FCENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

Petition No. 66/MP/2021

Coram:

Shri Jishnu Barua, Chairperson
Shri I. S. Jha, Member
Shri A. K. Goyal, Member
Shri P.K. Singh, Member

Date of Order: 24.11.2023

Petition under Section 79 of the Electricity Act, 2003 read with Regulation 29 of the Central Electricity Regulatory Commission (Terms and Condition of Tariff) Regulations, 2019 for approval of additional expenditure on account of installation of various Emission Control Systems at Nabinagar Thermal Power Station (4x250 MW) in compliance with the Ministry of Environment and Forests and Climate Change, Government of India notification dated 7.12.2015.

And in the matter of:

Bhartiya Rail Bijlee Company Limited,
Nabinagar Thermal Power Project,
Post-Khaira, Distt. Aurangabad,
Bihar-824303. **…. Petitioner**

Vs

1. East Central Railway,
   Hazipur, Bihar.

2. North Bihar Power Distribution Company Limited (NBPDCL),
   Vidyut Bhawan, Bailey Road,
   Patna (Bihar)-800001.

3. South Bihar Power Distribution Company Limited (SBPDCL),
   Vidyut Bhawan, Bailey Road,
   Patna (Bihar)-800001.

….Respondents

ORDER

Bhartiya Rail Bijlee Company Limited has filed the instant petition under Section 79 of the Electricity Act, 2003 read with Regulation 29 of the Central

Electricity Regulatory Commission (Terms and Condition of Tariff) Regulations, 2019 (hereinafter referred to as the "2019 Tariff Regulations") seeking approval for Additional Capital Expenditure (ACE) envisaged on account of installation of various Emission Control Systems (ECS) at Nabinagar Thermal Power Station (4 X 250 MW) in compliance with the Environment (Protection) Amendment Rules, 2015 (hereinafter referred to as the "2015 Rules") dated 7.12.2015 notified by Ministry of Environment and Forests and Climate Change (MoEFCC), Government of India.

2. The Petitioner has made the following prayers in the instant petition,:

"a. Grant approval for undertaking implementation of various schemes mentioned above in order to meet Revised Emission Standards.
b. Grant liberty to approach Hon'ble Commission for approval of implementation of Revised Emission Schemes on account of mercury, specific water consumption, Particulate Matter, if required.
c. Allow Gross station heat Rate, additional water consumption, Cost of Reagents etc. as per Regulation-76 i.e., "Power to relax" of the Tariff Regulations 2019.
d. Allow deemed availability of the station / unit on account of shutdown for the implementation of ECS as per Regulation-76 i.e., "Power to relax" of the Tariff Regulations 2019.
e. Pass such orders as deemed fit and necessary in the facts and circumstances of the present case."

Background

3. The Petitioner is a Joint Venture Company of NTPC Ltd. and the Ministry of Railways with a share-holding pattern of 74% and 26% equity, respectively. The Petitioner is a 'generating company' as defined under Section 2(28) of the Electricity Act, 2003 (herein referred to as the "2003 Act) and has constructed 1000 MW (4 x 250 MW) Nabinagar Thermal Power Plant (NTPP) at Nabinagar, Bihar. The details of the plant in brief are as follows:

Unit No.	Capacity (MW)	SCOD	Actual COD
I	250	21.1.2011	20.3.2016
II	250	21.7.2011	3.4.2017
III	250	21.1.2012	20.2.2019
IV	250	21.7.2012	1.12.2021

4. In May 1986, MoEFCC notified Environment (Protection) Act, 1986 (hereinafter referred to as the "1986 Act") and subsequently in November 1986, by exercising the powers conferred under Section 6 and Section 25 of the 1986 Act, MoEFCC has notified Environment (Protection) Rules, 1986, (hereinafter referred to as the "1986 Rules") wherein, standards for emission/ discharge of environment pollutants were specified under Schedule-I for various industries, including Thermal Power Plants. MoEF&CC vide the 1986 Rules has specified the Suspended Particulate Matter (SPM) norms as 150 mg/Nm3 for generating stations of 210 MW and more capacities and as 350 mg/Nm3 for the generating stations with capacities below 210 MW. Thereafter, MoEF&CC issued the Environment (Protection) Rules, 2015 (hereinafter referred to as the "2015 Rules") on 7.12.2015 revised the SPM norms and introduced the norms with respect to Water Consumption, Sulphur Dioxide, Oxides of Nitrogen and Mercury for thermal power plants on the basis of installed capacity and year of installation. Further, in terms of this notification, the subject norms have to be complied within two years of notification. However, subsequently, the water consumption norm for new plants installed after 1.1.2017 was enhanced to 3.0 m^3/MWh vide amendment dated 28.6.2018 and the Oxides of Nitrogen (NOx) norm for plants installed between 1.1.2004 to 31.12.2016 was increased vide amendment dated 19.10.2020. Accordingly, the water consumption and various emission norms for Thermal Power Plants is as follows:

S. No.	***Industry***	***Parameter***	***Standards***
5A.	***Thermal Power Plant (Water consumption limit)***	***Water Consumption***	*I. All plants with Once Through Cooling (OTC) shall install Cooling Tower (CT) and achieve specific water consumption upto maximum of 3.5m^3/MWh within a period of two years from the date of publication of this notification.* *II. All existing CT-based plants reduce specific water*

			consumption upto maximum of 3.5m^3/MWh within a period of two years from the date of publication of this notification. *III. New plants to be installed after 1st January, 2017 shall have to meet specific water consumption upto maximum of 3.0 m^3/MWh and achieve zero waste water discharged;*
25.	***Thermal Power Plant***	***TPPs (units) installed before 31st December, 2003***	
		Particulate Matter	*100 mg/Nm3*
		Sulphur Dioxide (SO2)	*600 mg/Nm3 (Units Smaller than 500 MW capacity units)* *200 mg/Nm3 (for units having capacity of 500 MW and above)*
		Oxides of Nitrogen (NOx)	*600 mg/Nm3*
		Mercury (Hg)	*0.03 mg/Nm3 (for units having capacity of 500 MW and above)*
		TPPs (units) installed after 1st January, 2004 up to 31st December, 2016	
		Particulate Matter	*50 mg/Nm3*
		Sulphur Dioxide (SO_2)	*600 mg/Nm3 (Units Smaller than 500 MW capacity units)* *200 mg/Nm3 (for units having capacity of 500 MW and above)*
		Oxides of Nitrogen (NOx)	*450 mg/Nm3*
		Mercury (Hg)	*0.03 mg/Nm3*
		TPPs (units) to be installed from 1st January, 2017	
		Particulate Matter	*30 mg/Nm3*
		Sulphur Dioxide (SO_2)	*100 mg/Nm3*
		Oxides of Nitrogen (NO_x)	*100 mg/Nm3*
		Mercury (Hg)	*0.03 mg/Nm3*

