Reason for variation of PLF, SOC, APC & Heat rate from CERC norms

Bokaro 'B' Thermal Power Station

Background:

Bokaro 'B' Thermal Power Station consists of 3 x 210 MW generating Units. The turbo generator and associated equipments were supplied by BHEL and the boiler and auxiliaries were supplied, erected and commissioned by ABL (presently named as M/s APIL). The control and instrumentation system was supplied, erected and commissioned by M/s. BELL's Control Ltd. which has already been closed. The water treatment and DM PLANT system was supplied and commissioned by M/S. Bharat Process and Mechanical Engineers Ltd. The C.H.P was supplied, erected and commissioned by M/s. MAMC though most of the vital equipments such as Crushers, Vibro-feeders, conveyors etc. were their bought out items from different firms, such as M/s. Mcnally Bharat Engg. Co. ltd, M/s. TRF Ltd. Etc. The rail borne coal handling system (RCTS) was supplied, erected and commissioned by M/s. Damodar Ropeway and construction Co. Ltd. (DRCC) and so on. The common service pipelines were fabricated and erected by some smaller firms. The electrical cabling system was done by M/s. INCAB Ltd.

From the above it is seen that the plant was supplied, erected and commissioned by a number of agencies without being executed on a turnkey basis for better and complete system integration.

The contracts to the different agencies were awarded in late 1970s and the construction job was started in early part of 1980s. The unit No.1 was commissioned in March 1986.Thereafter M/s. ABL suffered lockout, resulting in stoppage of erection job of the balance two nos. of boilers and auxiliaries. The equipments remained scattered in sheds and temporary company construction stores, in some cases even in open yards. Subsequently, by some contractual arrangement, M/s. AICOM Ltd. undertook the job of erection and commissioning of boiler and auxiliaries and Unit No. II was commissioned in 1990 and Unit No. III was commissioned in 1993 resulting in a gestation period of more than 10 years & by that time some equipment had already borne the brunt of stagnation.

The turbines are of LMW design with Hydro Mechanical Governing System. The boilers are of double down shot BABCOCK design with static tubular type Air Pre Heater. The pulverisers are 8.5 E (10) ball mills with MS piping and cast iron bends. The steam parameters mis-match both during start up and load fluctuations between turbine and boiler continues to be a nagging problem right from the inception, which results in higher cold start up duration and temperature surging in platen super heater elements. The platen super heater elements are thus susceptible to failure very frequently resulting in long shut down period and loss of generation.

The second pass of the boiler is bi-segmented, with the remote part accommodating half of the forced flow section & horizontal re-heater sections, the other compartment accommodating the other half of the forced flow section and primary super heater sections. Super heater and re-heater gas dampers have been provided for temperature balance between super heaters and re-heaters. The Re-heater temperature could never be achieved to its rated value ($540^{o}C$) even with the Re-heater gas dampers fully opened and Super-heater dampers substantially throttled. Re-heater attemperator spray were of no use and has been blanked, whereas super-heater attemperation water is invariably always at its maximum. The above two factors results high heat rate & consequently loss of efficiency of the boiler.

Because of the higher volume of flue gas flow through the re-heater segments, elements of Horizontal Re-heater and forced flow section in this compartment are susceptible to faster erosion and reduction of their life.

Economizer element tubes are of medium carbon steel with thickness of 3.6mm, bottom & intermediate bank tubes of horizontal Re-heater are of medium carbon steel with tube thickness of 3.2 mm, top bank tubes are of CML with tube thickness 4.9 mm. Because of the faster erosion and economical tube thickness design, both horizontal Re-heater & Economizer tubes are susceptible to failure very frequently resulting in frequent shut down of the units and loss of generation.

The boilers were designed with double down shot fuel injection system to make them suitable for low volatile and high ash content coal. Though, to some extent the purpose has served in terms of stability of flame in the furnace at lower loads, this has resulted in high percentage of un-combustibles in bottom ash (more than 20%) and also in the fly ash (8 to 10%). These results in loss of efficiency and high heat rate of the unit and the designed parameters are not achieved.

