ODISHA ELECTRICITY REGULATORY COMMISSION
BIDYUT NIYAMAK BHAWAN
PLOT NO.-4, CHUNUKOLI, SHAILASHREE VIHAR
BHUBANESWAR - 751 021
****

Present: **Shri U. N. Behera, Chairperson**
Shri S. K. Parhi, Member
Shri G. Mohapatra, Member

Case No. 18/2020

M/s. OPGC Ltd. …… Petitioner
Vrs.
GRIDCO Ltd. …..... Respondent

In the matter of: **An application for approval of capital cost for installation of FGD for Units-3 & 4 (2x660 MW) as per Regulations 11 and 29 of the CERC (Terms and Conditions of Tariff) Regulations, 2019 read with other relevant provisions of OERC (Conduct of Business) Regulations, 2004.**

For Petitioner: Shri Sitesh Mukherjee, Advocate
Shri Arjun Agrawal, Advocate
Shri Ritwik Mishra

For Respondents: Shri P.K. Mohanty, Sr. Advocate on behalf of GRIDCO Ltd.,
Shri Puneet Munjal on behalf of M/s. TPCODL
Shri K.C. Nanda, DGM (Fin.), WESCO Utility
Ms. Niharika Pattanayak, ALO, DoE, Government of Odisha
Nobody is present on behalf of NESCO Utility and SOUTHCO Utility

ORDER

Date of hearing: 08.09.2020 **Date of order: 24.09.2020**

OPGC, the petitioner in the present case has an existing coal based Thermal Power Station 2X210 MW (#1 & 2) at Ib Thermal Power Station Complex, Banharpalli, Jharsuguda District in Odisha. In the meantime, it has set up 2 more units #3 & 4 each of 660 MW capacity, commissioned on 03.07.2019 and 21.08.2019 respectively. The Petitioner had filed an application on 19.01.2019 before this Commission for determination of the tariff for #3 & 4 in terms of OERC (Terms and Condition for Determination of generation Tariff) Regulation, 2014. Subsequently, it has filed another application for approval of additional expenditure to be incurred to meet the revised emission norms of MoEFCC notification dated 07.12.2015 in addition to the total estimated capital expenditure of the main petition.

2. The Environmental Clearance for OPGC Units 3 & 4 was accorded by the Ministry of Environment & Forests (MoEF) vide the letter dated February 4, 2010 under the then prevailing Environment (Protection) Rules, 1986. The Ministry of Environment, Forests & Climate Change (MoEF & CC) vide Notification dated December 7, 2015 notified the Environment (Protection) Amendment Rules, 2015, thereby amending the Environment (Protection) Rules, 1986, which mandatorily required all operating thermal power plants to comply with the revised environmental norms (herein after called "Revised Norms") on or before 06.12.2017, i.e., within a period of 2 years from the date of above mentioned notification.

The relevant extracts of the Notification is reproduced below.

"... (b) for serial number 25, and the entries related thereto, the following serial number and entries shall be substituted, namely:-

Sr. No.	***Industry***	***Parameter***	***Standards***
1	*2*	*3*	*4*
"25.	***Thermal Power Plant***	***……. TPPs (units) to be installed from 1st January, 2017*****	
		Particulate Matter	*30 mg/Nm^3*
		Sulphur Dioxide (SO_2)	*100 mg/Nm^3*
		Oxides of Nitrogen (NOx)	*100 mg/Nm^3*
		Mercury (Hg)	*0.03 mg/Nm^3*

……

***Includes all the TPPs (units) which have been accorded environmental clearance and are under construction"*

3. In the case of plants under construction, it was directed to comply with the norms before commissioning. The timeline for implementation of the Revised Norms for OPGC Units 3 & 4 was subsequently revised by Central Pollution Control Board (CPCB) vide its letter dated 17.12.2017 for implementation as under:

Unit -3	31.12.2021
Unit-4	31.12.2021

4. Thereafter, the petitioner took the following action.

OPGC floated tender for appointment of Technical Consultant on 10th March 2016 and appointed M/s Black and Veatch Ltd. ("B&V") on 17th May 2016 for carrying out the feasibility study, recommending appropriate technological solution for meeting the revised emission norms, submit Detailed Project Report to that effect and support in preparation of

tender document. B&V submitted its report on 2nd November 2017 suggesting the following solution basing on which OPGC Board approved the preparation of tender documents.

a. Wet Limestone Based Flue Gas Desulphurization System for SOx abatement,

b. Flue Gas Conditioning System for PM abatement and

c. Selective Catalytic Reduction Retrofit for NOx abatement for OPGC – II

5. In accordance with the amendment issued by MoEF & CC on 28 June 2018 and as mandated in the new advisory, the stack height post FGD and water consumption were stipulated as follows:

