CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

Petition No. 146/GT/2015

Coram:

Shri Gireesh B. Pradhan, Chairperson
Shri A.K.Singhal, Member
Shri A. S. Bakshi, Member
Dr. M. K. Iyer, Member

Date of Order: 24th July, 2017

In the matter of

Approval of tariff of Circulating Fluidized Bed Combustion Technology based NLC Thermal Power Station-II Expansion Units I & II (2 x 250 MW) for the period from their actual date of commercial operation till 31.3.2019.

And

In the matter of

Neyveli Lignite Corporation Limited
Neyveli House, 135, EVR Periyar Road,
Kilpauk, Chennai – 600010 …….**Petitioner**

Vs

1. Tamil Nadu Generation and Distribution Company Ltd
800, Anna Salai
Chennai – 600002

2. Power Company of Karnataka Ltd.
KPTCL Building, Kaveri Bhavan, K.G.Road,
Bangalore – 560009

3. Bangalore Electricity Supply Company Ltd.
KR Circle, Bangalore – 560001

4. Mangalore Electricity Supply Company Ltd.
Paradigm Plaza, AB Shetty Circle,
Mangalore-575001

5. Gulbarga Electricity Supply Company Ltd.
Station Main Road, Gulbarga-585102

6. Hubli Electricity Supply Company Ltd.
Corporate Office, Navanagar,
PB Road, Hubli-580025

7. Chamundeshwari Electricity Supply Corporation Ltd.
Corporate Office, No.927, LJ Avenue, New Kantaraja Urs Road,
Saraswathipuram, Mysore-570009

8. Kerala State Electricity Board Ltd.
Vaidyuthi Bavanam, Pattom,
Thiruvananthapuram-695004

9. Puducherry Electricity Department
137, NSC Bose Salai,
Puducherry – 605001 ……..**Respondents**

Parties present:

Shri M.G. Ramachandran, Advocate, NLC
Ms. Anushree Bardhan, Advocate, NLC
Shri S. Gnana Prabhakaran, NLC
Shri S. Vallinayagam, Advocate, TANGEDCO
Shri R. Jayaprakash, TANGEDCO

ORDER

This petition has been filed by the petitioner, NLC for approval of tariff of Circulating Fluidized Bed Combustion (CFBC) Technology based NLC Thermal Power Station-II (Expansion) (2 x 250 MW) ('the generating station') for the period from their actual date of commercial operation (COD) of Units I &II till 31.3.2019, based on the provisions of the Central Electricity Regulatory Commission (Terms & Conditions of Tariff) Regulations, 2014 ('the 2014 Tariff Regulations'). The actual COD of Unit-I and Unit-II are 5.7.2015 and 22.4.2015 respectively.

2. The installed capacity of the project is 500 MW with CFBC lignite boilers feeding to turbines. The petitioner has entered into Power Purchase Agreements (PPA) with the respondent beneficiaries and the Ministry of Power, Govt. of India has allocated the power generated from this project amongst the respondent beneficiaries. The allocation of power from the generating station to the respondents and beneficiaries as per the Ministry of Power, Govt. of India vide letter dated 9.3.2004 is as under:

Name of the Beneficiaries	% Allocation	Allocation in MW
Tamil Nadu	46	230
Karnataka	22	110
Kerala	14	70
Pondicherry	3	15
Unallocated	15	75
Total	**100**	**500**

3. The Commission vide order dated 6.10.2015 granted interim tariff from the actual date COD of Unit-II (22.4.2015) and from the anticipated COD of Unit-I (30.6.2015) to 31.3.2017 on *pro rata* based on 85% of the actual capital expenditure as on COD of Unit-II (22.4.2015) and anticipated COD of Unit-I (30.6.2015), pending approval of final tariff as under:

(₹in lakh)

	Actual COD of Unit-II (22.4.2015 to 4.7.2015)	**Actual COD of Unit-I** (5.7.2015 to 31.3.2016)	**2016-17**
Return on Equity	1774.85	12796.51	17346.38
Interest on Loan	1711.78	12001.86	15044.35
Depreciation	1295.20	9338.29	12658.56
Interest on Working Capital	426.12	3061.36	4165.10
O&M Expenses	1301.23	9368.85	13500.00
Total	**6509.18**	**46566.87**	**62714.40**

4. The petitioner vide affidavit dated 28.3.2016 has sought approval of tariff in accordance with the provisions of the 2014 Tariff Regulations. Accordingly, the annual fixed charges claimed by the petitioner for the period 2015-19 is as under:

(₹in lakh)

	2015-16 (Unit-II)	**2015-16 (station)**	**2016-17**	**2017-18**	**2018-19**
Depreciation	9725.47	19451.28	19934.69	20418.09	20418.09
Interest on Loan	12725.40	24731.99	23457.39	21796.86	19315.54
Return on Equity	11055.41	22104.04	22653.38	23202.71	23202.71
Interest on Working Capital	2680.56	5793.55	5832.22	5870.59	5869.72
O & M Expenses	6350.00	12700.00	13500.00	14350.00	15255.00
Total	**42536.84**	**84780.87**	**85377.66**	**85638.25**	**84061.06**

5. In response to the directions of the Commission, the petitioner has submitted the additional information and has served copies on the respondents. The respondents, TANGEDCO and KSEB have filed their replies and the petitioner has filed its rejoinder to the said replies. The matter was heard on 29.9.2016 and the Commission after directing the petitioner to file certain additional information reserved its orders in the petition. Based on the submissions of the parties and the documents available on record, we proceed to determine the tariff of the generating station for the period 2014-19 as stated in the subsequent paragraphs.

Admissibility of Additional ROE

6. The scheduled COD of the units of the generating station as per Investment Approval of the GOI dated 18.10.2004 and the actual COD of the units as submitted by the petitioner is as under:

Unit Nos	**Scheduled COD as per original GOI sanction dated 18.10.2004**	**Actual COD**	**Time overrun (months)**
I	1.2.2009 (53 months)	5.7.2015	**77**
II	1.6.2009 (57 months)	22.4.2015	**71**

7. The actual COD of Unit-II is 22.4.2015 and COD of Unit-I of the generating station is 5.7.2015. Hence, there is time overrun of 77 months for Unit-I and 71 months for Unit-II from the scheduled COD of the generating station. The date of original investment approval is 18.10.2004. As specified by the Commission, the time line for completion of a green field gas based combined cycle project above 250 MW CBFC technology from the date of investment approval is 33 months for the first block with subsequent units at an interval of 4 months each. The actual COD of Block-I/ Unit-I is 5.7.2015 i.e. about 77 months from the date of investment approval and the actual COD of Block-II /Unit-II (generating station) is 22.4.2015 i.e. about 71 months from the date of investment approval. Since the generating station was declared under commercial operation on 5.7.2015 and is beyond the time line specified by the Commission, the generating station is not entitled of additional 0.5% ROE allowed for timely completion of the project.

Time Overrun

8. As stated the scheduled COD of the units of the generating station as per investment approval dated 18.10.2004 is 1.2.2009 for Unit- I and 1.6.2009 for Unit-II. However, Unit- I was declared under commercial operation on 5.7.2015 and Unit-II 22.4.2015. Thus, there is time overrun off 77 months for Unit-I and 71 months for Unit-II. The petitioner vide affidavit dated 8.5.2015 has furnished the justification for the time overrun and has submitted that the main plant package was awarded to indigenous reputed central public sector equipment manufacturer BHEL to develop in house technology, create expertise and reduced dependence on foreign manufacturers in the field of CFBC technology. It has also submitted that during the course of execution of the project from initial erection to commissioning of the Units, from initial light up to full load operation of the units, BHEL and NLC faced significant number of varied issues and challenges due to absorption of new technology and teething problems associated with this new technology. The petitioner has submitted that the delay in commissioning and declaration of commercial operation of the Units is beyond the control of the petitioner for the following reasons:

(A) <u>Huge quantum of works and manpower constraints during boiler erection</u>

(i) 250 MW CFBC boilers involve a huge quantum of equipments weighing about 30000 tons as against 16000 tons involved in conventional boilers. 56200 nos.(of which 8000 Nos. of T 91 special high alloy steel) of site welding joints as against 19500 site welding joints in conventional boiler. Welding of T91 joints is a special requirement for this boiler which has a long heat treatment cycle time (approx. 30 hours per cycle) for completing each joint.

(ii) There are several Link pipe- connections from Back pass to FBHEs for SH & RH Headers which involves welding of High Alloy steel (SA 335 P 91) with high Heat Treatment cycle time which is not the requirement for PF Boilers.

(iii) There are about 53 headers in this Boiler and welding of their connecting tubes to the respective SH& RH coils (involving T91 coils partially) are sequential and voluminous.

(iv) The erection of combustor ducts, Cyclones and FBHE's return legs etc. requires to be done in a specific sequence.

(v) Massive quantity of about 5000 Tons of Refractory application as against a mere 50 Tons involved in conventional boiler, which consumes more time.

(vi) The refractory application works involve 3 types of layers to be carried out sequentially one over the other after proper setting time.This consumes more time with enormous amount of shuttering works, anchor welding, Holders for Brick supports etc.

(vii) Based on the feedback regarding the refractory failure, Ceramic coating is done inside the cyclone areas.

(viii) It was envisaged during the course of erection to ensure surface protection against Sox and prevent refractory failure.

(ix) The design of CFBC boilers requires additional systems like Bed material system, Bed Ash system, Lime handling system; Emergency Boiler feed pump, Emergency cooling water system, Blowers and piping etc.

(x) The above quantum of works in this CFBC boiler is more than that of a 500 MW conventional boiler.

(xi) In general there was heavy shortage of both skilled and unskilled manpower in all the packages throughout the execution phase. The local manpower availability is very meager to cater the requirement and turnkey contractors have to mobilise most of the manpower from northernparts of the country.

(xii) The delays occurred due to product development and validity establishment in ordering and supply of associated equipments, for the execution of 250MW CFBC Boiler for the 1st time in India.

(xiii) The intricacies in the design & layout of boiler necessitate sequential erection of boiler equipments, which caused delay in erection. The engineering issues/fouling problems faced at site need to be re-designed and solved with suitable modifications. This caused considerable delay in execution.

(xiv) The location of the site-Cuddalore district is more prone for heavy rains and severe cyclonic storms. During the monsoon period (October to December) the progress of works got affected badly for 2 to 3 months every year due to the heavy rains. Also the site was ravaged on two occasions due to severe cyclonic storms. The Thane cyclone on 31.11.2011 with wind velocities reaching up to 140 kmph caused damages in the site and delayed the resumption of work.

(xv) Difficulties were faced during the civil foundation works in the initial construction periods due to the presence of water table and semi confined aquifers just below the surface level in this location. Due to this, continuous dewatering operations had to be carried out during foundation works with the result of huge volume of earth handling due to sliding of the strata. This caused considerable time for the completion of civil works.

(xvi) The erection work was stopped for a few days due to strikes on various accounts during 2007 to 2009.

(xvii) The above delays in erection activities accounted for delay of about 21 months up to the Hydro Test of Boiler I.

	Scheduled	Actual	Delay
Drum Lifting	Unit-I -19.11.2006 Unit-II-19.3.2007	Unit-I - 6.2.2008 Unit-II-31.5.2008	14 months for both units
Boiler Hydro Test	Unit-I -18.9.2007 Unit-II-18.1.2008	Unit-I -27.6.2009 Unit-II-30.7.2010	21 months 30 months
Boiler Light up	Unit-I -19.2.2008 Unit-II-19.6.2008	Unit-I -28.2.2011 Unit-II-28.2.2013	35 months 56 months

9. The petitioner has further submitted that at the time of investment approval, there was no bench mark time line available for units of 250MW CFBC Boilers in India and the above schedules were prepared on the basis of the schedules available for 125MW CFBC Boilers. It has also submitted that it has put forth all efforts by conducting review meetings with all levels of executives of M/s. BHEL and had amicably settled the issues arising then and there. Accordingly, it has submitted that the delay is due to the 250 MW CFBC technologies with huge quantum of works and other factors, over which the petitioner has no control.

(B) <u>Delay during commissioning activities of Unit-I</u>

10. The petitioner has submitted that the delay during the commissioning activities of Unit-I are on account of the following:

(i) In view of the delay in erection activities of Boiler and Turbo Generator of both units of the generating station, first boiler light up could be done on 28.2.2011 and synchronized for first time on 18.5.2011. Even though the unit was synchronized, technical snags like PA fan failure, FBHE coils support failures, refractory failures, problems in transport and extraction conveyors, etc were persisting which warranted frequent shut down for carrying out the rectification and modifications works. In Unit-I, full load of 250 MW was raised for a couple of minutes on 4.2.2012. The unit was not able to be kept in sustained operation continuously due to development of puncture in back pass economizer coil, super heater coil puncture in FBHE2 requirement of rectification of refractory works.

(ii) The unit was in service from February, 2012 to March, 2012 and thereafter from 19.3.2012 the unit was under shut down for FBHE coil support strengthening. The sleeve cracks were attended and the spacer rodswere replaced with tubes of higher diameter. The unit was in service from 4.11.2012 to 25.11.2012.

(iii) The unit was under shutdown from 25.11.2012 for major modifications and design improvements in FBHEs coil supports. On a detailed analysis of the FBHE coil supports failure, BHEL/R&D has found out the resonance of the natural frequency of the equipment and operating frequency of the equipment caused the failure of the supports. A totally modified design involving SS support blocks and SS hanger tubes has been designed and implemented.

