7	Receivables for 2 months	121.91	178.98
8A	Total Working Capital	237.73	320.83
9	Rate of interest*	11.50%	11.50%
13	Interest on working capital	27.34	36.90

<sup>1</sup> For Coal based / Lignite based generating station.<sup>2</sup> For Gas Turbine/ Combined Cycle generating stations duly taking into account the annual mode of operation (last available) on gas fuel and liquid fuel.

\* As per existing rate of interest for the outstanding loans of petitioner for FY 17-18

  
 (Petitioner)

Details/ Information to be Submitted in respect of Fuel for computation of Energy Charges<sup>1</sup>

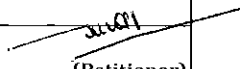
Name of the Company : Indraprastha Power Generation Company Limited

Name of the Power Station: Gas Turbine Power Station


Sl. No.	Months	Units	April 17 to March 18	
			Domestic	Imported
1	Quantity of Gas supplied by Gas Company*	(Million SCM)	126556.00	25977.30
2	Adjustment (+/-) in quantity supplied by Gas Company	(Million SCM)		
3	Gas Supplied by Gas Company (1+2)	(Million SCM)	126556.00	25977.30
4	Normative Transit & Handling Losses	(Million SCM)		
5	Net Gas Supplied (3-4)	(Million SCM)	126556.00	25977.30
6	Amount charged by Gas Company	(Rs. )	123.89	65.65
7	Adjustment (+/-) in amount charged by Gas Company	(Rs. )		
8	Total Amount charged (6+7)	(Rs. )	123.89	65.65
9	Transportation Charges by rail/ship/road/gas pipeline	(Rs. )		
10	Adjustment (+/-) in amount charged made by Transport Company	(Rs. )		
11	Demurrage / Imbalance/ Ship or Pay Charges, if any	(Rs. )		
12	Cost of diesel in transporting coal through MGR system, if applicable	(Rs. )		
13	Total Transportation Charges (9+/- 10-11+12)	(Rs. )		
14	Total Amount charged for gas supplied including Transportation (8+13)	(Rs. )		
15	Landed cost of Coal/Lignite/Gas	Rs./SCM	12.426	
16	Blending Ratio (Domestic/ Imported)			
17	Weighted average cost of coal/Lignite for preceding three months	Rs./SCM		
18	GCV of domestic coal/Gas as per bill of Company	Kcal/SCM		
19	GCV of Imported coal/Gas as per bill of Company	Kcal/SCM		
20	Weighted average GCV of coal/Lignite/GAS as Billed	Kcal/SCM		
21	GCV of domestic coal/Gas received at Station	Kcal/SCM		
22	GCV of Imported coal/Gas received at Station	Kcal/SCM		
23	Weighted average GCV of coal/Lignite/GAS as received	Kcal/SCM	9425.986	

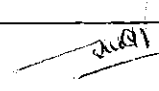
1 Similar details to be furnished for natural gas / liquid fuel for CCGT station and secondary fuel oil for coal/ lignite based thermal plants with

2 As billed and as received GCV, quantity of coal, and price should be submitted as certified by statutory auditor

  
 (Petitioner)

FORM-18			
Employee Expenses			
Name of the Company : Indraprastha Power Generation Company Limited			
Name of the Power Station: Gas Turbine Power Station			
		(Rs in Crore)	
Sl. No.	Particulars	2017-18	2019-20
1	Salaries	38.35	
2	Additional Pay		
3	Dearness Allowance (DA)		
4	Other Allowances & Relief		
5	Addl. Pay & C.Off Encashment		
6	Interim Relief / Wage Revision		
7	Honorarium/Overtime		
8	Bonus/ Exgratia To Employees		
9	Medical Expenses Reimbursement		
10	Travelling Allowance(Conveyance Allowance)		
11	Leave Travel Assistance		
12	Earned Leave Encashment		
13	Payment Under Workman's Compensation And Gratuity		
14	Subsidised Electricity To Employees		
15	Any Other Item		
16	Staff Welfare Expenses		
17	Apprentice And Other Training Expenses		
18	Contribution To Terminal Benefits		
19	Provident Fund Contribution		
20	Provision for PF Fund		
21	Any Other Items		
	<b>Total Employee Costs</b>	<b>38.35</b>	
22	Less: Employee expenses capitalised	0	
	<b>Net Employee expenses (D)-(E)</b>	<b>38.35</b>	

  
 (Petitioner)

FORM-18 (a)							
Employee Strength							
Name of the Company : Indraprastha Power Generation Company Limited							
Name of the Power Station: Gas Turbine Power Station							
S.No.	Particulars	Opening Balance	Retired /Deaths	Addition	Transfer	Closing Balance	Reconciliation with Audited Accounts of the year (Please mention Exact Note/Schedule for the Audited Accounts), if available
A	FRSR	475	46	14	265	178	
B	Non-FRSR	142	0	7	105	44	
							<div style="text-align: right;">             Petitioner         </div>