Submissions of the Petitioner

5. The Petitioner has filed the instant petition for approval of ACE envisaged towards the installation of ECS to comply with the MoEFCC directions in respect of Nabinagar Thermal Power Station. The Petitioner has submitted that Units 1, 2 and 3 were commissioned on 20.3.2016, 3.4.2017 and 20.2.2019, respectively, and unit 4 is yet to be commissioned. Accordingly, Unit 1 falls under 'category 2', Units 2, 3 and 4 falls under 'category 3' of the above notification. The gist of the submissions made by the Petitioner are as follows:

a) The 2019 Tariff Regulations provide for additional capitalization on account of the implementation of the revised Emission Control Norms (ECNs). Further, the Commission, vide the first amendment to the 2019 Tariff Regulations specified the terms and conditions for the determination of supplementary annual fixed charges and supplementary energy charges on implementation of ECS.

b) To meet the revised ECNs, the Petitioner has proposed the implementation of Wet Lime Based Flue Gas Desulphurization (WFGD) to control Sulphur Dioxide (SO_2) emissions and Combustion Modification (CM) and Selective Catalytic Reduction (SCR) to control NOx emissions. In terms of the CEA advisory, DSI -based FGD and Ammonia based FGD are preferable for units below 500 MW having a balance life of 7 to 9 years, and for the units of 500 MW and above, wet lime stone-based FGD is more suited. The lime slurry-based FGD is more versatile and suitable for any unit size. In the instant case, taking into consideration the number of units, geographical location, availability of space, quality of coal etc, wet lime stone-based FGD was finalized, which can withstand variations in sulphur percentage and calorific value of coal and as the limestone is non-hazardous and the technology does not have any safety issues.

c) Substantial time is required for installation of WFGD, and considerable time is required for pre-award activities such as identification of suitable technology, identification of vendors, engineering, tendering, location survey etc. Considering the deadlines and the time required for implementation, the specifications were prepared, and NIT was issued. The scheme will be implemented in all four units and will take 33 months, 39 months, 45 months and 51 months from the date of award for implementation in Units 1, 2, 3 and 4, respectively. A shutdown period of 45 days is required for each unit. The awarded cost for implementation of WFGD, including IDC, GST etc, is around ₹817.97 crore. After the commissioning of WFGD, the SO_2 emissions envisaged for unit 1 are less than 600 mg/Nm^3 and in the case of units 2, 3 and 4 they are less than 100 mg/Nm3. As per the normative parameters provided in the 2019 Tariff Regulations, the additional APC required is 1%,

additional O & M Expenses required are 2% of capital cost (excluding IDC and IEDC), the reagent required is 13 gms/kwh etc.

d) In Primary Control Technologies, the NOx produced in the combustion/furnace zone is reduced by modifying fuel burners by replacing Low NOx burners i.e. Combustion Modification. Similarly, in Secondary Control Technologies i.e. Selective Catalytic Reduction (SCR) and Selective Non-Catalytic Reduction (SNCR), the NOx, in post combustion, is reduced by injecting nitrogen containing reagents (ammonia or urea) in flue gas path, wherein, NOx is converted into N_2 and water. The low NOx burners (Primary Control Technology) are planned for all four (4) units, and SCR (Secondary Control Technology) is planned for the 2nd, 3rd and 4th units. In Combustion Modification (CM), the existing normal burners will be replaced with low NOx burners, which control the aerodynamic distribution and mixing of fuel and air, thereby reducing oxygen in the primary flame zone and limiting the flame temperature and NOx formation thereof. However, this leads to a higher inlet temperature of the economizer and an increase in unburnt carbon. Thus, there is an increase in heat loss of the boiler and an increase in unit heat rate by around 0.8%. The awarded cost for the implementation of CM is around ₹27.30 crore, including IDC, GST etc. In secondary control, ammonia-based SCR is planned, wherein ammonia (reagent) is injected through a catalyst into post combustion zone i.e. the upper furnace or convective pass of the boiler, within a specific temperature range. The hot flue gas and reagent diffuse through the catalyst, which is composed of active metals or ceramics with a highly porous structure. The use of a catalyst facilitates better control of NOx as well as a reaction within a specified temperature range. However, the same requires high capital costs and involves toxic chemicals. The formation of water during the reaction increases the wet loss of the boiler and increases the unit heat rate by around 0.1%. The SCR is yet to be awarded, and the tentative estimated capital cost for SCR is ₹385.93 crore, including IDC, GST etc. The SCR implementation time periods for units 2, 3 and 4 are 24 months, 30 months and 36 months, respectively. The shutdown period required for each unit is around 15 days. After the implementation of CM and SCR, the

NOx levels will be within allowable limits as prescribed by MoEFCC. As per the normative parameters provided in the 2019 Tariff Regulations, the indicative tariff has been computed.

e) The Operation & Maintenance of the ECS requires additional O & M Expenses i.e. spares and additional manpower.

f) The capital cost, operational parameters and other details considered in arriving at supplementary tariff for above ECS are as follows:

		FGD	**SCR**	**Combustion Modification System**	**Remarks**
1	Capital Cost (₹ in crore)	817.97	385.93	27.30	
2	Normative Specific Reagent Consumption (Kg/kwh)	0.013 (Limestone)	0.0006 (Ammonia)	Nil	Specific reagent consumption is based on coal and limestone quality considered
3	Additional APC	1%	0.2%	Nil	
4	Additional O&M charges	2% of capital cost (excluding IDC & IEDC)			
5	Shutdown Period	45 days		60 days	
6	Increase in GSHR		0.1% kCal/kWh	0.8% kCal/kWh	

g) Considering the above, exclusive of impact on GSHR, the indicative supplementary tariff is FC : 29.44 paise / kWh (1st year) and 27.47 paise / kWh (levelized) and VC : 5.48 paise / kWh. Further, about 8 paise / kWh may be increased in Energy Charge Rate (ECR) and Unit Fixed Charge (at 85% scheduled generation) on account of the increase in APC and GSHR.

h) Accordingly, the Commission may allow additional capital expenditure, additional O&M Expenses, associated costs such as increased water charges, cost of chemicals/reagents etc, and additional APC and GSHR over above the normative parameters allowed.

i) In terms of Regulation 29(4) of the 2019 Tariff Regulations, a separate supplementary tariff petition will be filed based on actual/projected actual expenditure and the normative parameters specified.

j) Each unit may be taken under shutdown for about 45-60 days for implementation of the ECS and stabilization may take some more time. As this unavailability leads to under-recovery of annual fixed charges, the

shutdown period for implementation of ECS may be considered as deemed available under Regulation 76, Power to Relax, of the 2019 Tariff Regulations.

k) The ECS is required to be installed in the existing units within two years from the date of notification of the 2015 Rules, i.e. 7.12.2015 and in case of the units commissioned after 1.1.2017, ECS are to be installed within two years from the COD. The Commission vide order dated 20.7.2018 in Petition No. 98/MP/2017 held that the ACE on implementation of ECS in terms of notification dated 7.12.2015 is admissible under a change in law. CEA was entrusted with planning, coordination and implementation of ECS. Accordingly, CEA, along with Regional Power Committees (RPC) formulated a phasing plan up to 2024, which was subsequently squeezed to 2022 as per the revised action plan of the Ministry of Power. Central Pollution Control Board (CPCB) has issued directions to various plants, including instant stations, to install ECS by December 2022. The progress of work was not only monitored by RPCs, wherein all stakeholders were kept posted on the developments, but also the Hon'ble Supreme Court which issued directions to complete the installation of ECS in highly polluted and densely populated areas by December 2021 and other stations l by December 2022. Therefore, the Petitioner proceeded with tendering and awarding the FGD systems through competitive bidding as early as possible. By the time the 2019 Tariff Regulations were notified by the Commission, the installation of ECS was at different stages, i.e. pre-award activities, NIT, etc. Subsequent to the 2019 Tariff Regulations, the Petitioner has filed the instant petition, wherein selection of technology, tentative/awarded capital cost, tentative supplementary tariff etc, are given and shared the same by serving the petition on the beneficiaries. Considering the stringent timelines, the implementation of ECS and presenting the proposal of the same before the Commission for approval are required to be parallel actions. Further, the Petitioner has been consulting the stakeholders and shared the proposal.

l) The depreciation has been considered up to 90% of additional capital cost, and the same is spread across 25 years.

m) The installation of the ECS system does not result in the life extension of the plant. Accordingly, no life extension beyond 25 years is envisaged at this stage.

n) The FGD system was awarded through International Competitive Bidding (ICB), wherein bids were received from 6 bidders, i.e. BHEL, L&T, MHPSI, Indure, ISGEC and GEPIL. The bid was awarded to BHEL, the L1 bidder and the awarded cost is ₹634.16 crore, exclusive of taxes and duties. The award contract provides for an escalation factor. The break-up of capital cost claimed for FGD is as follows:

Description	₹ in crore
Cost of Works	634.16
GST (18 %)	114.15
IEDC (3 %)	22.45
Total	770.76
IDC	44.35
FC	2.86
Total	**817.97**

o) The capital cost of ₹45 lakh/MW specified by CEA for FGD is the base cost, exclusive of other components i.e. taxes, duties, IDC, IEDC, Financing Charges, engineering charges, whereas, the hard cost claimed in the instant petition is ₹61 lakh/MW and the total capital cost claimed is ₹81.8 lakh/ MW, inclusive of all. The cost provided by CEA depends on various factors such as the range of SO_2 removal, chimney layout such as existing chimney as wet stack, new wet stack with single or multi flue cans, Chimney above absorber, provision of temporary chimney for making existing chimney operational and chimney material and choice of corrosion protection lining in the chimney, absorber and other sections of FGD etc, Further, the project is located at a difficult location in a remote area. The cost is arrived through competitive bidding and is reasonable considering the size, layout, location etc, of the project.

p) The capitalization considered for Combustion Modification is discovered through the transparent competitive bidding process and based on awarded values. Thus, the cost for CM has been reasonable for unit size. The capital cost considered for SCR is based on estimates.

6. In response to the Commission's directions in RoP dated 1.6.2021, the Petitioner vide affidavit dated 21.6.2021 has made the following submissions:

a) The Ministry of Power issued directions to the Commission under Section 107 of the Electricity Act, 2003, vide its letter dated 30.5.2018, to consider the additional cost implication on account of the installation of ECS as a pass-through in tariff.

b) Subsequently, the Commission, vide its order dated 20.7.2018 in Petition No. 98/MP/2017, has granted in-principle approval to NTPC for the installation of ECS and directed CEA to prepare guidelines specifying suitable technology for model specification of each plant.

c) CEA vide letter dated 20.2.2019 on 'Operation Norms for Thermal Generating Stations for the Tariff Period 2019-2024' has provided four technologies, i.e. Wet limestone based FGD, Lime Spray Drier / Semi-dry Semi FGD, Dry Sorbent Injection based FGD and Sea Water FGD, to comply with revised SO_2 emission norms. Further, CEA, vide its letter dated 7.2.2020, issued 'Advice on FGD Technology selection for different unit size', wherein the selection of appropriate FGD technology will be based on various parameters of the plant. However, the letters of CEA are advisory and not mandatory in nature.