(iv) These modifications warranted demolishing of 850 Tons of Refractory, cutting, dismantling and transporting entire super heater and reheater coils in FBHEs weighing around 600 MT to the BHEL shop floor, assembling, welding and testing with new SS support blocks, re-transport from BHEL/Trichy to Neyveli and erection. The re-erection involved fresh 9500 weld joints of T91 alloy steels which required sequential and uninterrupted heat treatment. Also the modifications warranted introduction of connectors of 347H material, the procurement of which also took time. All the above works has necessitated recasting of refractory to the tune of 850Tonnes. Despite close follow up the above modifications could be completed only in first week of February 2014 and the unit could be resynchronized by 13.2.2014 only.

(v) However due to some teething troubles, Unit-I was again under intermittent operation only and warranted improvements on the modifications carried out. M/s BHEL provided dog bone supports arrangements in the FBHE coils as part of modification in FBHE coil support. After carrying out these modification works between 13.6.2014 and 23.8.2014, the unit was in service intermittently from 24.8.2014 to 12.9.2014.

(vi) The unit was boxed up on 12.9.2014 due to damages in Non Metallic Expansion Joints provided in the seal pot 3 and 4 to combustor. The damaged NMEJs in the seal pot 3 and 4 were modified with Metallic Expansion joints and the unit was lighted up on 23.9.2014. The unit load went up to 203 MW on 25.9.2014. However, the unit got tripped on BP-1 protection at 192 MW, while raising the load.

(vii) At that time, it was noticed some red hotness in seal pot return line joining combustor. Hence, the inspection was carried out inside the combustor and it was noticed that refractory have failed in some portion and warranted immediate attention. After attending the works, the unit was lighted up on 13.10.2014 and the load raising activity was continued. Again the unit was tripped for attending the leak in water walls at rear pant leg on 28.10.2014.

(viii) After attending the leak in water walls at rear pant leg, the unit was lighted up on 02.11.2014 and tripped on 4.11.2014 due to the failure of refractory in the seal pot areas. After attending the refractory failure, Unit was lighted up and synchronized with southern grid on 05.01.2015 and was in service. Unit-I full load of capacity 250MW was reached on 6.1.2015. Due to the leak in the water wall, Unit-I was shut down on 7.1.2015.

(ix) After completion of modification in wind box sealing arrangement, the Unit-I was lighted up and synchronized on 29.1.2015. The Unit-I was in continuous service from 29.1.2015 to 5.2.2015. The Unit-I load was maintained around 200 MW. Load could not be raised above 210 MW asthere was some suspected air ingress in to flue gas at Regenerative Air Pre-Heater (RAPH).

(x) On 5.2.2015, unit tripped due to malfunctioning of the Primary air flow transmitter. On 6.2.2015, the combustor manholes were opened and it is observed that the bed materials are in coarse condition with small lumps.

- *The Regenerative Air Pre-Heater was checked for RAPH basket cleanliness and seal clearances. Water washing of RAPHs carried out and the seal clearances of RAPHs were adjusted.*
- *The coarse bed material was drained and fresh bed material was filled in the combustor.*
- *The Unit-I was lighted up on 19.2.2015 at 19.17 hours. The unit load was maintained around*

100 to 210 MW. During the service of the unit, problems were faced due to frequent tripping of Lignite feeders and load could not be raised above 210 MW due to ID fan suction pressure high.

(xi) On 13.3.2015 the Boiler tripped due to Economiser coil puncture, heavy leakage of hot bed materials through Start up burner 3 & 4 seal box and damages in Startup burner refractory was observed.

(xii) The unit was under shut down from 17.21 hours on 13.3.2015 due to the fire in the area of Startup burner 3 & 4 suspecting refractory failure and economizer puncture. The rectification works are under progress.

(xiii) The rectification of the refractory works was carried out from 13.3.2015 to 26.6.2015 and ID fan duct modification works was also taken up.

(xiv) Unit was synchronized at 02:11 hours on 27.6.2015 after attending economizer coil puncture and duct modifications in ESP inlet and outlet and ID fan inlet.

(xv) Full load was reached on 30.6.2015 by 14:00 hours and trial operation for COD was declared from 14:00 hours on 30.6.2015.

(xvi) 72 hours trial operation was completed on 4.7.2015 and COD of Unit-I was declared from 00:00 hours of 5.7.2015.

(C) <u>Delay during commissioning activities of Unit-II</u>

11. The petitioner has submitted that the delay during the commissioning activities of Unit-II is on account of the following:

(i) All the modifications which were carried out in Unit-I were carried out in Unit II also.

(ii) Finally the Unit-II was lighted up for first time on 22.5.2013 and subsequently EDTA cleaning and steam blowouts were completed on 22.7.2013. The rolling of the turbine to 3000 RPM (Full speed) and healthiness of the synchronization circuit was checked on 25.10.2013 and the unit was released for the FBHEs coil support modifications (in line with unit I) on 31.10.2013.

(iii) All the 144 numbers modified coils were erected and completed on 14.5.2014.

(iv) After completion of the modification works, Unit-II was lighted up on 22.11.2014 and synchronized with the Southern grid for the first time at 7.59 hours on 23.11.2014.

(v) The unit was in service intermittently up to 28.11.2014 and got tripped on 28.11.2014 due to main steam temperature very high protection. At that time of tripping, it was suspected that there was a puncture in the economizer as some water leak was observed in the rear right economizer hopper. Also during coast down time, STG did not come into service at 104 RPM and turbine shaft came to rest. During inspection, it was noticed that there was a scoring in the turbine rotor. The spare rotor available with the petitioner was spared in order to bring the unit at the earliest. The unit was lighted up on 19.1.2015 after attending all these above defects. The unit had reached full load of 250 MW on 24.1.2015 at 00.15 hrs. The Unit was shut down on 30.1.2015 due to suspected puncture in economizer.

(vi) After attending the defects, the unit was lighted up and synchronized with grid on 13.2.2015. Unit-II attained sustained operation of 250MW for eight hours up to 4.51 hours on 19.2.2015. then the unit was tripped due to the main steam pressure got dropped due to tripping of all lignite feeders as combustor differential pressure was very high. Unit was shut down from 19.2.2015 due to water wall puncture near right side of rear pant leg and refractory failure in FBHE 3 and 4.

(vii) After completion of the rectification works, Unit-II was synchronized with the grid on 30.3.2015 and reached full load of 250 MW on 7.4.2015. However, Unit-II was under shutdown from 8.4.2015 to attend the economizer puncture.

(viii) After attending the economizer punctures the unit was lighted up on 12.4.2015 and load raised to 250 MW on 15.4.2015. The 24 hours initial operations were completed on 16.4.2015 and 72 hours full load operation completed on 21.4.2015 and COD declared.

(ix) Notwithstanding all the sincere efforts put forth by the petitioner, due to the teething problems faced in assimilation of new technology during the commissioning of the units, the COD of the units could not be achieved within the time schedule over which the petitioner has no control.

12. The petitioner has further submitted that in order to facilitate the above modification/liquidation of defects various measures / repairs etc. were taken up in both the units. It has also submitted that the major issue ofFBHE supports failure was due to a unique unexpected problem of resonance of the natural frequency of the equipment and operating frequency of the equipment, which could not be foreseen. The petitioner has stated that in all such occasions, it was required to carry out engineering, preparation of drawings, offload to the sub-vendors and retrofit of the equipment which took considerable time. The petitioner has also stated that most of the major issues faced are attributable to the large size of the CFBC boiler which is being established for the first time in the country. It has stated that the CFBC technology also helped in overcoming one of the perennial problems faced in Neyveli due to presence of marcasite which causes slagging at operating temperatures and forms ash deposits on water wall tubes.

13. The petitioner has also submitted that the time taken in the execution of 250 MW CFBC units should be viewed in the light of adoption of better technology into the country within the prevailing infrastructure and system. It has also submitted that the benefits of technology in the form of higher efficiency, lower environmental pollution and cheaper power from a pit-head generating station will flow to the beneficiaries in the long run and in this context, the time taken should not be measured with any past bench mark. The petitioner has added that the successful demonstration of the unit's performance

signals the use of a new technology for utilizing India's vast lignite resource in an environmentally friendly and efficient manner.

14. In terms of the directions of the Commission in order dated 6.10.2015, the petitioner vide affidavit dated 28.3.2016 has amended the petition based on the actual date of commercial operation of the units of the generating station. As regards the reasons for the delay in declaration of COD of the generating station, the petitioner has submitted that the causes of delay are technology related and is beyond the control of the petitioner. The main reasons for the delay as submitted by the petitioner are summarized as under:

(a) Delay due to EPC Contract
(b) FBHE Failure.
(c) FBHE Empty chambers Refractory failure.
(d) Refractory Failure in Combustor and water wall exposure.
(e) PA Fan Bearing & Impeller Failure.
(f) Primary Air Duct SupportsDislocation:
(g) Clinker formation in Combustor due to non fluidization
(h) Frequent tripping of lignite feeders resulting in unequal firing in pant legs.
(i) Duct Modification:
(j) Accumulation of Bed material inside secondary air duct:
(k) Start up burner mouth choke problem resulting swirler modification and gun modification.
(l) SH coil failure and Hanger tube failure.
(m) Choking & Bed Formation in Lignite Transport Conveyors & Extraction Feeders.
(n) Back pass coil support Hanger tubes and roof sealing arrangement modification.
(o) Rotary air lock feeder Modification.
(p) Refractory Failure in lower secondary air openings modification therefore
(q) Refractory Failure in Cyclones resulting water wall exposure.
(r) Bed lancer Modifications due to erosion of bed lancer nozzle tips
(s) Seal pot return leg NMEJ Failure
(t) Seal pot Refractory Failure
(u) Blanking of PA Ducts to avoid Bed material overturn between pant legs
(v) Bed Material feeding system modification.

15. In response to the directions of the Commission vide ROP of the hearing dated 2.8.2016, the petitioner vide affidavit dated 31.8.2016 has reiterated its submissions for time overrun made vide affidavit dated 8.5.2015. However, the Commission vide ROP of the hearing dated 29.9.2016 had directed the petitioner to explain the reasons for delay with PERT chart giving details of activities delayed, working days/ months lost (quantification of days) with relevant documentary evidence. In compliance with the above directions the petitioner vide affidavit dated 2.11.2016 has submitted the reasons for delay in the completion of Unit-I & II with PERT chart as under:

S. No	Date		Delay In Days/ Months	Activity	Reasons for delay of Unit-I
	Scheduled as per LI Pert	Actual			
1	19.11.2006	6.2.2008	444 / 14	Boiler Drum lifting	Delay due to huge Quantum of Works like • Increased structures &equipments involved in CFBC Boiler • Requirement of high concreting quantity • Higher No. of site welding joints & Special high alloy steel (SA 213 Gr.T91) Weld-Joints • Huge quantity of Refractory • Intricacies in the design & layout of boiler necessitating sequential erection of boiler equipments. • Engineering issues/ fouling problem faced at site.
2	19.1.2007	29..2008	527 / 17	Condenser Erection	
3	18.9.2007	1.7.2009	652 / 21	Boiler Hydro-test	
4	17.1.2008	10.1.2010	724 / 24	Turbo-Generator & Aux box up	
5	18.3.2008	31.12.2010	1018 / 33	Turbine oil flushing completion	
6	18.4.2008	12.2.2011	1030 / 34	Turbine on barring gear	
7	19.2.2008	28.2.2011	1105 / 35	Boiler Light up	
8	1.5.2008	2.4.2011	1066 / 35	Steam blowing completion	Delay in erection of boiler and its auxiliaries.
9	19.5.2008	18.5.2011	1094 / 36	Synchronisation	
10	18.8.2008	4.2.2012	1265 / 41	Achieving full Load	• PA Fan bearing and impeller failure. • Primary air duct supports modification • Refractory failures in FBHE empty chambers, seal pots and combustors • Clinker formation in combustor due to non- • fluidisation • Bed formation in Lignite transport feeders, • ID fan duct modification, • Accumulation of bed materials in secondary air • ducts • Start upburners mouth choke problems. • Super heater coil failure and hanger failures • Back pass coil support hanger tubes and roof • ceiling arrangement modifications • Rotary Air Lock feeder modifications • MEJsand NMEJs failures • Bed material feeding system modification • Blanking of PA ducts to avoid bed material over-turn between pantlegs.
11	1.2.2009	5.7.2015	2345 / 77	COD of Unit-I	