The manufacturer of the boiler system, M/s ABB (Presently M/s. APIL) was contacted on many occasions to come out with a solution to the above problems, but so far nothing concrete could be evolved. On one occasion, they have opined that high percentage of un-burnt carbon is unavoidable with the existing 8.5 E coal mills installed for double down shot fire boilers and suggested for their modification which is under our consideration.

Coal Handling Plant:

Raw coal is supplied to the plant by road as well as by rail. Road-borne coal is fed to the crushing plant through reclaim hoppers #1A & 1B & transported to the crushers by Conveyor Belt # 2A & 2B. It was supposed to feed raw coal to these hoppers by dozers but presently dozing operation has been discontinued due to damage of the peripheral roof of the hoppers. Coal is being fed by Pay Loaders, thereby restricting the coal crushing capacity.

The crushed coal is being fed to the coal bunkers through crushed coal reclaim hoppers 2A &2B, the roof of which is also in bad shape. Movement of Dozers near the hoppers has been withdrawn. Crushed coal is either directly fed to the Reclaim Hopper from the crushing plant through Conveyor Belt #4A & 4B(one meant for road side crushing & another for RCT crushing) or from the crushed coal yard by Pay Loaders.

The RCT system designed for handling Rail-borne coal has a limited capacity (1600 Tons), thus only half rack consisting of 32 wagons is brought to avoid undue long detention & demurrage. Supply of racks is also irregular, thus further restricting the availability of crushed coal from RCT system.

There are situations, when all three units are available to generate at more than 80% PLF, but availability of crushed coal is not sufficient to meet the full load requirement & load is kept restricted resulting in low PLF.

The crushing plant is designed to handle 600 Tons/hr of raw coal from each of road-borne coal & RCT system. But in practice the feeder belts#2A &2B, though each designed for 600 tons/hr. can hardly handle 400 Tons each due to irregular feeding by pay loaders into reclaim hoppers(Dozers are not allowed in reclaim hoppers as pointed above). The

crusher outlet conveyor belts #4A & 4B, though each designed to handle 600 tons/hr., practically can hardly handle a maximum of 500 tons/hr.

Ash Handling System:

The bottom ash from each boiler is evacuated through clinker grinders, located in a pit below the ground level, which very frequently causes maintenance problems. Replacement of the grinders is practically possible during unit shut down only. There have been instances, when there is no way out but to restrict load due to bottom ash pulling problem, either due to frequent chocking of transport lines or non availability of clinker grinders due to their prolonged maintenance time for disadvantageous locations.

Though there are 6 no. of Ash Slurry Pumps, there are only four nos. of discharge lines, thus a maximum of 4 no. of Ash Slurry Pumps can be simultaneously run. In case, any of the transport line goes out for maintenance, only three nos. of pumps can be run which is not sufficient to evacuate the ash generated by full load generation. There are instances of restriction of load on this count also, even if generating capacity is available.

ESP & Ash Water System:

Originally the ESP's were designed for stack emission of 650 mg/m^3 in their ideal conditions of operation. The Intake Pump House has been installed on the upstream of the barrage constructed in early fifties. Substantial River silting has occurred right from barrage mouth up-to the 'B' Plant intake channel & beyond that also. Due to this, the intake channel & pumps pit get filled with sand & mud frequently, though it is being cleaned periodically. The ash water pumps designed to handle river water, are subjected to handle mud & sand also, thereby reducing their life & frequent non-availability. This affects the availability of sufficient ash water volume & pressure at the ESP end, which in turn has an adverse effect on the ash evacuation from the ESP system, thus increasing the stack emission. The high stack emission reduces the life of the ID Fans which need very frequent repair & maintenance, thus increasing the plant down time.

To improve the stack emissions, Additional ESP's have been installed, necessitating more quantity of ash water for proper evacuation of fly ash. To meet the requirement, though higher capacity pumps were installed in place of the existing pumps, those have not yielded very encouraging results because of fast erosion of the pump impellers, resulting in capacity reduction & frequent non-availability.