d) WFGD has various advantages such as very high SO_2 removal efficiency, low Ca / S molar ratio and low operational cost thereof, the by-product Gypsum is marketable, ample number of technology providers and advantage on competitive bidding thereof etc. In addition, it has a worldwide footprint, is safer, more suitable for high PLF and higher balance plant life.

e) The other technologies i.e. Lime Spray Drier / Semi-dry Semi FGD, Dry Sorbent Injection based FGD and Sea Water FGD, either have low efficiency or have limited technology providers or risks in storage and handling (of ammonia) or are applicable for coastal plants.

f) As per the recommendations of CEA, prior to the finalization of technology for FGD, the coal quality, unit size, space availability,

availability of reagent and its purity, disposal of by-product, balance life, APC, life cycle cost, availability of water, efficiency of FGD, consideration of new stack/ modification of stack, PLF etc, has to be considered. Thus, not only CAPEX but also OPEX has to be considered in the finalization of technology.

g) Considering the various parameters, including interest rate of 8.5%, balance life as 25 years (for recovery of 90% capital cost), a cost-benefit analysis has been carried out and the same is as follows:

	DSIFGD	WFGD	AFGD
Capital Cost	115.00	817.97	736.17
Reagent	Sodium Bi - Carbonate	Lime Stone	Ammonia
Specific reagent consumption (gms / kWh)	12	9	2.75
Additional APC	0	1.00	0.80
Cost of reagent	25700	1500	50000
Supplementary Capacity Charges (₹ Cr)	23.58	129.67	118.18
Supplementary Energy Charges (₹ Cr)	130.11	16.61	66.84
Supplementary Charges (₹ Cr)	153.69	146.28	185.02

h) Adoption of the same technology to all units provides an advantage in terms of operating cost, i.e. spares, tie-up for reagent suppliers etc.

i) Considering various factors such as the balance life of the asset, operating PLF of the station, the worldwide footprint of technology, availability of suppliers in abundance, availability of post-installation maintenance & spares, availability & possibility of common tie-up of reagent as per location etc. and cost-benefit analysis, WFGD has been selected for SO_2 removal. The same meets the evaluation criteria of CEA is in concurrence with the CEA norms dated 20.2.2019, and meets the emission norms stipulated by MoEFCC.

j) Accordingly, the Board of Directors of the Petitioner in its meeting held on 28.6.2017, gave its approval for planning and tendering of FGD for various plants. NTPC, being a lead promoter company of the Petitioner, carried out a bidding process for all its Joint Venture and subsidiary companies for the installation of FGD along with its other projects. Thus,

on 30.6.2017, Invitation for Bids (IFB) for installation of FGD system at the instant station was issued and 10 bidders i.e. Bharat Heavy Electricals Ltd (BHEL), GE Power India Limited (GEPIL), IEGC Heavy Heavy Engineering Ltd (ISGEC), Mitsubishi Hitachi Power System India Pvt Ltd (MHPSIPL), Larsen & Turbo Limited (L&T), Thermax Limited (Thermax), Reliance Infrastructure Ltd. (RIL), The Indure Pvt. Ltd (Indure), Doosan Power System India Pvt. Ltd (Doosan) and Tata Projects Ltd (TPL) have submitted their response. The techno-commercial bid was opened on 17.8.2017, and BHEL emerged as a successful bidder and the board vide resolution dated 12.3.2019 approved the award of FGD. Subsequently, on 10.7.2019, a Notification of Award (NoA) was issued to BHEL for FGD installation at an awarded cost of ₹634.16 crore (excluding Taxes, IDC, IEDC, etc). Thereafter, the Board vide resolution dated 26.3.2020 has accorded the investment approval for implementation of FGD. The break-up of the capital cost claimed for FGD is as follows:

Capacity (MW)	CEA's indicative hard cost (₹ lakh / MW)	Hard cost claimed (₹ lakh / MW)	Total IDC claimed (₹ lakh)	Total IEDC claimed (₹ lakh)	Total taxes & duties claimed (₹ lakh)	Total of Other costs claimed (₹ lakh)	Total cost claimed (₹ lakh)
1000 (4X250)	45.00	63.4	4435.00	2245.00	11415.00	286.00	81797.00

k) NTPC, being a Central Public Sector Utility, is guided by the directions/ guidelines issued by the Central Government and/ or its own procedures for its transparent functioning and is answerable to statutory authorities like Comptroller and Auditor General of India, Central Vigilance Commission, etc. NTPC has followed the policy of delegation as per its delegation of power in the competitive bidding process for the award of FGD. Further, furnished a certificate that the bidding was carried out in a fair and transparent manner.

l) The estimated hard cost of FGD for the station is higher than CEA's indicative cost on account of the smaller size of units i.e. cost of common works such as limestone handling system, milling system, lime slurry

preparation system, gypsum dewatering system, gypsum handling system, makeup water system etc., do not vary much with the size of units. Further, the cost and size of equipment do not have a linear relationship, and a higher number of equipment is required for a larger number of units. In addition, CEA, vide its letter dated 24.2.2021 also acknowledged that the earlier cost estimation is approximately three years old and the cost of FGD installation has increased due to various reasons.

m) The cost provided by CEA was only indicative in nature and does not represent the actual procurement cost. Further, the Commission has also acknowledged that bids floated by various generators for installation of WFGD may lead to changes in the prices of WFGD in the international and domestic markets.

n) The works for an installation of the ECS System (FGD) were started on 7.12.2020 and expected to be completed by October 2023. Bypass Dampers for FGD have been installed, the test pile has been completed, and job pile work is in progress for both units 2 and 3. However, due to COVID-19, the progress is at a slow pace.

o) In view of the revision in NOx emission limits to 450 mg/NM^3, the Petitioner would be able to comply with NOx norms with the installation of CM. Thus, the SNCR proposed for ₹385.93 crore is not required. After competitive bidding vide NOA dated 18.11.2019, CM for NOx reduction was awarded to L&T-MHPS boilers for ₹21.68 crore.