S.No	Date		Delay in Days / Months	ACTIVITY	Reasons for delay of Unit-II
	Scheduled as per LI- PERT	Actual			
1	19.3.2007	31.5.2008	439 / 14	Boiler Drum lifting	Delay due to huge Quantum of Works like • Increased structures &equipments involved in CFBC Boiler • Requirement of high concreting quantity • Higher No. of site welding joints & Special high alloy steel (SA 21 Gr.T91) Weld-Joints • Huge quantity of Refractory • Intricacies in the design & layout of boiler necessitating sequential • Engineering issues/ fouling problem faced at site.
2	19.5.2007	30.6.2009	773 / 25	Condenser Erection	
3	18.1.2008	30.7.2010	924 / 30	Boiler Hydro-test	
4	17.5.2008	6.5.2011	1084 / 36	Turbo-Generator &	
5	18.7.2008	6.6.2012	1419 / 47	Turbine oil flushing	
6	18.8.2008	9.8.2012	1452 / 48	Turbine on barring	
7	19.6.2008	28.2.2013	1715 / 56	Boiler Light up	
8	1.9.2008	14.8.2013	1808 / 60	Steam blowing completion	All the pre-commissioning tests on Turbine and Generator were completed in August-2013. However, Unit-2 was not synchronised and released for boiler modifications works as done in Unit-1.
9	19.9.2008	23.11.2014	2256 / 74	Synchronisation	All the modifications carried out in Unit-I except duct modifications were carried out in Unit-II also from November, 2013 to November, 2014. Changing of LP Turbine rotor due to damages in bearing No.4 & LP Shaft in Unit-II during December,2014 to January,2015. Unit-II Lighted up on 10.11.2014, Synchronised on 23.11.2014 and full load reached on 24.1.2015
10	18.12.2008	24.1.2015	2228 / 71	Achieving full Load	
11	June 2009	22.4.2015	2151 / 71	COD	

Submission of the Respondents

KSEB

16. The respondent, KSEB Ltd has submitted that the reasons for time overrun due to huge quantum of works and manpower constraints during boiler erection in connection with CFBC technology is not acceptable as there was lack of proper planning and insight at the time of preparation of original sanction. Accordingly, the delay due to these factors is purely attributable to the petitioner. It has also submitted that CFBC technology is not new in India and large steam generators already exists and is operational in India with CFBC technology. The respondent as further submitted that CFBC technology for large units is a proven technology and not new and are in successful operation outside India. The respondent has stated that in the above background, the delay of 77 months for commissioning of the generating station is not justifiable as there has been severe laxity on the part of the petitioner for having not coordinated with the suppliers of CFBC technology for timely implementation of the project. The petitioner in its rejoinder has clarified that the delay was due to the new technology and was beyond the control of the petitioner. it has further submitted that the technological issues that sprung up as surprise during execution had to be tackled and hence, the delay was beyond the control of the generator.

TANGEDCO

17. The respondent, TANGEDCO has submitted that the delay is mainly due to non completion of essential works or choosing a wrong technology or an untested technology as in the present case. It has also submitted that the petitioner was fully aware of the work involved in going in for fluidized bed boiler for this generating station and should have monitored the project for timely execution. It has further submitted that the delay in this project has led to severe shortage of power in Tamil Nadu putting the public in great inconvenience and has resulted in costly power from the open market or through UI. The respondent has stated that the time limit of 6 months is more than sufficient for completing the teething problems and penal provisions should be thought of if the period is delayed. Accordingly, it has prayed that the claim of the petitioner for delay in COD of the generating station may be negated. The petitioner in its rejoinder has reiterated the submissions as regards time overrun and has stated that the delay is beyond the control of the petitioner.

Analysis and decision

18. We have examined the submissions of the parties and the documents available on record. The Appellate Tribunal for Electricity (the Tribunal), in the judgment dated 27.4.2011 in Appeal No. 72 of 2010 has laid down the following principles for prudence check of time overrun and cost overrun of a project :

" 7.4. The delay in execution of a generating project could occur due to following reasons:

Due to factors entirely attributable to the generating company, e.g.,

i) imprudence in selecting the contractors/suppliers and in executing contractual agreements including terms and conditions of the contracts, delay in award of contracts, delay in providing inputs like making land available to the contractors, delay in payments to contractors/suppliers as per the terms of contract, mismanagement of finances, slackness in project management like improper co-ordination between the various contractors, etc.

ii) due to factors beyond the control of the generating company e.g. delay caused due to force majeure like natural calamity or any other reasons which clearly establish, beyond any doubt, that there has been no imprudence on the part of the generating company in executing the project.

iii) Situation not covered by (i) & (ii) above.

In our opinion in the first case the entire cost due to time over run has to be borne by the generating company. However, the Liquidated Damages (LDs) and insurance proceeds on account of delay, if any, received by the generating company could be retained by the generating company. In the second case the generating company could be given benefit of the additional cost incurred due to time over-run. However, the consumers should get full benefit of the LDs recovered from the contractors/suppliers of the generating company and the insurance proceeds, if any, to reduce the capital cost. In the third case the additional cost due to time overrun including the LDs and insurance proceeds could be shared between

the generating company and the consumer. It would also be prudent to consider the delay with respect to some benchmarks rather than depending on the provisions of the contract between the generating company and its contractors/suppliers. If the time schedule is taken as per the terms of the contract, this may result in imprudent time schedule not in accordance with good industry practices.

7.5. In our opinion, the above principles will be in consonance with the provisions of Section 61(d) of the Act, safeguarding the consumers' interest and at the same time, ensuring recovery of cost of electricity in a reasonable manner. "

19. It is observed that the CFBC technology was adopted by the petitioner keeping in view its suitability for low grade fuel, high combustion efficiency, no slogging in furnace and hence no requirement of soot blowing, minimization of SO_2 formation, simple operation, quick start up and environment friendly nature. However, the main factors responsible for the delay of 77 months and 71 months in the COD of Unit-I & Unit-II as inferred from the submissions of the petitioner are (i) Increased quantum of work (ii) Various technical flaws (iii) Rain, cyclone, Storm, (iv) Supply of material, unavailability of skilled manpower and the same are discussed as under:

(A) <u>Delay due to increased quantum of work</u>

20. As stated, the petitioner vide affidavit dated 2.11.2016 has furnished the PERT chart indicating the reasons for the delay in milestone activities. It is observed from the details furnished that there has been a delay of 35 months in case of Unit-I and 56 months in case of Unit-II upto boiler light up. The main reason for delay upto boiler light up is the increased quantum of work in CFBC boiler with 2-3 times increase in steel work welding, refractory application etc. as compared to the conventional boiler. The petitioner while justifying such delay has submitted that there is increased work quantum specific to CFBC in respect of tonnage erection (2 times), site welding joints (about 3 times), refractory leading to more time consumption for their erection and operation works as can be seen from the comparative table below:

	CFBC Boiler	**Conventional Boilers**
Erection Quantity	30000 tons	16000 tons
Site Welding Joints	56200 Joints	19500 joints
Refractory Application	5000 tons	50 tons

21. The submissions of the petitioner that there was much more refractory application, erection quantity and welding joints in CFBC boiler compared to conventional boiler is acceptable. It is observed that the time taken in a conventional boiler from the foundation of civil work to Boiler light up is

approximately 24 months. Considering the volume of work involved in CFBC boiler the time taken from civil foundation work to Boiler light up is almost 48 months in the typical commissioning schedule of 53 months for Unit-I and 57 months for Unit-II as per investment approval of NLC, CFBC boiler for TPS-II(Exp.) and commissioning schedule of 36 months for Unit-I in case of conventional boiler in recently commissioned NTPC station, Bongaigaon TPS. It could be observed that the original commissioning schedule of the NLC TPS-II (Exp.) had margins of about 17 months keeping in view the quantum of work involved in CFBC boilers. In this backdrop, after giving thoughtful consideration to the submission of petitioner and the nature of refractory work, erection work and welding joints involved in execution of CFBC project along with the time taken by these special welding joints, refractory work etc., we are inclined to condone 35 months delay for Unit-I. The delay of 56 months for Unit-II is on a much higher side even after considering the volume of work and considering the fact that for same amount of work there was delay of 35 months in case of Unit-I. In view of this the delay of 35 months, instead of 56 months delay has been condoned in case of Unit-II also. Accordingly, time overrun of 35 months for Unit-I and 35 months for Unit-II up to boiler light up have been condoned.

(B) <u>Delay due to technical flaws</u>

22. It is observed from the submissions of the petitioner that there has been significant problems in implementation of the CFBC technology and the petitioner has submitted that such failures is due to the fact that 250 MW CFBC boilers are being implemented for the first time by the petitioner and also due to adoption of new technology, there were technical flaws and teething problems. It is noticed that there was delay of 42 months for Unit-I and 15 months for Unit-II from boiler light up to declaration of COD. The main reason for delay from boiler light up to COD in case of Unit-I is on account of failure of PA fan bearing & impellar, refractory failure, clinker formation due to non fluidization, bed formation in lignite transport feeders, accumulation of bed material in secondary air duct, burner choking, repeated failure of Superheater coil at higher loads etc. and modifications carried out for primary air duct support, ID fan duct, Back pass coil support and Rotary air lock feeder etc. In case of Unit-II it is noticed that all the design deficiencies/technical flaws have been corrected/rectified prior to the synchronization along with the rectification works undertaken for Unit-I. Therefore, the entire delay in respect of Unit-II was mainly

up to synchronization of the said unit. In fact, the petitioner had actually covered up the delay of 3 months up to COD and the total delay up to COD has been reduced to 71 months for Unit-II. The petitioner has attributed the delay of frequent and long shutdown of the units due to frequent cyclone chokes in both the units, HP casing temperature. It is observed that owing to the new technology the cause analysis and remedial measures were attempted by the EPC contractor, M/s. BHEL by trying successive attempts, modifications were carried out in ducts, hanger tubes, roof sealing and rotary air lock feeders etc. thereby consuming more time and leading to the outage for longer periods. In addition to this, other problems like failure of FBHE coil support due to resonance of natural frequency of the equipment and modification in the design, cutting, dismantling of entire SH and Reheater coils, refractory damages in both the units, modification work in the wind box assembly, economizer coil puncture etc. have also contributed to the delay in commissioning. As submitted by the petitioner all the modification works which were carried out in Unit-I of the generating station were also carried out in Unit-II also except the duct modification work which was carried out with respect to Unit-II only. In our considered view, the failure of PA fan, steam cooled wall tube, Non-metallic expansion joint in seal pots, PA wind box, Back pass entry FBHE support system, problem in lignite conveyor and feeders etc. experienced during achieving full load were design problems as CFBC boiler of higher size of 250 MW is the first of its kind in India. It is noticed that in respect of Circulating Fluidized Bed Combustion (CFBC) Technology of 125 MW at Barsingsar Thermal Power Plant (2x125 MW) of the petitioner which was commissioned by same EPC contractor M/s BHEL during 2011-12, technical flaws and teething problems had arisen and the Commission while determining the tariff of the generating station from COD of Unit-I (29.12.2011) to 31.3.2014 vide order dated 10.7.2015 in Petition No. 197/GT/2013 had partly condoned the time overrun on the ground that the delay due to technical flaws had occurred due to adoption of new technology. The petitioner and EPC contractor had gained experience up to some extent from Barsingsar project of the petitioner with regard to the defects in design and reasons for repeated failure in achieving sustained operation at full load. However, in case of this generating station, we notice that the technical problems faced were more severe compared to Barsingsar TPS and repetitive, where the petitioner had no other alternative but to repose confidence on the EPC

contractor to overcome these problems so that the machines are stabilized and COD could be declared. In our considered view, the up-gradation to higher sizes CFBC is a continuous process on the part of the manufacturer, the project company and would also involve the beneficiaries concerned. We also understand the fact that in its continuing improvement there would be problems during stages of design, manufacturing and engineering and also in stabilization of units. There is no denying of the fact that the delay due to technical flaws had occurred due to adoption of new technology and once the problems in Unit-I was rectified, there was not much problem faced in Unit-II due to technical flaws. Keeping in view the larger interest of environment, the beneficiaries and the Project developer, we are of the view that the beneficiaries cannot be fully burdened by passing over all the risks of huge delay in the commissioning of the project. Also, the beneficiaries should encourage the adoption of new technology which are environment friendly and share some risks towards unforeseen technical flaws which had occurred during the commissioning of the project. In this background, we are of the considered view that the delay of 42 months in case of Unit-I and 15 months in case of Unit-II from Boiler light up to COD shall equally be borne by the petitioner and beneficiaries in the ratio 50:50.

(C) Delay due to rain/cyclone storm

23. The petitioner has attributed the delay on the ground that the location of the site is more prone to heavy rains and cyclonic storms. The petitioner has submitted that during the north-east monsoon period i.e. (October to December) the progress of works got affected badly for 2 to 3 months every year due to the heavy rains and site was ravaged on two occasions due to severe cyclonic storms. It has also been submitted that the Thane cyclone on 31.11.2011 with wind velocities reaching up to 140 kmph caused damages in the site and had delayed the resumption of work. It has further submitted that difficulties were faced during the civil foundation works in the initial construction period due to presence of water table and semi confined aquifers just below the surface level in this location. As a result, continuous dewatering operations had to be carried out during foundation works with huge volume of earth handling due to sliding of the strata which caused considerable time for the completion of civil works.

24. Though the petitioner has submitted that heavy rains and cyclonic storms had badly affected the progress of work leading to delay in series of activities and consequently resulting in time overrun, it had not furnished the details of activities and the specific time period for which these activities were delayed. Therefore, it is not possible to quantify the exact period of delay and the works which were affected by rain and cyclonic storm. However, with the time overrun allowed up to boiler light up and from boiler light up to COD, the time overrun due to rain, cyclone etc. also has been considered seperately.