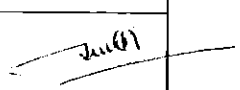



## Legal Expenses

Name of the Company : Indraprastha Power Generation Company Limited

Name of the Power Station: Gas Turbine Power Station

S. No.	Particulars	Case No.	Matter	Fees Per Hearing (Rs)	Total Fees (Rs.)	
A)	Cases other than 142 before					Reconciliation with Audited Accounts of the year (Please mention Exact Note/Schedule for the Audited Accounts), if available
1	DERC	Review petition no. 59 of 2017	Against DERC order dt. 31.08.2017 (filed by IPGCL Vs DERC & Ors)	30000	162072	
2	APTEL	APPEAL No. 92 of 2016	Against DERC order dt. 29.09.2015 (filed by BRPL Vs DERC & Ors)	30000	132000	
3	APTEL	APPEAL No. 284 of 2015	Against DERC order dt. 29.09.2015 (filed by IPGCL Vs DERC & Ors)	30000	122549	
4	Supreme Court	Contempt petition Nos. 59 & 83 of 2015	Filed by IPGCL & PPCL in writ petition No. 104 & 105 of 2014 (BRPL & BYPL Vs UOI & ORS)		1226500	
5	Others					
B)	Cases under 142					

  
 Petitioner

FORM-20		
R & M Expenses		
Name of the Company : Indraprastha Power Generation Cor		
Name of the Power Station: Gas Turbine Power Station		
Sl. No.	Particulars	2017-18 (Rs in Crore)
1	Plant and Machinery	13.08
2	Building	0.73
3	Civil Works	
4	Hydraulic Works	
5	Lines, Cables Net Works etc.	
6	Vehicles	
7	Furniture and Fixtures	
8	Office Equipments	
9	Station Supplies (STP Expenditure)	
10	DLN Burners	
11	Other Credits to R&M Charges	0.34
12	Others*	
	<b>Total</b>	<b>14.14</b>
13	Any other items (Capitalisation)	-
	<b>Total</b>	<b>14.14</b>
		 (Petitioner)

## Variable charges for Gas power Plant

Name of the Company : Indraprastha Power Generation Company Limited

Name of the Power Station: Gas Turbine Power Station

Particulars	UoM	Plant	Combined Cycle	Open Cycle
Description	MW	270	270	180
GHR claimed By GTPS	Kcal/kWh	2483	2472	3444
Target Availability claimed	%	85	85	85
Time of operation	Days	365	365	365
Gross Generation	MU	578.977	572.140	6.837
Auxilliary Consumption	%	3.78	3.78	0.5
Net Generation	MU	557.079	550.50	6.803
Total Gross Heat value required	Kcal	1437776619915.03	1414232125365.09	23544494549.94
Gross Heat Obtained from KG Basin Gas	MMBTU/day-GCV			
1 MMBTU	Kcal			
Total Gas required	SCM	152533286.2	150035457.9	2497828.296
Gross Heat Obtained from KG Basin Gas for the period	Kcal	1192915084216.00		
Gross Calorific value of Gas (Assumed)	Kcal/SCM	9425.986	9425.986	9425.986
Volume of KG Basin Gas (APM+PMT+NAPM)	SCM	126556000		
Balance Heat Required from RLNG	Kcal	244858251590.10		
Gross Calorific value of RLNG (Assumed)	Kcal/SCM	9425.86	9425.86	9425.86
Quantity of RLNG required(RLNG+SPOT-RLNG)	SCM	25977285		
Price of KG Basin Gas	Rs./MMBTU-GCV			
Price of KG Basin Gas	Rs./SCM	9.789	9.789	9.789
Price of RLNG	Rs./MMBTU-GCV			
Price of RLNG	Rs./SCM	25.273	25.273	25.273
KG Basis Gas Landed Cost	Rs. Crores	123.89		
RLNG Landed Cost	Rs. Crores	65.65		
Avg. Landed Cost of Total Gas	Rs./SCM	12.426	12.426	12.426
Total Fuel Cost	Rs. Crores	189.54	186.43	3.10
Monthly Fuel Cost	Rs. Crores	15.79	15.54	0.26
Energy Charge rate on Ex-basis	Rs./Unit	3.402	3.387	4.563
Net Generation from KG Basin Gas	Mus			
Net Generation from RLNGs	MUs			
Energy Charge Rate on Ex-bus basis from KG Basin Gas	Rs./Unit	2.68	2.67	3.59
Energy Charge Rate on Ex-bus basis from RLNG	Rs./Unit	6.92	6.89	9.28

(Petitioner)