p) The details of the cost for WFGD and CM are as follows:

(₹ in crore)

	WFGD	**Combustion Modification**
Work Cost	634.16	21.14
GST	114.15	3.80
IDC, IEDC & FC	69.66	2.35
Total	**817.97**	**27.30**

q) The generating station has an online Emission Monitoring System, and real time emission data is automatically transmitted to CPCB from October 2018 onwards. However, during the initial phase of stabilization of the system, as data was erratic or nil in values during some time of the

day, the average parameter was low. Thus, from October 2018 to March 2020, the SO_2, as submitted to CPCB, was in the range of 170-400 mg/Nm^3. However, average monthly peak values from 2018-19 (October 2018 onwards) to 2019-20 are in the range of 1200-1300 mg/Nm^3, and the weighted average SO_2 level in 2020-21 is 1158 mg/Nm^3. Similarly, the average NOx from October 2018 to March 2018 is in the range of 140-180 mg/Nm^3, and the weighted average NOx level in 2020-21 is 383 mg/Nm^3.

7. Respondent No. 2, NBPDCL, and Respondent No. 3, SBPDCL, have filed a joint reply. The gist of the submissions made by the Respondents are as follows:

a) As per Regulation 29(1) of the 2019 Tariff Regulations, the Petitioner was required to share the proposal for ACE with the Respondents. However, the Petitioner has already proceeded with the implementation of ECS without sharing the proposal with them. Further, the Petitioner has not furnished any reason for non-accomplishment of works within the stipulated time period of two years and instead proposed to undertake these works after about five years. Thus, any additional financial burden due to delay in implementation of ECS should not be allowed.

b) CEA, vide its advice dated 7.2.2020, stipulated various factors inter-alia, including coal quality, availability of water, consideration of new stack/ modification of stack, PLF etc, before finalization of FGD technology. However, the Petitioner has not furnished those details.

c) As per the CEA's advice dated 7.2.2020, the Petitioner is required to conduct a 'Life Cycle Cost Benefit Analysis' while choosing FGD technology and is required to submit the same. However, the Petitioner has not submitted any supporting documents for capital cost, reagent cost etc, considered. Further, the revenue realized on account of by-products was not considered in the analysis.

d) CEA, vide advise dated 20.2.2019, has recommended SNCR for NOx emission limit of 300 mg/Nm^3 and SCR for 100 mg/Nm^3. However, the Petitioner has considered CM as well as SCR for units 2, 3 and 4. As the CEA

recommended only SCR for meeting 100 mg/Nm3, the CM and its cost thereof for Units 2, 3 and 4 may not be allowed.

e) The Petitioner has not furnished a head-wise break up of the cost claimed, i.e. main FGD package, electrical power supply, wastewater treatment, fire protection and detection, spares, engineering, project management, contingency reserves etc.

f) The estimated cost of ₹63.40 lakh/MW for FGD is higher than CEA's indicative hard cost and the justification provided by the Petitioner is not acceptable as a 41% increase in cost within two years is high.

g) In the NoA dated 10.7.2019, the Petitioner has included AMC charges as part of the contract. However, as these are part of O&M Expenses, the same may not be allowed.

h) Allowing any additional O&M Expenses is premature at this stage.

i) The Petitioner has claimed "deemed availability" during the shutdown for implementation of ECS. The Petitioner should install ECS during the annual overhaul and the Regulations do not provide for the same.

j) The Petitioner may be directed to deliberate with beneficiaries prior to taking up any work which had an impact on the tariff.

8. In response, the Petitioner, in its rejoinder, vide affidavit dated 20.7.2021, has reiterated submissions made earlier in the petition and made the following additional submissions:

a. The beneficiaries were aware of the intent of the Petitioner to comply with revised ECNs in terms of MoEFCC's notification dated 7.12.2015. Further, the implementation of ECS has been closely monitored by the Hon'ble Supreme Court and the Government of India.

b. The revised norms were to be implemented in two years, and non-compliance leads to penalties. Further, as the activities from pre-award to installation take at least 3 years, the activities were taken up simultaneously and proceeded for award as soon as possible. These developments took place in the 2014-19 tariff period i.e. prior to notification of the 2019 Tariff Regulations.

c. Regulation 29 of the 2019 Tariff Regulations does not provide for any prior intimation to the beneficiary. Thus, the compliance of MoEFCC notification is not subject to the prior concurrence of beneficiaries.

d. The Petitioner was consulting the beneficiaries for the installation of ECS and shared the details.

e. The MoEFCC's notification dated 7.12.2015 has introduced SO_2 norms and NOx norms for the first time and the technologies for these are neither identified nor in operation.

f. On request of NTPC, MoEFCC has revised the norm for chimney height vide notification dated 28.6.2018. Further, after implementation of revised emission norms i.e. FGD, lining of existing stakes (Chimneys) is required to prevent corrosion, however, the lining of existing stakes requires a long shutdown of units for around 6 to 8 months, but in case of construction of a new chimney, the same could be constructed in parallel to FGD installation without shutting down the units for much longer time and is also cost-effective. Accordingly, a new stack will be constructed in the instant station.

g. The NOx norms have to be met continuously and not on an average basis. Further, NOx level depends on nitrogen in coal, mill combination, operating load etc. Accordingly, CM is essential for revised emission norms.

h. As Unit-I falls in Category 2, the capital cost of ₹385.93 crore for Unit-I w.r.t. SNCR is not required. Further, Units II, III and IV falls in Category 3, therefore, CM and SCR are required.

i. The cost-benefit analysis submitted is as per the parameters provided by CEA vide its advice dated 7.2.2020.

j. Regulation 35(1)(7) of the 2019 Tariff Regulations provides for 2% of admitted capital as additional O&M Expenses on account of ECS and escalated annually @3.5% till 31.3.2024. Further, generating companies are allowed to recover O&M Expenses and interest on loans for the shutdown period due to the installation of ECS.

k. In terms of the decision of the Commission dated 27.4.2021 in Petition No. 335/MP/2020, all endeavours will be made to plan the integration of the FGD system with the annual overhaul. However, in case it is not completed, may

seek deemed generation, and at this stage, it is not possible to assess the exact impact of charges payable during shutdown.

l. The 2019 Tariff Regulations do not bar the Petitioner from claiming ACE, increase in cost of generation, other incidental expenses etc, during shutdown on account of ECS.

m. As per the Commission's decision in an order dated 28.7.2018 in Petition No. 98/MP/2017, any expenditure or revenue loss is recoverable by Petitioner.