(D) Delay due to shortage of skilled man power and delay in manufacture and supply of material

25. The petitioner has submitted that the reasons for delay up to synchronization was on account of shortage of both skilled and unskilled manpower, manufacture & supply of equipment, supply of equipment and slow progress of erection work. With the condonation of delay of 35 months in case of Unit-I and 35 months in case of Unit-II, the reason of delay due to skilled manpower, supply of material etc. subsumed here. Hence, the reasons for delay due to shortage of both skilled and unskilled manpower & supply of equipments as submitted by the petitioner are not considered separately.

26. From the submissions above, it emerges that the problems faced by the petitioner in design, construction, erection and in commissioning (stabilization) of CFBC boilers was on account of adoption of new environment friendly technology and the same was intended for better utilization of scarce resources. The adoption of new technology was in good faith and the delay due to problems associated with new technology cannot be attributed to the petitioner. Accordingly, the situation is covered in terms of the principle laid down in para 7.4 (ii) of the judgment of the Tribunal and the time overrun of 56 months (35+21) for Unit I and 42.5 months (35+7.5) for Unit II has been condoned. The LD and Insurance proceeds if any, recovered for the total delay of 77 months and 71 months, shall be adjusted in the capital cost *pro rata* for 56 months for Unit-I and 42.5 months for Unit-II. The balance LD if any, may be retained by the petitioner.

27. Based on the above discussions, the time overrun allowed (against the actual time overrun) for Unit-I and Unit-II and the schedule CODs have been reset for the purpose of computation IDC, IEDC etc. is summarized as under:

Units	Schedule COD as per Investment Approval	Actual COD	Time Overrun considering SCOD (months)	Time overrun allowed (in months)	SCOD (reset) for IDC, IEDC computation
I	1.2.2009	5.7.2015	77	56	1.10.2013
II	1.6.2009	22.4.2015	71	42.5	16.12.2012

Impact of time overrun on contract price, IDC and IEDC etc

28. Due to time overrun in COD of Units-I & II, there is requirement of *pro-rata* reduction in contract price, IDC and IEDC. From the Form-5B furnished by the petitioner vide affidavit dated 28.3.2016 it is noticed that there is no increase in Main plant package cost, Civil works etc. on actual COD as compared to award value. The total actual expenditure on overheads as on station COD (5.7.2015) is ₹27655 lakh (comprising of ₹13695 lakh for Unit-II as on COD of Unit-II (i.e. 22.4.2015) and ₹13960 lakh for Unit-I as on COD of Unit-I). Thus, the total *pro-rata* deduction in Overhead expenses as submitted by the petitioner in Form-5B is worked out as under:

	Total period taken from zero date to actual COD (Months)	**Time overrun disallowed** (Months)	**Overhead Expenses under IEDC** *(₹ in lakh)*	**Pro-rata reduction = (col.4x col.3)/col.2** *(₹ in lakh)*
(1)	(2)	(3)	(4)	(5)
Unit-II	116	21	13695	2479.27
Unit-I/ Generating station	118.5	28.5	13960	3357.47

Capital Cost

29. Regulation 9 (2) of the 2014 Tariff Regulations provides as under:

> *"The Capital cost of a new project shall include the following:*
> *(a) The expenditure incurred or projected to be incurred up to the date of commercial operation of the project;*
>
> *(b) Interest during construction and financing charges, on the loans (i) being equal to 70% of the funds deployed, in the event of the actual equity in excess of 30% of the funds deployed, by treating the excess equity as normative loan, or (ii) being equal to the actual amount of loan in the event of the actual equity less than 30% of the funds deployed;*
>
> *(c) Increase in cost in contract packages as approved by the Commission;*
>
> *(d) Interest during construction and incidental expenditure during construction as computed in accordance with Regulation 11 of these regulations;*
>
> *(e) Capitalised Initial spares subject to the ceiling rates specified in Regulation 13 of these regulations;*
>
> *(f) Expenditure on account of additional capitalization and de-capitalisation determined in accordance with Regulation 14 of these regulations;*

(g) Adjustment of revenue due to sale of infirm power in excess of fuel cost prior to the COD as specified under Regulation 18 of these regulations; and

(h) adjustment of any revenue earned by the transmission licensee by using the assets before COD.

Approved Capital Cost

30. The project was sanctioned on 18.10.2004 by the Ministry of Coal, Govt of India at a capital cost of ₹2030.78 crore at January, 2004 Price Level, including IDC of ₹181.86 crore and Foreign Exchange component of ₹541 crore. As per Govt. of India guidelines, the Revised Cost Estimate (RCE-I) for the project was approved by the Govt. of India for ₹2453.57 crore (including IDC of ₹169.15 crore) on 10.7.2008. Thereafter, the project cost was revised taking into account the time and cost overrun and RCE-II for ₹3027.59 crore (including IDC) was approved by the Board of the Petitioner Company on 9.4.2012. The petitioner vide affidavit dated 4.7.2015 has submitted the RCE-III for ₹3583.77 crore (anticipated cost) approved by the Board of the petitioner company on 23.6.2015 and the Auditor certified Form-5B for Unit-II and Unit-I/generating station. The approved Project Cost as per original investment approval, RCE-I, RCE-II and RCE-III is given as under:

(₹ in crore)

	Sanctioned cost as per approval dated 18.10.2004	**As per RCE I dated10.7.2008**	**As per RCE II dated 9.4.2012**	**As per RCE III dated 23.6.2015**
Project Cost	2030.78	2453.57	3027.59	3583.77

* *Notional IDC of ₹38263 lakh and liabilities of ₹25077 lakh are included in the capital cost*

31. The Revised Cost Estimate (RCE-III) as approved by the Board of Directors of the Petitioner Company is ₹3583.77 crore including IDC of ₹793.10 crore which is ₹1552.99 crore higher than original approved cost of ₹2030.78 crore. Hence, there is increase of 76.47% in the approved cost as per RCE-III from the original investment approval cost. This increase is due to increase in Land site development cost, Civil works, IDC, Construction & Pre-commissioning activities etc.

Actual Capital Cost as on COD

32. In Form-5B submitted by the petitioner vide affidavit dated 28.3.2016, it is observed that the actual capital expenditure as on COD of Unit-II (22.4.2015) is ₹155780.00 lakh including IDC of ₹39512.00 lakh and Overheads of ₹13695.00 lakh. It is also observed that the actual capital expenditure as on

COD of Unit-I/ Station (5.7.2015) is ₹326055.00 lakh including IDC of ₹79551.00 lakh and Overheads of ₹27655.00 lakh. Accordingly, the capital cost considered by the petitioner for the purpose of tariff vide affidavit dated 28.3.2016 is as under:

(₹in lakh)

	2015-16 (Unit-II)	2015-16 (station)	2016-17	2017-18	2018-19
Capital Cost excluding IDC	116268.00	246504.00	370960.76	389399.03	389399.03
Add : IDC	39512.00	79551.00	0.00	0.00	0.00
Add :Notional IDC	17218.51	38267.03	0.00	0.00	0.00
Add Liabilities & Provisions	12538.00	6638.73	18438.27	0.00	0.00
Capital Cost	**185536.51**	**370960.76**	**389399.03**	**389399.03**	**389399.03**

IDC and Normative IDC

33. We have in this order decided that the impact of time overrun of 56 months (out of 77 months) for Unit I and 42.5 months (out of 71 months) for Unit II, is to be allowed. Accordingly, IDC and Normative IDC have been allowed upto SCOD (reset) (as per table at para 27 above) subject to truing-up.

34. It is noticed that the petitioner in the original petition vide affidavit dated 8.5.2015 (soft copy) has filled in Form 7 (Details of Project Specific Loan). Subsequently, vide affidavit dated 28.3.2016 the petitioner has revised and furnished Form 8 (Details of Allocation of Corporate Loan to various projects) instead of Form 7. In reply to ROP dated 2.8.2016, the petitioner has not furnished complete details/ documents in support of the revisions in floating rate of interest. In the absence of the same, the rate of interest as claimed by the petitioner vide affidavit dated 31.8.2016 has been considered in this order for the purpose of tariff with a direction to the petitioner to furnish comprehensive details/ documents at the time of truing up of tariff of the generating station for the period 2014-19. Accordingly, the IDC and Normative IDC is allowed as under:

(₹in lakh)

	COD of Unit-II (22.4.2015)	COD of Station (5.7.2015)
IDC computed up to SCOD (reset)	27281.65	58661.76
Normative IDC computed up to SCOD (reset)	5109.44	13340.58

Projected Additional Capital Expenditure from COD (5.7.2015) to 31.3.2019

35. The petitioner has not furnished the additional capital expenditure claimed in a year-wise chronological order. Accordingly, the petitioner was directed vide ROP of the hearing dated 2.8.2016 to submit the details as per the Form-9A of the 2014 Tariff Regulations and also to fill up the form in chronological order year-wise along with detailed justification clearly indicating the necessity and the benefits of such capitalization. In response, the petitioner vide affidavit dated 31.8.2016 has submitted that the additional capital expenditure for the period 2014-19 has not been envisaged now and the same would be claimed at the time truing up of tariff in terms of 2014 Tariff Regulations. In view of the submissions of the petitioner, no additional capital expenditure has been considered in this order. The claim of the petitioner at the time of truing up shall however be considered based on the justification and documents furnished by the petitioner in terms of the provisions of the 2014 Tariff Regulations.

Initial Spares

36. Regulation 13 of the 2014 Tariff Regulations provides as under:

> *"13. Initial Spares: Initial spares shall be capitalised as a percentage of the Plant and Machinery cost upto cut-off date, subject to following ceiling norms:*
>
> *(a) Coal-based/lignite-fired thermal generating stations - 4.0%*
>
> *(b) Gas Turbine/Combined Cycle thermal generating stations - 4.0%*
> *Provided that:*
>
> *i. where the benchmark norms for initial spares have been published as part of the benchmark norms for capital cost by the Commission, such norms shall apply to the exclusion of the norms specified above:*
>
> *iv. for the purpose of computing of initial the cost spares, plant and machinery cost shall be considered as project cost as on cut-off date excluding IDC, IEDC, Land Cost and cost of civil works. The transmission licensee shall submit the break-up of head wise IDC & IEDC in its tariff application."*

37. The petitioner vide affidavit dated 1.9.2016 has submitted that initial spares of ₹7951.06 lakh has been procured and capitalized for the generating station. It has further submitted that total value of initial spares amounting to ₹478.80 lakh is pending and is to be supplied during 2016-17. The COD of the Unit-I/Station is 5.7.2015 and accordingly, the cut-off date of the generating station is 31.3.2018. The total initial spares upto the cut-off date of the generating station works out to ₹8429.86 lakh (i.e. 7951.06 + 478.80). However, the petitioner has not claimed any additional capital expenditure including initial

spares of ₹478.80 lakh from COD to 31.3.2017 and has submitted that additional capital expenditure for the period 2014-19 would be claimed at the time of truing up of tariff of the generating station.

38. The total Plant and Machinery cost including taxes and duties as per Form-5B is ₹155138.00 lakh. Further, the petitioner has capitalized initial spares of ₹7951.00 lakh as on COD of the generating station (5.7.2015). Accordingly, the initial spares capitalized for ₹7951.00 lakh works out to 5.125% of the Plant and Equipment cost which is beyond the ceiling limit of 4% (₹6205.52 lakh) specified under the said regulations. Hence, initial spares have been restricted to ₹6205.52 lakh upto COD of the generating station with deduction of ₹1745.48 lakh as on COD of the generating station. The petitioner is directed to furnish the details of additional capital expenditure along with the break-up of actual plant & machinery cost up to cut-off date and the details of initial spares capitalized up to the cut-off date at the time of truing-up of tariff in terms of the Regulation 8 of the 2014 Tariff Regulations.

Infirm Power

39. The petitioner vide affidavit dated 28.3.2016 has submitted that the expenses incurred for fuel oil is more than the revenue earned from sale of infirm power and the reason for consumption of fuel oil was due to the more number of lighting up operation of the boiler for testing and trial operation. The petitioner has submitted that this was purely due to technology related issues and was not under the control of the petitioner. It has also submitted that the expenditure incurred on fuel during test and trial run was offset against the revenue earned through the sale of infirm power and the net expenditure was ₹234.54 crore. Considering the anomalous scenario of more number of repeated test trial run, the petitioner has prayed that it may be permitted the total expenses incurred for the start-up fuel over and above the revenue earned from the sale of infirm power in the capital cost.

40. The petitioner was directed vide ROP of the hearing dated 2.8.2016 to submit the details of infirm power injected in the grid from Unit-I and Unit-II separately till COD and the revenue earned from sale of infirm power excluding fuel cost, and the details of fuel used from synchronization till COD along with expenditure on fuel, for pre-commissioning activities. In response, the petitioner vide affidavit dated 31.8.2016 has furnished the detail of infirm power injected in the grid by Unit-I and Unit-II separately

from synchronization to COD of the Units, revenue earned from sale of infirm power excluding fuel cost and details of fuel used from synchronization to COD, for pre- commissioning activities as under:

	Unit	Unit-I	Unit-II	Total
Infirm power injected into the grid	kWh	210549209	102770722	313319931
Revenue earned from sale of Infirm Power	₹	357223272	131286187	488509459
Infirm power drawn from grid	kWh	90968996	23009110	113978106
Cost of Infirm Power drawn	₹	376700156	54301500	431001656
Lignite Consumption	MT	472198.073	187058.854	659256.927
Fuel cost Lignite	₹	888400024	351935130.3	1240335154
Consumption of oil (HFO)	KL	13773.005	1832.681	15605.686
Consumption of oil (LDO)	KL	4135.413	415.716	4551.129
Fuel cost (oil)	₹	1032885578	129678503	1162564081
Revenue from infirm power excluding fuel cost	**₹**	**(-) 1940762486**	**(-) 404628946.3**	**(-) 2345391432**

41. The petitioner has submitted that revenue from sale of infirm power excluding fuel cost from Units-I & II of the project till COD of the generating station is (-) ₹2345391432. It is observed from Form-5B furnished by the petitioner that this amount has been included as start-up fuel in the capital cost. In view of this, the revenue from sale of infirm power from Units-I& II of the project till the COD of the generating station is in order and no further adjustment has been made.