The above cited reasons right from the plant inception has contributed directly or indirectly for the wide variation of PLF, SOC, APC & Heat Rate from the presently issued CERC norms & it is difficult to achieve the same norms in the near future. However, some action plan has been initiated & some more programme will be taken up to improve the parameters as referred above to the best possible extent.

The best possible achievable parameters with respect to the above, with year-wise improvement are as follows, also indicating the action plans under process:

PLF/ PAF (Plant Load Factor/Plant Availability Factor):

Achievable projections-	Year: 05-06 -	50 %
	Year: 06-07 -	55%
	Year: 07-08 -	60%
	Year: 08-09 -	65%

Action Plans:

1. Arrangement is being made to feed road-borne coal into RCT hoppers to improve capacity utilization & thus better availability of crushed coal.

2. Renovation of Reclaim Hopper 1A/1B will be taken up in near future, though plant may have to be run on partial load during that period.

3. Platen super heater outlet header for Unit 1& 2 has been replaced and it will be replaced in Unit No. 3 during the ensuing overhauling. All the 03 headers used to develop crack from the stub joints, requiring frequent shut down for maintenance.

4. Attemperator nozzles of unit No. 1 has been replaced and programmed to be replaced for unit 2 & 3 shortly.

5. Economizer elements of all the three units are being replaced during their respective overhauling. Cassette baffles are being installed on the economizer elements to reduce erosion of the element tubes.

6. Deteriorated platen super heater loops are being replaced during the units overhauling periods.

7. Guillotine type isolating gates are programmed to be installed on the ID fan suction and discharge ducts for repair and maintenance of the fans during unit running conditions.

8. Dry Fly Ash evacuation system is being programmed, Tender for which has already been floated for finalization of contract.

9. Carbon steel tube bank of HP heater 05 is programmed to be replaced by S.S tube bends as Carbon Steel tubes has started failing frequently, necessitating frequent maintenance or reduced generation.

10. Improved Capacity, three stage Ash Water Pump are programmed to be installed to augment the ash water pressure.

Specific Oil Consumption:

Achievable projections:	Year 05-06 -	4.0 ml / Kwh
	Year 06-07 -	3.5 ml / Kwh
	Year 07-08 -	3.0 ml / Kwh
	Year 08-09 -	2.5 ml / Kwh

Action Plan:

Specific Oil Consumption for oil support purpose during running of the units is so far well within acceptable limits. The high specific oil consumption is due to frequent start up of the units. This can be minimized by reducing the number of the unit's trip outs or shut down necessitated for boiler tube leakages etc.

Unit tripping due to electrical faults is programmed to be minimized with the following action plans:

- Action for replacement of existing 220KV & 132 KV CTs & PTs by new ones have been taken in phased manner. Already replacement of 21 nos of 220KV CTs for 220KV bays (18 nos.) has been done.

- VAJC Relays have been replaced. CTC team of Maithon has done some modification work utilizing contact of remote switches of Isolators in Relay/Control Panel in absence of VAJC Relay. Work is expected to be completed soon.

- Provision of Thrmography survey of 220KV & 132KV Switchyard is being done by M/s IIPM and will continue (Three times in a year) to detect the Hot spot in Connectors of pipe Bus & equipments.

- AMC of 220KV & 132KV isolators has been awarded. Overhauling of Isolators has been done.

- DGA test of transformer oil is carried out by CPRI team in CTC laboratory of Maithon.

- Action has been taken for conditioning monitoring of transformer. Order is to be placed on M/s Comptron Greaves Limited for ATR#1 & ATR#2. WO awarded.

- Programme has been made for filtration of oil of GT & UAT during overhauling of the units. Work will be carried out during respective Unit overhauling.

- Relay maintenance is done every year by DVC testing team of Maithon.

- No. of tripping due to excitation failure, technical snag in RCU, Rotor E/F etc. will come down by the erection & commissioning of Static Excitation Equipment(SEE) in phase wise in all the three units. First SEE is likely to be commissioned in U#3 during next annual overhauling.