9. In response to the queries in the RoP dated 10.5.2021, the Petitioner vide affidavit dated 5.6.2023 has submitted as follows:

i. Bihar State Pollution Control Board has issued an Emission Consent order dated 17.6.2021, and as per Point No. 7, the Unit shall comply with new emission standards notified dated 7.12.2015 and as per Point No. 9, the Unit has to install FGD System to comply SO_2 emission level.

ii. Steam Generator Package has been awarded to BHEL. However, the demonstration of SO_2 value was not guaranteed. The SO_2 removal efficiency (continuous) of the FGD package is 96.91%.

iii. The actual SO_2 emission value on average basis at 6% O_2 dry basis from 2020-21 to 2022-23 was 1110 mg/Nm^3 and the peak SO_2 in 2018-19 and 2019-20 was around 1250 mg/Nm^3. The report for 2022-23 is yet to be submitted to CPCB.

iv. The coal is brought from different mines and sulphur content depends on the source of coal. Further, analysis of coal indicates the sulphur content for a few samples, wherein the average sulphur content in coal is 0.5%.

v. In case of use of existing chimney, Titanium/C-276 alloy lining would be required for a stack height of 220 mts. but the new chimney would be 150 mt.

vi. The Unit-4 was commissioned and declared COD w.e.f. 1.12.2021.

vii. In order to control NOx limits, presently undertaking only Combustion Modification works, and SNCR is kept on hold.

Analysis and Decision

10. We have considered the submissions of the Petitioner and the Respondents and have perused the documents available on record. The installed capacity of the generating station is 1000 MW (4 x 250 MW), and out of the 4 units, Unit-1 was commissioned prior to 31.12.2016 and the remaining three units were commissioned after 1.1.2017. MoEFCC vide notification dated 7.12.2015 specified norms for SO_2 and NOx emissions from thermal power stations. Subsequently, MoEFCC vide notification dated 28.6.2018 has revised the norms for NOx emission for plants installed between 1.1.2004 and 31.12.2016. Subsequently, MoEFCC relaxed the norms of NOx for TPPs commissioned during the period from 1.1.2004 and 31.12.2016 from 300 mg/Nm3 that was stipulated in the MoEFCC Notification of 7.12.2015 to 450 mg/Nm3 vide Notification G.S.R. 662(E) dated 19.10.2020. Thus, the applicable SO_2 and NOx limits for Unit 1, commissioned on 20.3.2016, are 600 mg/Nm^3 and 450 mg/Nm^3 respectively and for Units 2, 3 and 4, commissioned on 3.4.2017, 20.2.2017, and 1.12.2017 respectively, it is 100 mg/Nm^3 and 100 mg/Nm^3, respectively.

11. The Petitioner has submitted that the instant generating station has an online Emission Monitoring System and real time emission data is automatically transmitted to CPCB from October 2018 onwards. During the initial phase of stabilization of the system, the data was erratic and the values were nil during some time of the day, and the average parameter was also low. The Petitioner has submitted that from October 2018 to March 2020, the SO_2 on the average basis at 6% O_2 dry basis as submitted to CPCB, was in the range of 170-400 mg/Nm^3. However, average

monthly peak values from 2018-19 (October 2018 onwards) to 2019-20 are in the range of 1200-1300 mg/Nm^3, and the weighted average SO_2 level in 2020-21 and 2022-23 is 1110 mg/Nm^3. The average NOx from October 2018 to March 2020 was in the range of 140-180 mg/$Nm^{3,}$ and the weighted average NOx level in 2020-21 was 383 mg/Nm^3. In this context, it is noted that the average monthly peak values in the range of 1200-1300 mg/Nm^3 furnished from October 2018 to March 2020 were not part of the CPCB report. Further, the Petitioner has neither furnished any reasons for recording such erratic values with respect to vital parameters of SO_2 and NOx, that too in the newly commissioned station and for such a long period nor was the fault analysis report prepared and measures taken thereof.

12. In compliance with the MoEFCC notification dated 7.12.2015, the Petitioner planned WFGD for all four units to control the SO_2 emission and claimed ACE of ₹817.97 crore and initially claimed CM (primary technology) for all 4 units and additionally SCR (secondary technology) for Units 2, 3 and 4 to control NOx level and claimed ACE of ₹413.23 crore (CM-₹27.30 crore and SCR-₹385.93 crore). However, subsequently, the Petitioner has submitted that in view of the enhanced norms of NOx, the same can be complied with the installation of only CM (primary technology), and the award for the installation of the same has been placed and is under implementation by L&T and the secondary technology proposed for ₹ 385.93 crore is not required and is kept in abeyance.

13. The Respondents have contended that the Petitioner has not complied with the provisions of Regulation 29 of the 2019 Tariff Regulations, according to which the Petitioner was required to share the proposal with the beneficiaries in respect of

ACE for complying with the revised ECNs. However, in contravention of the above provision, the Petitioner has proceeded with the implementation of revised ECNs without sharing the proposal with the Respondents.