Liquidated Damages

42. The petitioner was directed vide ROP of the hearing dated 2.8.2016 to furnish the details of Liquidated Damages (LD) recovered from the contractors in different packages due to the delay in completion of works and for the defects in supplied items. In response, the petitioner vide affidavit dated 31.8.2016 has submitted that total amount withheld towards LD as ₹1917.88 lakh as detailed under:

Sl. No.	Package	Description	Name of Firm	LD amount withheld (in ₹)
1	A01	Main Plant	BHEL	114341148
2	A03	Ash Handling system	ENERGO	1609490
3	A04	Circulating water system	SPML	3324706
4	A06	Chimney + Cooling tower	GAMMON	55297890
5	A08	Switch Yard	BHEL	8678107
6	B01	DG Station	Jeevan Diesels	357089
7	C02	Gen. Civil works-Phase-II	RS Development & Co.	6246988
8	C02	Gen. Civil works - Phase-II- Gr-I	ECCI	752863
9	C02	Gen. Civil works- Phase-II- Gr-III	Diamond Infra Construction	325000
10	C02	Gen. Civil works- Phase-II- Gr-IV	ECCI	424203
11	C02	Gen. Civil works- Phase-II- Gr-V	ECCI	322810
12	C02	Roads & Drains- Phase-II- Gr-II	NSK Builders Pvt. Ltd.	107310
Total			**191787604**	

43. The petitioner has further submitted that the LD amount of ₹1917.88 lakh withheld is in the custody of the petitioner and based on the decision which is yet to be taken, the amount will be either refunded or accounted as LD. We are of the considered view that since the petitioner has kept an amount of ₹1917.88 Lakh in his possession as on date of COD of the generating station, the same needs to be adjusted in the capital cost to the extent the time overrun has been allowed in Unit-I and Unit-II respectively. The total LD amount of ₹1917.88 lakh withheld is for the total delay of 77 months, and hence the same is to be *prorated* for the time overrun allowed for 56 months for Unit-I and 42.5 months for Unit-II. However, the adjustment of LD will be done at the time of truing up exercise.

44. Based on the above, the capital cost considered for the purpose of tariff as on COD of the units is as under:

(₹ in lakh)

	COD-Unit-II (22.4.2015)	**COD-Station (5.7.2015)**
Capital cost including IDC, Normative IDC and Liabilities	185536.99	389398.64
Less: Liabilities	12538.50	25076.97
Capital cost including IDC and Normative IDC excluding Liabilities	172998.49	364321.67
Less: IDC	39512.39	79551.02
Less: Normative IDC	17218.51	38267.03
Capital cost excluding IDC, Normative IDC and Liabilities	116267.59	246503.62
Less: Pro-rata reduction on overhead expenses IEDC	2479.27	5836.74
Less: Initial spares beyond 4% of plant and machinery	872.74	1745.48
Less: Adjustment of LD recovered	384.93	646.45
Total Opening Capital cost excluding IDC, Normative IDC, Liabilities	**112530.65**	**238274.95**

Reasonableness of Capital Cost

45. The hard cost of the generating station up to 5.7.2015 (COD) works out as ₹4.76 crore/MW. For 250 MW unit (CFBC Technology) no benchmark cost has been specified by the Commission. In respect of a Green field project of 500MW unit size with conventional boilers, the benchmark hard cost as specified by the Commission in order dated 4.6.2012 for thermal power stations with coal as fuel at December, 2011 price level is ₹5.08 crore/MW for the first unit and ₹4.71 crore/MW for the second Unit. Considering 250 MW unit size of this generating station, the hard cost allowed as on COD of the station is found reasonable.

Discharge of Liabilities

46. The position of liabilities and provisions as on COD of generating station as per Form-5B duly certified by Auditor is ₹25076.97 lakh and an amount of ₹18438.26 in 2015-16 and ₹6638.71 in 2016-17 is projected to be discharged as per submission in Form 18 vide affidavit dated 28.3.2016. This has been considered subject to truing-up in terms of the Regulation 8 of the 2014 Tariff Regulations.

Capital Cost for 2015-19

47. Based on the above, the capital cost approved for the generating station for the period from 22.4.2015 to 31.3.2019 is as under:

(₹in lakh)

	2015-16		**2016-17**	**2017-18**	**2018-19**
	22.4.2015 to 4.7.2015 (Unit-II)	**5.7.2015 to 31.3.2016 (Units I & II)**			
Opening capital cost excluding IDC, normative IDC, liabilities	**112530.65**	**238274.95**	-	-	-
IDC allowed	27281.65	58661.76	-	-	-
Normative IDC allowed	5109.44	13340.58	-	-	-
Opening Capital Cost	144921.75	310277.29	316916.00	335354.26	335354.26
Discharge of Liabilities	0.00	6638.71	18438.26	0.00	0.00
Closing capital cost	**144921.75**	**316916.00**	**335354.26**	**335354.26**	**335354.26**

Debt Equity Ratio

48. Regulation 19 of the 2014 Tariff Regulations provides as under:

> *"19. Debt-Equity Ratio: (1) For a project declared under commercial operation on or after 1.4.2014, the debt equity ratio would be considered as 70:30 as on COD. If the equity actually deployed is more than 30% of the capital cost, equity in excess of 30% shall be treated as normative loan:*
>
> *Provided that:*
>
> *i. where equity actually deployed is less than 30% of the capital cost, actual equity shall be considered for determination of tariff:*
> *ii. the equity invested in foreign currency shall be designated in Indian rupees on the date of each investment:*
> *iii. any grant obtained for the execution of the project shall not be considered as a part of capital structure for the purpose of debt : equity ratio.*
>
> ***Explanation.-****The premium, if any, raised by the generating company or the transmission licensee, as the case may be, while issuing share capital and investment of internal resources created out of its free reserve, for the funding of the project, shall be reckoned as paid up capital for the purpose of computing return on equity, only if such premium amount and internal resources are actually utilised for meeting the capital expenditure of the generating station or the transmission system.*
>
> *(2) The generating company or the transmission licensee shall submit the resolution of the Board of the company or approval from Cabinet Committee on Economic Affairs (CCEA) regarding infusion of fund from internal resources in support of the utilization made or proposed to be made to meet the*

capital expenditure of the generating station or the transmission system including communication system, as the case may be.

(3) In case of the generating station and the transmission system including communication system declared under commercial operation prior to 1.4.2014, debt equity ratio allowed by the Commission for determination of tariff for the period ending 31.3.2014 shall be considered.

(4) In case of the generating station and the transmission system including communication system declared under commercial operation prior to 1.4.2014, but where debt: equity ratio has not been determined by the Commission for determination of tariff for the period ending 31.3.2014, the Commission shall approve the debt: equity ratio based on actual information provided by the generating company or the transmission licensee as the case may be.

(5) Any expenditure incurred or projected to be incurred on or after 1.4.2014 as may be admitted by the Commission as additional capital expenditure for determination of tariff, and renovation and modernisation expenditure for life extension shall be serviced in the manner specified in clause (1) of this regulation.

49. Accordingly, the debt equity ratio of 70:30 has been considered for the purpose of tariff.

Return on Equity

50. Regulation 24 of the 2014 Tariff Regulations provides as under:

"24. Return on Equity: *(1) Return on equity shall be computed in rupee terms, on the equity base determined in accordance with regulation 19.*

(2) Return on equity shall be computed at the base rate of 15.50% for thermal generating stations, transmission system including communication system and run of the river hydro generating station, and at the base rate of 16.50% for the storage type hydro generating stations including pumped storage hydro generating stations and run of river generating station with pondage:

Provided that:

i). in case of projects commissioned on or after 1st April, 2014, an additional return of 0.50 % shall be allowed, if such projects are completed within the timeline specified in Appendix-I:

ii). the additional return of 0.5% shall not be admissible if the project is not completed within the timeline specified above for reasons whatsoever:

iii). additional RoE of 0.50% may be allowed if any element of the transmission project is completed within the specified timeline and it is certified by the Regional Power Committee/National Power Committee that commissioning of the particular element will benefit the system operation in the regional/national grid:

iv). the rate of return of a new project shall be reduced by 1% for such period as may be decided by the Commission, if the generating station or transmission system is found to be declared under commercial operation without commissioning of any of the Restricted Governor Mode Operation (RGMO)/ Free Governor Mode Operation (FGMO), data telemetry, communication system up to load dispatch centre or protection system:

v) as and when any of the above requirements are found lacking in a generating station based on the report submitted by the respective RLDC, RoE shall be reduced by 1% for the period for which the deficiency continues: vi) additional RoE shall not be admissible for transmission line having length of less than 50 kilometers.

51. Regulation 25 of the 2014 Tariff Regulations provides as under:

Tax on Return on Equity:

(1) The base rate of return on equity as allowed by the Commission under Regulation 24 shall be grossed up with the effective tax rate of the respective financial year. For this purpose, the effective tax

rate shall be considered on the basis of actual tax paid in the respect of the financial year in line with the provisions of the relevant Finance Acts by the concerned generating company or the transmission licensee, as the case may be. The actual tax income on other income stream (i.e., income of non generation or non transmission business, as the case may be) shall not be considered for the calculation of "effective tax rate".

(2) Rate of return on equity shall be rounded off to three decimal places and shall be computed as per the formula given below:

Rate of pre-tax return on equity = Base rate / (1-t)

Where "t" is the effective tax rate in accordance with Clause (1) of this regulation and shall be calculated at the beginning of every financial year based on the estimated profit and tax to be paid estimated in line with the provisions of the relevant Finance Act applicable for that financial year to the company on pro-rata basis by excluding the income of non-generation or non-transmission business, as the case may be, and the corresponding tax thereon. In case of generating company or transmission licensee paying Minimum Alternate Tax (MAT), "t" shall be considered as MAT rate including surcharge and cess.

(3) The generating company or the transmission licensee, as the case may be, shall true up the grossed up rate of return on equity at the end of every financial year based on actual tax paid together with any additional tax demand including interest thereon, duly adjusted for any refund of tax including interest received from the income tax authorities pertaining to the tariff period 2014-15 to 2018-19 on actual gross income of any financial year. However, penalty, if any, arising on account of delay in deposit or short deposit of tax amount shall not be claimed by the generating company or the transmission licensee as the case may be. Any under-recovery or over-recovery of grossed up rate on return on equity after truing up, shall be recovered or refunded to beneficiaries or the long term transmission customers/DICs as the case may be on year to year basis.

52. Though the regulation specify the computation of effective tax rate on the basis of tax paid, we deem it proper to allow grossing up on MAT rate considering the fact that the matter is decided during the year 2016-17. Accordingly, for the present, the effective tax rate (MAT) of 21.342% has been considered for the period 2015-16 onwards up to 2018-19 for the purpose of grossing up of the base rate of 15.5%. Based on the above, the rate of ROE works out to 19.705% from 2015-16 onwards. This is however, subject to truing up. Accordingly, return on equity has been worked out as under:

(₹in lakh)

	2015-16		**2016-17**	**2017-18**	**2018-19**
	22.4.2015 to 4.7.2015 (Unit-II)	**5.7.2015 to 31.3.2016 (Units I & II)**			
Gross Normative Equity	43476.52	93083.19	95074.80	100606.28	100606.28
Addition due to discharge of liabilities	0.00	1991.61	5531.48	0.00	0.00
Closing Equity	43476.52	95074.80	100606.28	100606.28	100606.28
Average Equity	43476.52	94078.99	97840.54	100606.28	100606.28
Return on Equity (Base Rate)	15.500%	15.500%	15.500%	15.500%	15.500%
Tax rate for the year	21.342%	21.342%	21.342%	21.342%	21.342%
Rate of Return on Equity (Pre Tax)	19.705%	19.705%	19.705%	19.705%	19.705%
Return on Equity (Pre Tax)	**1732.14**	**13726.42**	**19279.48**	**19824.47**	**19824.47**

Interest on loan

53. Regulation 26 of the 2014 Tariff Regulations provides as under:

26. Interest on loan capital*: (1) The loans arrived at in the manner indicated in regulation 19 shall be considered as gross normative loan for calculation of interest on loan.*

(2) The normative loan outstanding as on 1.4.2014 shall be worked out by deducting the cumulative repayment as admitted by the Commission up to 31.3.2014 from the gross normative loan.

(3) The repayment for each of the year of the tariff period 2014-19 shall be deemed to be equal to the depreciation allowed for the corresponding year/period. In case of Decapitalization of assets, the repayment shall be adjusted by taking into account cumulative repayment on a pro rata basis and the adjustment should not exceed cumulative depreciation recovered up to the date of de-capitalization of such asset.