- W.O. for thorough overhauling of all 220 KV & 132 KV MOCB is placed on M/s BHEL. Work will be started after receipt of material.

Auxiliary Power Consumption:

Achievable projections:	Year 05-06 -	10.8 %
	Year 06-07 -	10.5 %
	Year 07-08 -	10.25 %
	Year 08-09 -	10. 00 %

Reasons for higher APC as compared to CERC norms are:

i) Frequent start up

ii) Partial loading

iii) Leakage of Air pre-heater and ducts necessitating running of all the three ID fans on higher load.

iv) Passing of different valves necessitating over loading of boiler feed pump and CEP's

Action Plan:

1. Leakages of Air pre-heater and ducts are programmed to be minimized by repair and maintenance during unit overhauling. Replacement of Air-pre-heater tubes of unit No. 3 is programmed to be replaced at the earliest. Procurement action has already been initiated.
2. Reducing the number of units tripping and thus number of start up.
3. Servicing / replacement of passing valves thus reducing the loads of boiler feed pump and CEP's .

Heat Rate:

Achievable projections:	Year 05-06 -	3300 Kcal / kwh
	Year 06-07 -	3250 Kcal / Kwh
	Year 07-08 -	3200 Kcal / Kwh
	Year 08-09 -	3100 Kcal / Kwh

Reasons for higher heat rate as compared to CERC norms:

1. Coal pipe leakage, walker seal leakages of pulverized coal.
2. High un-burnt carbon in bottom ash and fly ash.
3. Running of units on partial load with sliding pressure.
4. Plugging of large number of condenser tubes resulting in low vacuum.
5. Occasional Non-availability of HP heaters due to tube leakage.
6. Higher system make-up due to passing of valves.

Action Plan:

1. C. I. Coal Pipe bends are being replaced with Ceramic lined bends to minimize coal pipe leakage.
2. Coal Mills are programmed to be modified to improve coal fineness for better combustion in furnace and thus reduced the combustibles in bottom ash & fly ash.
3. Servicing/ replacement of all high pressure valves during unit overhauling.
4. Reducing partial loading by better availability of mills.
5. Replacement of Plugged condenser tubes.
6. Improving condenser vacuum.
7. Replacement of HP Heater#5 tube bundles for which action has already been taken-up.

On execution of the action plans as stated above will definitely improve the present performance parameters to the extent as projected above but CERC norms may not be achieved because of inherent and inbuilt system deficiencies of Bokaro 'B' TPS.

It is therefore, prayed for acceptance of the projected performance parameters of Bokaro 'B' TPS as a special case.

Durgapur Thermal Power Station:

Background:

Durgapur Thermal Power Station (DTPS) with present installed capacity of 350 MW comprises U #3 of 140 MW and U #4 of 210 MW thermal units. U #3 provided with M/s ABL Make Boiler & M/s GE, USA Make T.G was commissioned in Dec. 1966 and U #4 of M/s BHEL Make Boiler & T.G commissioned in Sept. 1982. It may be noted that U #1 & #2 of DTPS were decommissioned in Oct.1985 due to severe fire damage.

Plant Load Factor/Availability Factor (PLF/PAF):

Unit #3 (140 MW)

Pre R&M	60% for 2005-06 and 65 % for 2006-07
Post R&M	70 % for 2007-08 and 72.5 % for 2008-09

Reasons for lower PLF/PAF:

1. Over loading of I.D Fans after installation of New ESP.
2. APH seal leakage.
3. Poor performance of milling system.
4. Deteriorated coal quality from design value.
5. Non- availability of HP heaters.
6. Due to deterioration in coal quality, non-availability (non-functioning) of soot blower sometimes load has to be decreased for maintaining Steam temperature.