14. The Regulation 29 of 2019 Tariff Regulations provides for additional capitalization on account of revised ECNs, and the same is as follows:

> ***"29. Additional Capitalization on account of Revised Emission Standards****:*
>
> a. *A generating company requiring to incur additional capital expenditure in the existing generating station for compliance of the revised emissions standards shall share its proposal with the beneficiaries and file a petition for undertaking such additional capitalization.*
>
> b. *The proposal under clause (1) above shall contain details of proposed technology as specified by the Central Electricity Authority, scope of the work, phasing of expenditure, schedule of completion, estimated completion cost including foreign exchange component, if any, detailed computation of indicative impact on tariff to the beneficiaries, and any other information considered to be relevant by the generating company.*
>
> c. *Where the generating company makes an application for approval of additional capital expenditure on account of implementation of revised emission standards, the Commission may grant approval after due consideration of the reasonableness of the cost estimates, financing plan, schedule of completion, interest during construction, use of efficient technology, cost-benefit analysis, and such other factors as may be considered relevant by the Commission.*
>
> d. *After completion of the implementation of revised emission standards, the generating company shall file a petition for determination of tariff. Any expenditure incurred or projected to be incurred and admitted by the Commission after prudence check based on reasonableness of the cost and impact on operational parameters shall form the basis of determination of tariff."*

15. As per Regulation 9(1) of the 2019 Tariff Regulations, the generator has to share the proposal for ACE for installation of the ECS to comply with the revised ECNs with the beneficiaries and file the petition. In the instant case, it is observed that the Petitioner had initiated action for the installation of the ECS by inviting bids in the year 2017 and the 2019 Tariff Regulations, notified on 7.3.2019, came into effect

on 1.4.2019. Thus, we are of the view that the Petitioner could not have shared the proposal for installation of the ECS with the beneficiaries in the year 2017 or 2018, as the provision of sharing such proposal was mandated only in the 2019 Tariff Regulations. As such, the Respondent's contention that the Petitioner has proceeded with the installation of ECS without sharing the same with the Respondent does not have any merit. Further, as stated, the Petitioner has initiated action before 1.4.2019, and any re-initiation of the process could have led to a delay in the installation of the ECS and non-compliance of timelines specified for complying with the revised ECNs.

16. As regards the selection of WFGD over other technologies, the Petitioner has submitted that various aspects were considered by NTPC, the lead promoter of the Petitioner, including quality of coal, availability of reagent, availability of technology, risk in handling etc, at the time of selection of technology for the instant generating station. Further, the award of the same technology by NTPC to multiple stations had the advantage of spares and availability of reagents. In addition, considering the balance life of Units of the instant generating and OPEX, as per life cycle cost-benefit analysis, the WFGD was found to be a more suitable technology for reducing the SO_2 emissions. Accordingly, the Board of Directors of the Petitioner deliberated and approved the installation of WFGD in the generating station in its 73rd meeting held on 28.6.2017. Subsequently, on 30.6.2017, NTPC invited bids through open competitive bidding in two stages i.e. techno-commercial and price bid. The techno-commercial bid was opened on 17.8.2017, wherein the bidders were evaluated, and those qualified in the first stage (techno-commercial bid) were asked to submit price bids through the e-tendering portal. Accordingly, ten (10) bidders i.e. Bharat Heavy

Electricals Ltd (BHEL), GE Power India Limited (GEPIL), IEGC Heavy Heavy Engineering Ltd (ISGEC), Mitsubishi Hitachi Power System India Pvt Ltd (MHPSIPL), Larsen & Turbo Limited (L&T), Thermax Limited (Thermax), Reliance Infrastructure Ltd. (RIL), The Indure Pvt. Ltd (Indure), Doosan Power System India Pvt. Ltd (Doosan) and Tata Projects Ltd (TPL) submitted their response. After considering the quoted price, discount, arithmetic corrections, loading due to differential Guaranteed Parameters etc, BHEL was evaluated as the L1 bidder with ₹692.44 crore. Subsequently, the e-reverse auction was conducted, and BHEL again was L1 with ₹649.96 crore, and L&T was L2 with ₹650.47 crore in the e-reverse auction. After, the reverse auction, the cost quoted by BHEL was ₹644.16 crore, exclusive of taxes and duties, and with further rate analysis and negotiation, BHEL finally offered ₹634.16 crore. Accordingly, the Board of Directors of the Petitioner, in its 81st meeting held on 12.3.2019 approved the award of WFGD to BHEL for ₹634.16 crore. Thereafter, the Petitioner vide NoA dated 10.7.2019 awarded ex-works supply (India) of FGD to BHEL for ₹382.76 crore, including mandatory spares and type testing. Further, the Petitioner, vide another NoA dated 10.7.2019, awarded inland transportation, inland insurance, installation, testing and commissioning to BHEL for ₹251.41 crore.

17. The CEA in its advice dated 7.2.2020 mentioned that suitable technology shall be decided based on various factors including coal quality, unit size, space availability, availability of reagent and its purity, disposal of by-product, balance life, APC, life cycle cost, availability of water, the efficiency of FGD, consideration of new stack/modification of stack, PLF etc. It is observed that the Petitioner taking into consideration the advice of CEA, the life of the generating station and other factors,

selected the WFGD technology for the instant generating station for control of the SO_2 emission levels. Further, the same has been approved by the Board of Directors of the Petitioner. Accordingly, we approve the Petitioner's proposal for the installation of the WFGD in the instant generating station.

18. As regards the ECS for NOx, the Petitioner initially proposed CM and SCR to control NOx emission levels and claimed ACE of ₹413.23 crore, (₹27.30 crore towards CM and ₹385.93 crore towards SCR). Later, in view of the relaxed norms of NOx, the Petitioner proposed only installation of CM, and there is no need to install SCR for the time being. Accordingly, the Petitioner claimed only ₹27.30 crore for the installation of the CM to reduce the NOx emission. Further, it is observed that the Petitioner has awarded the installation of CM to L&T, and it is being implemented by L&T. The Petitioner has submitted that the present NOx emission norms could be met by installing the CM in the instant generating station, and accordingly, we approve the Petitioner's proposal for installation of CM for reducing the NOx emissions in the instant generating station.