(4) Notwithstanding any moratorium period availed by the generating company or the transmission licensee, as the case may be, the repayment of loan shall be considered from the first year of commercial operation of the project and shall be equal to the depreciation allowed for the year or part of the year.

(5) The rate of interest shall be the weighted average rate of interest calculated on the basis of the actual loan portfolio after providing appropriate accounting adjustment for interest capitalized:

Provided that if there is no actual loan for a particular year but normative loan is still outstanding, the last available weighted average rate of interest shall be considered:

Provided further that if the generating station or the transmission system, as the case may be, does not have actual loan, then the weighted average rate of interest of the generating company or the transmission licensee as a whole shall be considered.

(6) The interest on loan shall be calculated on the normative average loan of the year by applying the weighted average rate of interest.

(7) The generating company or the transmission licensee, as the case may be, shall make every effort to re-finance the loan as long as it results in net savings on interest and in that event the costs associated with such re-financing shall be borne by the beneficiaries and the net savings shall be shared between the beneficiaries and the generating company or the transmission licensee, as the case may be, in the ratio of 2:1.

(8) The changes to the terms and conditions of the loans shall be reflected from the date of such re-financing.

(9) In case of dispute, any of the parties may make an application in accordance with the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 1999, as amended from time to time, including statutory re-enactment thereof for settlement of the dispute:

Provided that the beneficiaries or the long term transmission customers /DICs shall not withhold any payment on account of the interest claimed by the generating company or the transmission licensee during the pendency of any dispute arising out of re-financing of loan.

54. Interest on loan has been worked out as mentioned below:

(a)The weighted average rate of interest has been worked out on the basis of the actual loan portfolio of respective year applicable to the project;

(b) Depreciation allowed for the period has been considered as repayment;

(c) The interest on loan has been calculated on the normative average loan of the year by applying the weighted average rate of interest calculated.

55. Necessary calculations for interest on loan are as under:

(₹ in lakh)

	2015-16		2016-17	2017-18	2018-19
	22.4.2015 to 4.7.2015 (Unit-II)	5.7.2015 to 31.3.2016 (Units I &II)			
Gross Loan-Opening	101379.04	216975.36	216975.36	216975.36	216975.36
Cum. Repayments up to Previous Period	0.00	1534.38	13689.46	30762.57	48318.75
Net Loan-Opening	101379.04	215440.98	203285.90	186212.79	168656.61
Addition due to Drawl	0.00	4647.10	12906.78	0.00	0.00
Repayment	1534.38	12155.08	17073.11	17556.19	17556.19
Net Loan-Closing	99844.67	207933.00	199119.58	168656.61	151100.42
Average Loan	100611.85	211686.99	201202.74	177434.70	159878.51
Rate of Interest	9.867%	9.867%	9.773%	9.627%	9.365%
Interest on loan	**2007.11**	**15465.11**	**19664.54**	**17082.30**	**14973.07**

Depreciation

56. Regulation 27 of the 2014 Tariff Regulations provides as under:

> ***"27.Depreciation:*** *Depreciation shall be computed from the date of commercial operation of a generating station or unit thereof or a transmission system including communication system or element thereof. In case of the tariff of all the units of a generating station or all elements of a transmission system including communication system for which a single tariff needs to be determined, the depreciation shall be computed from the effective date of commercial operation of the generating station or the transmission system taking into consideration the depreciation of individual units or elements thereof.*
>
> *Provided that effective date of commercial operation shall be worked out by considering the actual date of commercial operation and installed capacity of all the units of the generating station or capital cost of all elements of the transmission system, for which single tariff needs to be determined.*
>
> *(2) The value base for the purpose of depreciation shall be the capital cost of the asset admitted by the Commission. In case of multiple units of a generating station or multiple elements of transmission system, weighted average life for the generating station of the transmission system shall be applied. Depreciation shall be chargeable from the first year of commercial operation. In case of commercial operation of the asset for part of the year, depreciation shall be charged on pro rata basis.*
>
> *(3) 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 in case of hydro generating station, the salvage value shall be as provided in the agreement signed by the developers with the State Government for development of the Plant:*
>
> *Provided further that the capital cost of the assets of the hydro generating station for the purpose of computation of depreciated value shall correspond to the percentage of sale of electricity under long-term power purchase agreement at regulated tariff: Provided also 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.*
>
> *(4) Land other than the land held under lease and the land for reservoir in case of hydro generating station shall not be a depreciable asset and its cost shall be excluded from the capital cost while computing depreciable value of the asset.*
>
> *(5) Depreciation shall be calculated annually based on Straight Line Method and at rates specified in Appendix-II to these regulations for the assets of the generating station and transmission system: Provided that the remaining depreciable value as on 31st March of the year closing after a period of 12 years from the effective date of commercial operation of the station shall be spread over the balance useful life of the assets.*

(6) In case of the existing projects, the balance depreciable value as on1.4.2014 shall be worked out by deducting the cumulative depreciation as admitted by the Commission up to 31.3.2014 from the gross depreciable value of the assets.

(7) The generating company or the transmission license, as the case may be, shall submit the details of proposed capital expenditure during the fag end of the project (five years before the useful life) along with justification and proposed life extension. The Commission based on prudence check of such submissions shall approve the depreciation on capital expenditure during the fag end of the project.
(8) In case of de-capitalization of assets in respect of generating station or unit thereof or transmission system or element thereof, the cumulative depreciation shall be adjusted by taking into account the depreciation recovered in tariff by the de-capitalized asset during its useful services."

57. The weighted average rate of depreciation claimed as per above regulation is 5.24% and the same has been considered for the period 2015-19. Necessary computations in support of depreciation are as under:

(₹ in lakh)

	2015-16		2016-17	2017-18	2018-19
	22.4.2015 to 4.7.2015 (Unit-II)	5.7.2015 to 31.3.2016 (Units I &II)			
Opening Gross Block	144921.75	310277.29	316916.00	335354.26	335354.26
Additions due to Discharge of liabilities	0.00	6638.71	18438.26	0.00	0.00
Closing gross block	144921.75	316916.00	335354.26	335354.26	335354.26
Average gross block	144921.75	313596.64	326135.13	335354.26	335354.26
Rate of Depreciation	5.24%	5.24%	5.24%	5.24%	5.24%
Dep.Value	130429.57	282236.98	293521.61	301818.83	301818.83
Remaining Depreciable Value	130344.48	280421.36	279550.92	270775.03	253218.84
Depreciation	**1534.38**	**12155.08**	**17073.11**	**17556.19**	**17556.19**

Operation & Maintenance expenses

58. Regulation 29(1)(a) of the 2014 Tariff Regulations provides the O&M expense norms for 250 MW sets for coal based and lignite fired generating stations based on CFBC technology as under:

(₹in lakh/MW)

2015-16	2016-17	2017-18	2018-19
25.40	27.00	28.70	30.51

59. The O&M expenses (annualized) claimed by the petitioner is as under:

(₹in lakh)

2015-16		2016-17	2017-18	2018-19
22.4.2015 to 4.7.2015 (Unit-II)	5.7.2015 to 31.3.2016 (Units I & II)			
6350.00	12700.00	13500.00	14350.00	15255.00

60. The petitioner has claimed normative O&M expenses (annualized) as per Regulation 29 (1) (a) of the 2014 Tariff Regulations. The petitioner in Form-1 of the petition has not included Water charges as per Regulation 29 (2) of the 2014 Tariff Regulations as part of the O&M expenses claimed. Instead, the

petitioner has claimed water charges separately. However, the water charges have been examined and considered as part of O&M expenses. The petitioner while claiming O&M expenses in terms of the 2014 Tariff Regulations has also prayed for grant of liberty to approach the Commission for revision of O&M expenses on the ground that the O&M expenses would be more than the normative O&M expenses since the auxiliary equipments in case of CFBC boilers is more than the conventional pulverized fuel boilers of the same capacity.

61. The petitioner was directed vide ROP of the hearing dated 2.8.2016 to submit the details of actual O&M expenses of the generating station from COD to till date. In response, the petitioner vide affidavit dated 31.8.2016 has submitted that the total O&M expenses from COD to 31.7.2016 is ₹11685.20 lakh (from 5.7.2015 (COD) to March, 2016 is ₹8332.16 lakh and from March, 2016 to July, 2016 is ₹3353.07 lakh). It has further been submitted that O&M expenses furnished do not reflect the real ground realities and they are bound to increase as units are in the process of sustained and stable operation and major packages are about to be finally taken over by the petitioner after completion of PG test. It has also submitted that the existing manpower is 246 nos as against the sanctioned strength of 360 nos and the process of increasing the manpower is under process.It has been stated that the actual O&M expenses incurred by the petitioner for the period 5.7.2015 to 31.7.2016 (approx 1 year) is ₹11685.20 lakh which is lower than the O&M expenses of ₹12700 lakh as per the norms specified by the Commission for the year 2015-16.

62. We have noted the above submissions of the petitioner. Considering the fact, that there are additional auxiliary equipments over and above the requirements of conventional boilers and also since the existing manpower is 246 against the sanctioned strength of 360 and the proposal for increasing the manpower is under process, we are inclined to grant liberty to the petitioner to approach the Commission at the time of truing up of tariff with all relevant details of actual O&M expenses incurred.

63. It is further noticed that the petitioner has claimed additional O&M expenses on account of CISF security forces and has submitted that CISF is a premier multi-skilled security agency of the country mandated to provide security to Industrial zone like the project of the petitioner. The petitioner has

submitted that the expenditure incurred for providing certain infrastructure facilities such as residential accommodation to the force, vehicles etc. has not been included in the project cost and the O&M expenses. It has also submitted that the deployment of the force would be completely at the cost of the petitioner.

64. We have examined the matter. From the submissions of the petitioner, it is observed that the petitioner has not furnished the detailed claim along with the bifurcation of CISF manpower and the expenditure on CISF. While claiming the additional O&M expenses for CISF, the petitioner ought to have furnished the expenditure due to normal deployment of CISF required for the plant in the area and also the additional manpower along with the expenditure incurred on additional CISF personnel employed. In the absence of any details regarding the additional CISF manpower and the expenditure incurred on them, we are not inclined to consider the claim of the petitioner towards additional O&M expenses for CISF at this stage. The petitioner is however granted liberty to claim the expenses on this count, with proper justification and relevant details at the time of truing-up of tariff and the same will be considered in accordance with law.

65. Accordingly, the normative O&M expenses, excluding water charges, for the period 2015-19 is allowed as under:

(₹in lakh)

2015-16		2016-17	2017-18	2018-19
22.4.2015 to 4.7.2015 (Unit-II)	5.7.2015 to 31.3.2016 (Units I & II)			
1283.88	9403.55	13500.00	14350.00	15255.00

Water charges

66. Regulation 29(2) of the 2014 Tariff Regulations provides as under:

> "*29 (2) The Water Charges and capital spares for thermal generating stations shall be allowed separately:*
>
> *Provided that water charges shall be allowed based on water consumption depending upon type of plant, type of cooling water system etc., subject to prudence check. The details regarding the same shall be furnished along with the petition:*
>
> *Provided that the generating station shall submit the details of year wise actual 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 or claimed as a part of additional capitalisation or consumption of stores and spares and renovation and modernization"*

67. In terms of the above regulation, water charges are to be allowed based on water consumption depending upon type of plant, type of cooling water system etc., subject to prudence check of the details furnished by the petitioner.

68. The petitioner has claimed water charges for the period 2014-19 as under:

	UNIT	2014-15	2015-16	2016-17*	2017-18*	2018-19*
Water Quantity	CU.M	5384080	14024732	11525630	11525630	11525630
Consent Fee	₹	1572294	1572294	1970136	1970136	1970136
Water Cess	₹	618696	1401843	115153	115153	115153
Pumping Charges	₹	2024414	5273299	4333637	4333637	4333637
Total	₹	**4215404**	**8247436**	**6418926**	**6418926**	**6418926**

**** provisional***

69. The petitioner has submitted that it is not paying water charges in the absence of any Water Agreement with the State Govt. agency. However, the petitioner has claimed water charges on the basis of pumping charges and water cess/ consent fee which is paid to the statutory body on the quantum of water the plant has consumed. The petitioner has submitted the cumulative actual water consumption and rate of water charges of the generating station for the period from 2012-15 is as under:

		2012-13		2013-14		2014-15	
		Raw water quantity in Cu.m	**Water Cess in ₹**	**Raw water quantity in Cu.m**	**Water Cess in ₹**	**Raw water quantity in Cu.m**	**Water Cess in ₹**
I	For DM Water production	18630	1863	25000	2500	9000	900
	For Soft water production	1697900	169790	2873300	287330	4562000	456200
	Total (I)	**1716530**	**171653**	**2898300**	**289830**	**4571000**	**457100**
II	Domestic purpose(potable for bathrooms & toilets)	0	0	0	0	6000	180
III	Water used for rinsing, backwashing etc. in WCTP (in DM & soft water plants)	302920	60584	511460	102292	807080	161416
	Total	**2019450**	**232237**	**3409760**	**392122**	**5384080**	**618696**

Water Cess	Rate (Ps/Cu.M)
Type-I @10 Ps/Cu.M	10
Type-II @3 Ps/Cu.M	3
Type-III @20Ps/Cu.M	20

Water charges

70. We have examined the matter. As stated, the petitioner is not paying water charges in absence of any Water Agreement with the State Govt. agency. However, it has claimed water charges on the basis of pumping charges and water cess/ consent fee, which it has been paying to the statutory body on the quantum of water the plant has consumed.