Unit #4 (210 MW)

Year 2005-06 -	55.0%
Year 2006-07 -	57.5 %
Year 2007-08 -	60.0 %
Year 2008-09 -	65.0 %

Reasons for Lower PLF/PAF:

1. Capacity of coal mills is not sufficient in present coal conditions. Hence 5 no of mills are required to run for full load causing decrease in mills availability and overloading of PA fans also.
2. Over loading of I.D Fans after installation of Additional ESP.
3. Low PA header pressure.
4. Low Condenser vacuum.
5. APH modification and cooling tower revamping during capital overhaul of 2006-07.(Hence planned outage of the unit).
6. Deteriorated coal quality than design value.
7. Non- availability of HP heater.
8. Constraint in Ash disposal at continuous higher loading due to leakage in lines.

9. Older design of PA fan requires much time in maintenance if outage occurs.
10. Frequency of failure of GC1 gasket (condensate/ water box side) has increased. BHEL has suggested modified water box. Action initiated to procure new box.
11. Due to deterioration in coal quality, non –availability (non functioning) of soot blower sometimes load has to be decreased for maintaining Steam temperature.

Specific Oil Consumption (SOC):

Unit #3 (140 MW)

Year 2005-06 & 2006-07 -	3.5 ml/kwh
Year 2007-08 & 2008-09 -	3.0 ml/kwh

Reasons for higher SOC:

1. Poor performance/ troubles in milling system.
2. Deteriorated coal quality than design value.

Unit #4 (210 MW)

Year 2005-06	6ml/kwh
Year 2006-07	5ml/kwh
Year 2007-08 & 2008-09	4ml/kwh

Reasons for higher SOC

1. Poor performance of milling system.
2. Deteriorated coal quality than design value.
3. Low VM coal causing disturbance in flame condition and sensing of flame hence oil support required during those condition.

Auxiliary Power Consumption (APC):

Unit #3 (140 MW)

Year 2005-06 & 2006-07	11.5%
Year 2007-08 & 2008-09	11.0%

Reasons for higher APC

1. Over loading of I.D Fans after installation of New ESP.
2. Dependency of Unit #3 and #4 on each other in one or other auxiliary causing continuous service of some auxiliary even if the unit is down.
3. APH seal leakage and duct leakage.

Unit #4 (210 MW)

Year 2006-07	11.5%
Year 2007-08	11.0%

1. Over loading of I.D Fans after installation of Addl. ESP.
2. APH seal leakage.
3. Dependency of Unit #3 and #4 on each other in one or other auxiliary causing continuous service of some auxiliary if unit is down.
4. Duct leakage.
5. 5 mill operation due to deteriorated coal quality than design.
6. Poor performance of cooling tower, hence more number of CT Fans are required.

Heat rate:

Unit #3 (140 MW)

Pre R&M -	3100 Kcal/kwh for 2005-06 & 2006-07
Post R&M -	3000 Kcal/kwh for 2007-08 & 2008-09

1. Outage of HP heater.
2. Non- availability of soot blower.
3. APH seal leakage and old basket of APH.

Unit #4 (210 MW)

Year 2005-06 & 2006-07	3100 Kcal/kwh
Year 2007-08 & 2008-09	3000 Kcal/kwh

1. Outage of HP heater.
2. Non- availability of soot blower.
3. APH seal leakage and old basket of APH.

Chandrapura Thermal Power Station

Background:

Chandrapura Thermal Power Station (CTPS) with an installed capacity of 780 MW comprises of three nos. 140 MW (re-rated from 140 MW to 130 MW with effect from 01.12.1993) and three nos. 120 MW thermal units. The first three units (U #1, #2 & #3) of M/s GE, USA make were commissioned between 1964 and 1966 and the other three nos. units (U #4, #5 & #6) with M/s BHEL make Turbine and M/s ACC Babcock Limited (ABL) make Boilers were commissioned between 1974 and 1979. Considering de-rated capacity of U #1, #2 & #3 present capacity of CTPS is 750 MW (3x130 MW + 3x120 MW).

The performance of CTPS Units #4, #5 & #6 has been very poor since inception.