19. As regards the cost, the Petitioner has claimed ₹63.40 lakh/MW of hard cost towards the installation of WFGD in the instant generating station against the CEA recommended hard cost of ₹45 lakh/MW. Thus, the cost claimed by the Petitioner is higher than the cost recommended by CEA. The Petitioner has submitted that the cost estimates prepared by CEA were a few years old, and it is only indicative in nature. The Petitioner has further submitted that the cost claimed by the Petitioner is discovered through a transparent open competitive bidding and approved by the Board of Directors of the Petitioner. The Respondents have submitted that in

addition to O&M Expenses for ECS, the Petitioner has included AMC charges in NoA for FGD, it is observed that these AMC charges are in respect of C&I equipment of FGD and not the complete FGD.

20. As regards the installation of CM, it is observed that the Petitioner invited bids through open competitive bidding on 17.1.2019 and the techno-commercial bid was opened on 14.3.2019. After evaluation of price bids, L&T MHPS Boilers Pvt. Ltd. emerged as L1, and the Petitioner vide NoA dated 18.11.2019 awarded ex-works supply of CM for ₹17.35 crore, including mandatory spares, and vide another notification of award dated 18.11.2019 awarded inland transportation, insurance, installation, testing, commissioning and guarantee testing of CM for ₹4.34 crore. Thus, the petitioner has awarded CM for ₹21.68 crore. As per the submissions of the Petitioner, the Petitioner has adopted a competitive bidding process for the identification of the agency for the installation of the CM and the capital cost discovered is also transparent.

21. The Petitioner has claimed the following capital cost towards the installation of WFGD and CM in the instant generating station.

(₹ in crore)

	WFGD	**Combustion Modification**
Ex-works supply	382.76	17.35
Installation and transportation charges	251.41	4.34
Total	634.41	21.68
Work Cost (claimed)	634.16	21.14
GST	114.15	3.80
IDC, IEDC & FC	69.66	2.35
Total	**817.97**	**27.30**

22. As pointed out by the Respondents, the capital cost of installation of WFGD is higher than the indicative cost recommended by the CEA. It is observed that the

indicative cost given the CEA's advisory is based on the projects awarded before 21.2.2019 and the Petitioner has awarded the project on 12.3.2019. The Petitioner has discovered the cost of FGD based on the open competitive bidding, including e-reverse auction, after following the due procedure. Further, the Petitioner has furnished a certificate from NTPC stating that the award of contract for installation of FGD in its various generating stations and its JVs is after following a fair and transparent competitive bidding process as per approved procedures, guidelines and policies of the company and after installation of FGD and its successful operation, the stations would meet the required SO_2 emission norms. It is further observed that BHEL has started works for installation of WFGD, civil works are in progress, bypass dampers have been installed for Units-2 and 3 and FGDs are envisaged to be installed for all Units at the earliest.

23. In view of the above, we grant in-principle approval of the hard cost of ₹634.16 crore and ₹21.14 crore towards the installation of WFGD and CM in the instant generating station under Regulation 11 of 2019 Tariff Regulations, subject to truing-up at the time of determination of supplementary tariff for ECS. The other components of the cost of WFGD and CM will be considered after the implementation of ECS and the filing of a petition by Petitioner under Regulation 29(4) of the 2019 Tariff Regulations. Further, the Petitioner is directed to ensure that all the units of the generating station comply with ECS norms and timelines of MoEFCC.

24. We have observed that the information furnished by the Petitioner in response to the queries of the Commission and the observations of the Respondents, is at

times incomplete, vague or irrelevant, such as the cost-benefit analysis considering the actual PLF, revenue received from the sale of by-products, actual balance life of units, non-submission of PG test report, the action taken during time elapsed (around 19 months) between bid evaluation and award of contract with respect to WFGD etc.

25. The Petitioner is directed to submit the petition for determination of supplementary tariff after addressing the above observations and furnishing information pertaining to the escalation factor mentioned for FGD, sub-head wise break up of investment approval cost and actual cost, time overrun, cost overrun, the penalty recovered from the vendors for delay and lapses in the execution of works, total O&M Expenses associated with ECS, particularly indicating the O&M Expenses pertaining to C&I equipment and also keep the Respondents informed about the developments in the installation of ECS in compliance with the revised ECNs, in terms of Regulation 29 of the 2019 Tariff Regulations.

26. As regards the Petitioner's submission that it will approach the Commission as and when the works pertaining to new norms for water consumption, mercury, and particulate matter may have to be taken up, the same would be dealt with as per the applicable laws and regulations.

27. The Petitioner's plea for additional Auxiliary Power Consumption, additional O&M Expenses i.e. spares and manpower and cost of chemical reagents (limestone) on account of installation and implementation of ECS and additional water consumption on account of WFGD will be dealt with as per the provisions of the

2019 Tariff Regulations at the time of determination of supplementary tariff under Regulation of 29(4) of the 2019 Tariff Regulations after implementation of ECS.

28. The Petitioner has claimed for additional GSHR over and above the normative GSHR due to the implementation of ECS, under Regulation 76, i.e. “Power to Relax” of the 2019 Tariff Regulations. The 2019 Tariff Regulations do not provide for additional GSHR on account of the installation of ECS. As the instant petition is for in-principle approval of the ACE on account of the installation of ECS in compliance with revised emission norms, we are not inclined to consider the same in this order and the Petitioner may raise the same at the time of determination of supplementary tariff under Regulation of 29(4) of the 2019 Tariff Regulations.

29. As regards the Petitioner’s claim for deemed availability on account of shutdown for implementation of ECS, the Commission in an order dated 22.6.2020 in Petition No. 168/MP/2019, has already held that Petitioner and the beneficiaries shall plan and synchronize the inter-connection of FGD system with the plant with the annual overhaul. Accordingly, we are of the view that the Petitioner and the beneficiaries should plan and synchronize the inter-connection of ECS with annual overhauling. Any additional requirement of shutdown beyond the annual overhaul period would be considered based on the submissions by Petitioner.

30. The instant order disposes of Petition No. 66/MP/2021 in terms of the above discussions and findings.

sd/-	**sd/-**	**sd/-**	**sd/-**
(P. K. Singh)	**(Arun Goyal)**	**(I. S. Jha)**	**(Jishnu Barua)**
Member	**Member**	**Member**	**Chairperson**