71. From the submissions and details available it is observed that the petitioner has claimed water cess @10 paise/Cu.M for DM water and Soft water production, @3 paise/Cu.M for domestic purpose and @20paise/Cu.M for water used for rinsing and backwashing, Pumping charges @ ₹0.376/ KL and annual water consent fee of ₹15.72 lakh in 2014-16 and ₹19.70 lakh in 2016-19. The actual water consumption for last 3 years 2012-13, 2013-14 and 2014-15 of the generating station is 2019450 KL, 3409760 KL and 5384080 KL respectively. However, both the units of the generating station has been commissioned during the year 2015-16. Hence, the actual water consumption data for the period 2012-13 to 2014-15 do not provide any help to assess the projected quantum of water required after COD of the generating station till 31.3.2019. Accordingly, the same has not been considered.

72. In the absence of any contracted quantum of water and in order to examine the reasonableness of consumptive water based on norms of CEA report on minimization of water requirement for 500 MW unit size,a norm of 3.5 m3/hr/MW has been considered for the generating station considering the two smaller size units the water consumption works out to 15.33 million KL per annum (i.e. 3.5x500x8760). The projected water quantity claimed by the petitioner is 14024732 KL for the year 2015-16 and 11525630KL for the period from 2016-19. Accordingly, the projected water quantity claimed for the year 2015-16 is higher than the projected water quantity for the period 2016-19 and no justification has been furnished by the petitioner in this regard. Considering the fact that the petitioner has claimed 11525630 KL for the period 2016-19 on projection basis, which is lower than 15.33 million KL per annum as per CEA norms, and in the absence of actual figures of water consumption as units are in the process of sustained and stable operation, the same is allowed during the period 2015-19. Accordingly, the projected water charges based on the rate of pumping charges of 0.376/KL, water cess of ₹115153 and annual water consent fee of ₹1970136 as claimed by the petitioner is allowed as under:

	Projected Quantity Considered (KL) (1)	Pumping Charges (0.376Rs/KL) (2)=(1)x0.376	Water cess Rate (0.05Rs/KL) (3)	Water Consent Fee (Rs/Annum) (4)	Projected Water charge Allowed (₹ in lakh) (5)= (2)+(3)+(4)
2015-16	11525630.00	4333636.88	115153	1970136.00	64.189
2016-17	11525630.00	4683220.38	115153	1970136.00	64.189
2017-18	11525630.00	4683220.38	115153	1970136.00	64.189
2018-19	11525630.00	4683220.38	115153	1970136.00	64.189

73. The water charges allowed as above is subject to truing-up at the end of the tariff period for which the petitioner is directed to place on record all relevant information.

74. The total O&M expenses including water charges as allowed for tariff purpose for the period 2015-19 is as under:

(₹ in lakh)

	2015-16		2016-17	2017-18	2018-19	Total
	22.4.2015 to 4.7.2015 (Unit-II)	**5.7.2015 to 31.3.2016 (Units I & II)**				
O&M Expenses allowed as per Regulation 29 (1) (a)	1283.88	9403.55	13500.00	14350.00	15,255.00	53792.43
Water Charges allowed as per Regulation 29 (2)	12.98	47.53	64.19	64.19	64.19	253.08
Total O&M Expenses allowed	1296.86	9451.08	13564.19	14414.19	15319.19	54045.51

**The difference of O&M expenses claimed and total O&M expenses allowed is due to the fact that the Commission has included the water charges in the total O&M expenses which was not claimed by the petitioner.*

Operational Norms

75. The operational norms in respect of the generating station considered by the petitioner are as under:

Maximum Design heat rate applicable	Kcal./Kwhr.	2483.97
Target Availability	%	**75.00**
Auxiliary Energy Consumption	%	10.00
Gross Station Heat Rate	kCal/kWh	2863.11
Specific Fuel Oil Consumption	ml/kWh	1.00
Limestone Consumption	Kg/kWh	0.046

Normative Annual Plant Availability Factor

76. Regulation 36(A)(e) of the 2014 Tariff Regulations provides for the target availability of the generating station as under:

(A) Normative Annual Plant Availability Factor (NAPAF)

(e) Lignite fired Generating Stations using Circulatory Fluidized Bed Combustion (CFBC) Technology and Generating stations based on coal rejects

1. *For first three years from COD:75%*
2. *For next year after completion of three years of COD:80%*

77. In terms of the above regulation, the Target Availability of 75% has been allowed for the period from 22.4.2015 to 4.7.2018 and 80% for the period from 5.7.2018 to 31.3.2019.

Gross Station Heat Rate (GSHR)

78. Regulation 36 (C)(b) (i) of the 2014 Tariff Regulations provides as under:

(C) Gross Station Heat Rate

"(b) New Thermal Generating Station achieving COD on or after 1.4.2014

(i) Coal-based and lignite-fired Thermal Generating Stations

= 1.045 X Design Heat Rate (kCal/kWh)

Where the Design Heat Rate of a generating unit means the unit heat rate guaranteed by the supplier at conditions of 100% MCR, zero percent make up, design coal and design cooling water temperature/back pressure.

Provided that the design heat rate shall not exceed the following maximum design unit heat rates depending upon the pressure and temperature ratings of the units:

Pressure Rating (Kg/cm2)	*150*	*170*	*170*	*247*
SHT/RHT (0C)	*535/535*	*537/537*	*537/565*	*565/593*
Type of BFP	*Electrical Driven*	*Turbine Driven*	*Turbine Driven*	*Turbine Driven*
Max Turbine Heat Rate (kCal/kWh)	*1955*	*1950*	*1935*	*1850*
Min. Boiler Efficiency				
Sub-Bituminous Indian Coal	*0.86*	*0.86*	*0.86*	*0.86*
Bituminous Imported Coal	*0.89*	*0.89*	*0.89*	*0.89*
Max Design Unit Heat Rate (kCal/kWh)				
Sub-Bituminous Indian Coal	*2273*	*2267*	*2250*	*2151*
Bituminous Imported Coal	*2197*	*2191*	*2174*	*2078*

Provided further that in case pressure and temperature parameters of a unit are different from above ratings, the maximum design unit heat rate of the nearest class shall be taken:

Provided also that where unit heat rate has not been guaranteed but turbine cycle heat rate and boiler efficiency are guaranteed separately by the same supplier or different suppliers, the unit design heat rate shall be arrived at by using guaranteed turbine cycle heat rate and boiler efficiency:

Provided also that where the boiler efficiency is below 86% for Subbituminous Indian coal and 89% for bituminous imported coal, the same shall be considered as 86% and 89% respectively for Sub-bituminous Indian coal and bituminous imported coal for computation of station heat rate:

Provided also that maximum turbine cycle heat rate shall be adjusted for type of dry cooling system:

Provided also that in case of lignite-fired generating stations (including stations based on CFBC technology), maximum design heat rates shall be increased using factor for moisture content given in sub-clause (C)(a)(iv) of this regulation:
Provided also that for Generating stations based on coal rejects, the Commission will approve the Design Heat Rate on case to case basis.

Note: In respect of generating units where the boiler feed pumps are electrically operated, the maximum design unit heat rate shall be 40 kCal/kWh lower than the maximum design unit heat rate specified above with turbine driven BFP."

79. The petitioner has submitted the design turbine cycle heat rate and boiler efficiency as 1952.9 kcal/kWh and 78.62% respectively at 100% MCR and 0% make-up water. Accordingly, the unit design heat rate worked out is 2483.97 kcal/kWh (1952.9/0.7862). Further, the petitioner has considered deviation factor of 6.5% from Design Heat Rate which is not in confirmity with the 2014 Tariff Regulations. Accordingly, by considering the above parameters along with the moisture factor, the petitioner has claimed GSHR of 2863.11 Kcal/kWh.

80. In terms of Regulation 36(C)(b)(i) of the 2014 Tariff Regulations, for the new Thermal Generating Station achieving COD on or after 1.4.2014, the Gross Station Heat Rate= 1.045 x Design Heat Rate (kcal/kWh) (i.e. 1.045x2483.97 =2595.75), provided that the design heat rate shall not exceed the maximum design unit heat rates depending upon the pressure and temperature ratings of the units. The maximum design heat rate as specified by the Commission for plants having temperature (537ºC/537ºC) and pressure(170 kg/cm²) rating nearer to the generating station using sub-bituminous coal is 2267 kcal/kwh. Provided, the maximum design unit heat rate shall be 40 kCal/kWh lower than the maximum design unit heat rate specified above with turbine driven BFP where the BFP are electrically operated. As the BFP of the generating station is motor driven the maximum design unit heat rate is 2227 kCal/kWhr (2267-40). Provided further that in case of lignite-fired generating stations (including stations based on CFBC technology), maximum design heat rates shall be increased using factor for moisture content given in sub-clause (C)(a)(iv) of this regulation. The petitioner has stated that the proximate and ultimate analysis of lignite has indicated 53% moisture content. Hence, by using multiplication factor of 1.1% for lignite having 50% moisture, the ceiling design heat rate works out to

2449.7 kcal/kwh(1.1 x 2227).Thus, taking the deviation factor of 1.045, the Gross Station Heat rate is 2559.94 kcal/kwh (1.045x2449.7). Accordingly, the GSHR of 2559.94 kcal/kWh has been considered for the purpose of tariff.

Norms of Limestone Consumption

81. In terms of Regulation 36(E)(iv) of the 2014 Tariff Regulations, the normative limestone consumption is 0.046 kg/kWh and the same is considered for the purpose of tariff of the generating station.

Auxiliary Energy Consumption

82. Regulation 36(E)(a) and 36(E)(d)(i) of the 2014 Tariff Regulations provides Auxiliary power consumption as under:

> ***(E) Auxiliary Energy Consumption***
>
> *(a) Coal-based generating stations except at (b) below:*

	With Natural Draft cooling tower or without cooling tower
(i) 200 MW series	*8.5%*
(ii) 300/330/350/500 MW and above	
Steam driven boiler feed pumps	*5.25%*
Electrically driven boiler feed pumps	*7.75%*

> *Provided further that for thermal generating stations with induced draft cooling tower, the norms shall be further increased by 0.5%*
>
> *(d) Lignite-fired thermal generating stations:*
>
> *(i) All generating stations with 200 MW sets and above:*
>
> *Provided that for the lignite fired stations using CFBC technology, the auxiliary energy consumption norms shall be 1.5 percentage point more than the auxiliary energy consumption norms of coal-based generating stations at (E) (a) above.*
>
> *(ii) Barsingsar Generating station of NLC using CFBC technology: 11.50%*
>
> *(iii) TPS-I, TPS-I (Expansion) and TPS-II Stage-I&II of Neyveli Lignite Corporation Ltd.:*

TPS-I	*12.00 %*
TPS-II	*10.00 %*
TPS-I (Expansion)	*8.50 %*

83. In terms of above regulation, the Auxiliary Power Consumption (APC) of 10% is provided for the generating station. However, the petitioner has claimed APC of 15% due to higher number of auxiliary equipments in CFBC technology as compared to conventional technology power plants. Such auxiliary equipments, as per the submission, includes higher capacity air blowers, higher BMCR rating than the

conventional boilers, additional RO, DM Plant & Lime Handling system, increased no. of equipments in Water Chemical Treatment Plant and Lignite Handling System. The petitioner has however not furnished the detail quantification in support of the increased claim of 15% in APC. Accordingly, the APC of 10% in terms of the above regulation has been considered. The petitioner is however, directed to submit the actual auxiliary consumption at the time of truing up of tariff.

Specific Oil Consumption

84. Regulation 36(D)(b)(iii) of the 2014 Tariff Regulations, provides for Secondary fuel oil Consumption of 1.00 ml/kWh for Lignite fired generating station based on CFBC technology. Hence, the Secondary fuel oil Consumption considered by the petitioner is as per norms and is allowed.