Unit # 4:

The main reason for poor performance of U #4 was the failure of Turbo-Generator (high vibration of TG Bearing No. #3) on 3rd June, '01.After O/H of TG and its auxiliaries Unit was synchronized on 23.04.03. Unit suffered forced outage on 29.05.03 due to a devastating fire that broke out in 3.3 KV Cable galleries. Prior to fire incidence during the operating period in Apr.-May'03 unit average load was 42.96 MW (PLF 35.8%). Also, during operation continuous oil support was unavoidable due to inherent problem of ABL Boiler right from its commissioning. Since then unit remained under shut down.

Unit # 5:

Unit operation was found to be uneconomical due to very high specific oil consumption, poor performance of cooling tower, coal mills and frequent boiler tube leakage (PLF: 01-02 29.36%, 02-03 16.4% & in 03-04 9.34%). Unit was last in operation on 23.11.03 and gone under S/D due to Boiler tube leakage and Generator Seal leakage. Later unit was kept available but not brought back to bar as per management decision because of uneconomic generation of the unit since very beginning owing to high SOC.

Unit # 6:

Since commissioning the unit could not be operated at rated capacity. Unit suffered forced outage in July '95 due to bursting of 3.3 KV Switch gear resulting in severe damage of all switch gears along with Bus bars, internal wiring, Protection relays and other accessories. After complete rehabilitation work, unit couldn't be stabilized and kept in continuous service in spite of repeated efforts mainly due to high turbine (IP Rotor vertical) eccentricity, high vibration in TG Bearing #3 & #5, erratic performance of coal mills, BFPs etc. Unit was last de-synchronized on 06.06.02 due to boiler tube leakage along with above problem.

In view of prolonged S/D of the Unit #4, #5 & #6 and uncertainty about their restoration and rehabilitation, the manpower, earlier engaged for O&M of above three units, had subsequently been reduced to bare minimum skeleton level as required for operation of safety measures.

For economical operation and improvement of station generation several actions has been initiated. DVC has given stress to run U #1, #2 & #3 at present. Performance of these three units has shown gradual improvement (Annual PLF considering these three units was 27.76 %, 34.22 % & 55.43% during 02-03, 03-04 & 04-05 respectively). SOC has been subsequently brought down from 16.435 ml/kWh in 03-04 to 2.61 ml/kWh in 04-05 which

is close to National average for such old units. A comprehensive R&M program will be taken up during 06-07 for these Units for Life Extension and Uprating the capacity. Also it has been decided to carry out Thermal Performance Test (TPT) scheduled in Nov.'05, based on which decision for revival of U #4, #5 & #6 will be taken.

Considering the present condition of such old units the Operating Norms in respect of U# I, II, & III of CTPS are being highlighted as:

a) Plant PLF: 55.0 %; excluding the period for RLA and R&M activities.

b) Plant SOC: 3.0 ml/kwh

c) Aux. Consumption: 11.5 %

d) Heat Rate: 3100 kcal/kwh

Justifications:

1. Non availability of designed coal quality (VM 19-20 % minimum) leads to poor stability in the furnace.

2. Suction type Coal Mills with Exhauster Fans demand frequent down time for maintenance work causing partial loading.

3. Secondary Air Damper Control (SADC) is carried out manually to satisfy all furnace conditions. Whereas the present input coal quality demands SADC in remote and auto control mode, to minimize delay between "Demand & Action".

4. HP Heaters are not in service for a prolonged period and as such economizer inlet feed water temperature is being maintained at lower level (175 deg. C) as compared to the rated value 242 deg. C. This is responsible for high heat rate figure and also poor condenser vacuum. Rated load (130 MW) can not be achieved without HP heaters to avoid over firing caused by low feed water temperature at economizer inlet.

5. Burner Tilt mechanism: Remote Control for synchronized tiling operation (up & down) of all the burners is not possible to attain desired flame stability as per the input coal quality and re-heater outlet steam temperature.

6. Capacity of Condensate pumps, CW pumps and CT Fans (for U#1 & 2) got reduced due to ageing and need replacement for the restoration of original capacities.

7. Rated Condenser vacuum can not be obtained without HP Heaters and rated flow through the Condensers.

8. Main Steam Air Ejector for U#3 is having inherent defect, since its performance has been found to be unsatisfactory in all load conditions and suspected to be of under capacity.