Interest on Working Capital

85. Sub-section (a) of clause (1) of Regulation 28 of the 2014 Tariff Regulations provides as under:

> *28 (1) The working capital shall cover:*
>
> *(a) Coal-based/lignite-fired thermal generating stations*
>
> *(i) Cost of coal or lignite and limestone towards stock, if applicable, for 15 days for pit-head generating stations and 30 days for non-pit-head generating stations for generation corresponding to the normative annual plant availability factor or the maximum coal/lignite stock storage capacity whichever is lower;*
>
> *(ii) Cost of coal or lignite and limestone for 30 days for generation corresponding to the normative annual plant availability factor;*
>
> *(iii) Cost of secondary fuel oil for two months for generation corresponding to the normative annual plant availability factor, and in case of use of more than one secondary fuel oil, cost of fuel oil stock for the main secondary fuel oil;*
>
> *(iv) Maintenance spares @ 20% of operation and maintenance expenses specified in regulation 29;*
>
> *(v) Receivables equivalent to two months of capacity charges and energy charges for sale of electricity calculated on the normative annual plant availability factor; and*
>
> *(vi) Operation and maintenance expenses for one month.*

Fuel components in working capital

86. The petitioner has claimed following cost for fuel components and 2 months Energy charges in the working capital based on price and "as received" GCV of lignite and secondary fuel rates for the preceding three months of January, 2015, February, 2015 and March, 2015 (i.e. lignite price of 2014-15) in respect of Unit-II of the generating station for the period from 22.4.2015 to 4.7.2015 and Lignite & secondary fuel for the preceding three months of April, 2015, May, 2015 and June, 2015 (i.e. lignite

price of 2015-16) in respect of the generating station (Unit-I and Unit-II) for the period from 5.7.2015 to 31.3.2019 as under:

(₹in lakh)

	2015-16		**2016-17**	**2017-18**	**2018-19**
	22.4.2015 to 4.7.2015 (Unit-II)	**5.7.2015 to 31.3.2016 (Units I & II)**			
Cost of lignite towards stock	1442.27	3354.43	3354.43	3354.43	3354.43
Cost of lignite towards generation	2884.55	6708.86	6708.86	6708.86	6708.86
Cost of limestone towards stock	143.66	287.33	287.33	287.33	287.33
Cost of limestone towards generation	143.66	287.33	287.33	287.33	287.33
Cost of secondary fuel oil for 2 months	97.88	160.60	160.16	160.16	160.16
Energy Charges for 2 months	6255.31	14388.19	14348.88	14348.88	14348.88

87. From the detail furnished by the petitioner, it is observed that the petitioner has used both the secondary oils, LDO and HFO and the major secondary oil used is HFO. Accordingly, in terms of Regulation 28(1)(a)(iii) of the 2014 Tariff Regulations, in case of use of more than one secondary fuel oil, cost of fuel oil stock for the main secondary oil has been considered for allowing 2 months of secondary oil cost in the working capital. Accordingly, the cost of HFO is considered for the working capital.

88. The petitioner vide affidavit dated 2.11.2016 has submitted that the year wise Lignite Transfer Prices have been fixed based on the MoC guidelines dated 2.1.2015 and the transfer price of lignite so computed is certified by the statutory auditor. The Lignite Transfer Price based on the MoC guidelines dated 2.1.2015 and certified by the auditor is as under:

	Lignite price (Pooled) (₹/Tonne)
2014-15	1814
2015-16	2066
2016-17	2329
2017-18	2557
2018-19	2821

** The above price is inclusive of Royalty @ 6%*

89. Accordingly, the price and GCV of lignite for the years 2014-15 and 2015-16 and the secondary oil as considered by the petitioner and allowed by the Commission for computation of lignite cost, secondary oil, 2 month energy charges & limestone in working capital is as under:

	As considered by the petitioner	As allowed by the Commission
Price of Lignite (₹/Tonne)	1981 (From COD of Unit-II (22.4.2015 to 4.7.2015)	1814
	2299 (From COD of station (5.7.2015 to 31.3.2019)	2066
GCV of Lignite (Kcal/kg.)	2645.67 (From COD of Unit-II (22.4.2015 to 4.7.2015)	2645.667
	2640.33 (From COD of station (5.7.2015 to 31.3.2019)	2640.334
Price of Secondary fuel oil (₹/KL)	36000 (From COD of Unit-II (22.4.2015 to 4.7.2015)	33361.776
	29000 (From COD of station (5.7.2015 to 31.3.2019)	26490.699
GCV of Sec. Fuel oil (Kcal./Kg)	10000(From COD of Unit-II (22.4.2015 to 4.7.2015)	10000
	10000(From COD of station (5.7.2015 to 31.3.2019)	10000
Price of Limestone (₹/MT)	2313.43	2313.430

90. Based on above, the weighted average GCV and cost for fuel components in working capital and 2 months energy charges is worked out as under:

(₹In lakh)

	2015-16		2016-17	2017-18	2018-19	
	22.4.2015 to 4.7.2015 (Unit-II)	5.7.2015 to 31.3.2016 (Units- I & II)			1.4.2018 to 4.7.2018	5.7.2018 to 31.3.2019
Cost of Lignite for 45 days	715.797	5983.103	8080.501	8080.501	2103.144	6375.848
Cost of Limestone for 45 days	43.57	319.12	430.99	430.99	112.18	340.07
Cost of Secondary Fuel oil for 2 months	18.52	107.68	145.04	145.04	37.75	114.44
Energy Charges for 2 months	1047.88	8650.70	11651.31	11651.31	3032.53	9193.37

91. The difference in the cost of lignite and 2 months Energy Charges as claimed by the petitioner and as allowed in this order is on account of the fact that while the price of lignite considered by the petitioner for the preceding 3 months are ₹1980/Ton and 2299/Ton with GSHR of 2863.11 kCal/kWh, the Commission has considered the price of lignite as ₹1804/ Ton and ₹2066/Ton with GSHR of 2559.94 kCal/kWh.

Lignite Transfer Price & Energy Charges

92. The petitioner has claimed year-wise Energy Charges for the period 2015-19 based on Station Heat rate of 2863.11 kCal/kWh, weighted average lignite price of ₹1981/Ton & GCV of 2645.67 kCal/kg for Unit-II for the year 2015-16 and ₹2299/ Ton and GCV of 2640.33 kCal/kg for the generating station (Unit-I&II) for the period from 2015-19 and oil procured and burnt for the preceding three months as under:

2015-16		2016-17	2017-18	2018-19
22.4.2015 to 4.7.2015 (Unit-II)	5.7.2015 to 31.3.2016 (Units- I & II)			
2.532	2.912	2.912	2.912	2.912

93. It is observed that the lignite Transfer price for the period 2015-19 as submitted by the petitioner was calculated based on MoC guidelines dated 2.1.2015 and the same has been considered by the Commission for computation of fuel component and energy charges in working capital. This has been considered for the computation and recovery of Energy Charges for the period 2015-19. This is however subject to adjustment after truing up of lignite price at the end of the tariff period 2014-19 as per MOC guidelines based on the detailed justification and information for the variation in the year to year lignite transfer price for the period 2014-19 as submitted by the petitioner.

Maintenance spares

94. The petitioner has claimed Maintenance spares in the working capital as under:

(₹in lakh)

2015-16		2016-17	2017-18	2018-19
22.4.2015 to 4.7.2015 (Unit-II)	5.7.2015 to 31.3.2016 (Units- I & II)			
1270.00	2540.00	2700.00	2870.00	3051.00

95. Regulation 28(1)(a)(iv) of the 2014 Tariff Regulations provides for Maintenance spares @ 20% of the Operation & Maintenance expenses. Accordingly, the maintenance spares @ 20 % of the O&M expenses, including water charges, is allowed as under:

(₹in lakh)

2015-16		2016-17	2017-18	2018-19	
22.4.2015 to 4.7.2015 (Unit-II)	5.7.2015 to 31.3.2016 (Units- I & II)			1.4.2018 to 4.7.2018	5.7.2018 to 31.3.2019
259.37	1890.22	2712.84	2882.84	797.44	2266.40

O & M Expenses (1 month)

96. O&M expenses for 1 month claimed by the petitioner for the purpose of working capital is as under:

(₹in lakh)

2015-16		2016-17	2017-18	2018-19
22.4.2015 to 4.7.2015 (Unit-II)	5.7.2015 to 31.3.2016 (Units- I & II)			
529.17	1058.33	1125.00	1195.83	1271.25

97. Regulation 28(a)(vi) of the 2014 Tariff Regulations provides for Operation & Maintenance expenses for one month for coal-based generating station. Accordingly, the one month O&M expenses as allowed for the purpose of working capital is as under:

(₹in lakh)

2015-16		2016-17	2017-18	2018-19	
22.4.2015 to 4.7.2015 (Unit-II)	5.7.2015 to 31.3.2016 (Units- I & II)			1.4.2018 to 4.7.2018	5.7.2018 to 31.3.2019
108.07	787.59	1130.35	1201.18	332.27	944.33

Receivables

98. Receivables equivalent to two months of fixed and energy charges has been worked out and allowed as under:

(₹in lakh)

2015-16		2016-17	2017-18	2018-19	
22.4.2015 to 4.7.2015 (Unit-II)	5.7.2015 to 31.3.2016 (Units- I & II)			1.4.2018 to 4.7.2018	5.7.2018 to 31.3.2019
2219.04	17724.87	24077.12	23962.29	6190.77	18169.39

99. Accordingly, Interest on working capital is worked out as under:

(₹in lakh)

	2015-16		2016-17	2017-18	2018-19	
	22.4.2015 to 4.7.2015 (Unit- II)	5.7.2015 to 31.3.2016 (Units I & II)			1.4.2018 to 4.7.2018	5.7.2018 to 31.3.2019
O&M expenses	108.07	787.59	1130.35	1201.18	332.27	944.33
Receivables	2219.04	17724.87	24077.12	23962.29	6190.77	18169.39
Maintenance Spare	259.37	1890.22	2712.84	2882.84	797.44	2266.40
Secondary Fuel oil cost	18.52	107.68	145.04	145.04	37.75	114.44
Fuel Stock-Lignite	715.80	5983.10	8080.50	8080.50	2103.14	6375.85
Fuel Stock-Limestone	43.57	319.12	430.99	430.99	112.18	340.07
Total Working Capital	**3364.37**	**26812.58**	**36576.84**	**36702.84**	**9573.54**	**28210.49**
Interest Rate	13.50%	13.50%	13.50%	13.50%	13.50%	13.50%
Interest on Working Capital	**454.19**	**3619.70**	**4937.87**	**4954.88**	**1292.43**	**3808.42**

Annual Fixed Charges

100. The annual fixed charges approved in respect of the generating station for the period 2014-19 is summarized as under:

(₹in lakh)

	2015-16		2016-17	2017-18	2018-19
	22.4.2015 to 4.7.2015 (Unit- II)	5.7.2015 to 31.3.2016 (Units I & II)			
Return on Equity	1732.14	13726.42	19279.48	19824.47	19824.47
Interest on Loan	2008.42	15480.57	19683.83	17099.73	14988.49
Depreciation	1535.38	12167.21	17089.48	17572.56	17572.56
Interest on Working Capital	454.19	3619.70	4937.87	4954.88	5100.84
O & M Expenses	1296.86	9451.08	13564.19	14414.19	15319.19
Total	**7026.98**	**54444.98**	**74554.85**	**73865.84**	**72805.56**

101. The annual fixed charges determined as above shall be applicable pro-rata to the capacity contracted with the respondents.

Month to Month Energy Charges

102. Clause 6 sub-clause (a) of Regulation 30 of the 2014 Tariff Regulations provides as under:

> *"6. Energy charge rate (ECR) in Rupees per kWh on ex-power plant basis shall be determined to three decimal place in accordance with the following formula*:
>
> *(a) For coal based and lignite fired stations*
> *ECR = {(GHR – SFC x CVSF) x LPPF / CVPF+SFC x LPSFi + LC x LPL} x 100 / (100 – AUX)*
> *Where,*
> *AUX = Normative auxiliary energy consumption in percentage.*
> *CVPF = Gross calorific value of primary fuel as received, in kCal per kg, per litre or per standard cubic metre, as applicable.*
> *CVSF = Calorific value of secondary fuel, in kCal per ml.*
> *ECR = Energy charge rate, in Rupees per kWh sent out.*
> *GHR = Gross station heat rate, in kCal per kWh.*
> *LC = Normative limestone consumption in kg per kWh.*
> *LPL = Weighted average landed price of limestone in Rupees per kg.*
> *LPPF = Weighted average landed price of primary fuel, in Rupees per kg"*

103. The petitioner shall compute and claim the Energy Charges on month to month basis from the beneficiaries based on the given formulae.

104. The Commission in its order dated 19.2.2016 in Petition No. 33/MP/2014 (TPDDL v NTPC & anr) had directed as under:

> "*The respondents shall introduce help desk to attend to the queries and concerns of the beneficiaries with regard to the energy charges. The contentious issues regarding the energy charges should be sorted out with the beneficiaries at the senior management level, preferably at the level of Executive Directors."*

Accordingly, in line with the above decision, help desk shall be introduced by the petitioner and contentious issues if any, which arise in respect of energy charges for this generating station shall be sorted out with the beneficiaries at the Senior Management level.

Application Fee and Publication Expenses

105. The petitioner has sought reimbursement of filing fees and the expenses incurred for publication of notices for application of tariff for the period 2015-19. The petitioner has deposited tariff filing fees of ₹4400000/- for the period 2015-17 in terms of the provisions of the Central Electricity Regulatory Commission (Payment of Fees) Regulations, 2012. The petitioner has also incurred charges towards publication of the said tariff petition in the newspapers. Accordingly, in terms of Regulation 52 of the 2014 Tariff Regulations and in line with the decision in Commission's order dated 6.1.2016 in Petition No.232/GT/2014, the petitioner shall be entitled to recover the filing fees (pro-rata to the contracted capacity) and the expenses incurred on publication of notices directly from the respondents. The filing fees for the remaining years of the tariff period 2016-19 shall be recovered pro rata after deposit of the same and production of documentary proof.

106. The annual fixed charges approved for the period 2015-19 as above are subject to truing-up in terms of Regulation 8 of the 2014 Tariff Regulations.

107. Petition No. 146/GT/2015 is disposed of in terms of the above.

Sd/-	***Sd/-***	***Sd/-***	***Sd/-***
(Dr. M.K.Iyer)	**(A.S Bakshi)**	**(A.K.Singhal)**	**(Gireesh B Pradhan)**
Member	**Member**	**Member**	**Chairperson**