9. Bearing Cooling Water (BCW) Heat Exchangers for U#1 & 2 needs replacement due to profuse tube leakage and considerably deteriorated performance.

10. Overloading of ID Fans due to seal leakage in the rotary regenerative type Air Pre Heaters also restricts the boiler loading.

Mejia Thermal Power Station

Background:

Mejia Thermal Power Station consists of four 210 MW unit of BHEL make, COD Dec.'97, Mar.'99, Sep.'99 and Feb.'05. Further to this, Erection of 2x250 MW is in progress and likely to be commissioned by Mar.'07

MTPS (4X210MW units)

Projected Plant Load Factor/ Plant Availability Factor (PLF/PAF):

Year 05-06:	75 %
Year 06-07:	78 %
Year 07-08:	80 %
Year 08-09:	80 %

Reasons for deviation of PLF (%) against CERC norms:

- Deteriorated coal quality from designed value
- Receipt of less than required coal rakes and limitations of handling of road borne coal in RH-1 due to inherent system deficiency
  (a) Average receipt coal rakes is 2 nos per day against linkage of 3 nos per day
  (b) RH-1 can handle up to 3000 MT per day for road borne coal
- Lower performance of coal mills with manganese liners and high ash content in coal. Long drawn process of renovation of mills with superior liner and grinding technology undertaken to address the problem

Projected Specific Oil Consumption (SOC):

Year 05-06:	3.50 ml/kwh
Year 06-07:	3.25 ml/kwh
Year 07-08:	3.00 ml/kwh
Year 08-09:	2.75 ml/kwh

Reasons for high SOC:

- Furnace instability because of receipt of less than required coal rakes and limitations of handling of road borne coal in RH-1
- Deteriorated coal quality from designed value
  (a) Lower performance of coal mills with manganese liners and high ash content in coal
  (b) Low VM coal (14.5%)
- Non-commissioning and subsequent abandoning of DIPC system in Units#1,2,3 and non re-orientation of oil gun as in standard boiler design, because of which oil support is required in split coal elevation combinations.

Projected Auxiliary Power Consumption:

Year 05-06:	11.00 %
Year 06-07:	10.80 %
Year 07-08:	10.50 %
Year 08-09:	10.25 %

Reasons for deviation of APC:

- Partial loading because of receipt of less than required coal rakes and limitations of handling of road borne coal in RH-1
- Deteriorated coal quality from designed value – high ash content & low VM coal for which three no coal mills are to run for full load against designed two mill operation. Even during partial loading two mills are to run.
- Deteriorating performance of coal mills with manganese liners not compatible for type of coal received.
- Consumption of no rejection coal mill is high compared to other bowl type mills.
- Continuous running of three nos barrage intake pumps to draw water from Durgapur barrage through 17 KM long pipe line against 50 meter head, which is a specific system not prevailing in other thermal power stations.
- Recurrence of APH seals leakage and duct leakage, which are being addressed over a period of time through prolonged modification.
- Another system deficiency: (a) More than required no of CT fans in operation for Units#1,2&3 (b) More than two CW pumps required to be in service.

Projected Heat rate (kcal/kwh):

Year 05-06:	2650kcal/kwh
Year 06-07:	2625 kcal/kwh
Year 07-08:	2600 kcal/kwh
Year 08-09:	2550 kcal/kwh

Reasons for deviation in heat rate:

- Partial loading because of lower receipt of coal rakes and limitations of handling of road borne coal in RH-1 (details mentioned above)
- Condenser vacuum affected because of passing in PRDS spray line valve, retrofitting of valve with superior technology contemplated.
- Part availability of HP heaters (tube leakage, opening trouble of filling line valve etc.): Problems being analyzed for suitable remedial measure with due modification in the system – a long drawn process
- APH seal leakage

- Non – attaining of Main steam and re-heat temperature in ABCD combinations with both HP heaters in service: Another system deficiency. OEM undertaken study for remedial measure

- Both ejectors remain in service in Units #1, 2 & 3 to maintain required condenser vacuum