Parameter	***Standards***
Stack height post FGD in meters	*$H= 6.902\ (QX0.277)^{0.333}$* *Or* *100 Meters whichever is more*
Specific water consumption	*3.0 m^3 per MWh*

6. Tendering process for selection of EPC contractor for installation of FGD and FGC were initiated by OPGC on 6th July 2018, through domestic competitive bidding process. Based on review of data on coal quality, assumptions for sulphur content was increased from 0.4% to 0.6%. As a result, the FGD system was required to be resized and B&V was accordingly directed to carry out necessary modifications to their proposal. B&V, vide its revised DPR No.192529, Rev.3, dated 20th December 2018, recommended implementation of the suggested technology at revised cost of Rs.1491.20 Cr, which was duly approved by the OPGC Board. Accordingly, OPGC sought approval of the DPR from CEA, for Environment Retrofit Project vide its letter Ref. No. 8958/WE, dated December 18, 2018.

7. On the basis of the technical information provided by OPGC, available technology and other conditions CEA vide its letter dated 23 January 2019, issued its recommendation report detailing suggested technology and estimated indicative cost in installation of FGD system for 2 X 660 MW OPGC-II IB Thermal Power Station. The recommendations by CEA inter-alia were:

A. "***TECHNOLOGY:***

Wet FGD (Lime stone based technology) may be considered. The nearest source of reagent is about 180 Km to the site. However, actual sources of reagent may be selected based on availability of limestone, limestone purity, cost, quality, detail engineering and logistics to OPGC-II. Additionally, source of limestone should be chosen with life cycle cost analysis comparing "Costs related to Limestone supply to the site V/s Optimum salebility of By-product i.e. Gypsum.

B. ***ENGINEERING ASPECT:***

1. Individual FGDs for each Units.

2. *Limit SO_2 below environment norms with upto o.5% Sulphur content in coal.*
3. *Absorber Lining- Such as Ceramic Tiles, Steel Alloy Lining or Glass flake filled multi-functional epoxy or glass flake.*
4. *For Limestone based FGD following chimney arrangement may be considered:*

   At present provision of single chimney with two flue can has been made. It is recommended to use this existing chimney as wet stack by making proper corrosion protect lining.

   I. *This arrangement can be done by providing a temporary new (SS) chimney over one of the absorber and accordingly corrosion protection lining of one flue can (existing chimney) can be done. Like that this temporary chimney can be shifted to other absorber and corrosion protection lining of balance flue can (existing chimney), may be completed.*

      OR

   II. *Two temporary (one over each absorber) SS chimney over absorbers and corrosion protection lining of existing chimney both flue Can may be done simultaneously.*

      OR

   III. *One/Two Temporary Chimney above ground level and corrosion protection lining of existing chimney both flue Can may be done simultaneously.*

      The intention behind this activity is to minimise the CAPEX by avoiding installation of new wet stacks as the plant is yet to start commercial operation and scrapping the newly constructed chimney may not be prudent choice.

   IV. *However, if OPGCL wants to go for installing new wet stacks a detailed "life cycle cost benefit analysis" and feasibility needs to be done, while taking into account the cost of existing chimney.*

      ***Corrosion Protection** lining options chimney/wet stack shall be Borosilicate Block lining, Steel Alloy lining or Glass flake filled epoxy phenol novolac.*

5. *Lime stone purity 85% (above) so that by-product should be of saleable quality.*
6. *Online monitoring system for Flue Gas before and after FGD system.*
7. *All ducts, effluent handling pits or concrete zone etc. to be protected with glass flake based coating/steel Alloy lining as far as possible.*
8. *Piping material may be of flake glass based coating, carbon steel rubber lined (CSRL)/rubber lining however lesser diameter pipes can be of GRP/FRP, GRE or SS material.*
9. *Auxiliary Power Consumption (APC) – 1% for each FGD /UNIT.*

NOTE: OPGC to make lifecycle cost benefit analysis and feasibility before opting for above mentioned suggested.

C. ***COST:***

(i) CAPEX:

The cost of retrofitting FGD for the plant should be discovered through open competitive bidding in consultation with representatives of GRIDCO for which we have already informed GRIDCO vide letter ref: 44/FGD/UMPP/CEA/2019-110-121 DTD: 22.01.2019. The indicative cost works out to Rs. 0.35 Cr/MW (CAPEX only) excluding Opportunity cost related to inter connection period, taxes, IDC, financing, IEDC and duties etc.

(ii) OPEX:

Operating Cost will include Reagent cost, Additional water consumption associated with FGD, Manpower cost, By-product handling and revenue from disposal (less) such cost shall be calculated after detailed engineering and life cycle cost benefit analysis. And award (if any) may be done through open competitive bidding.

(iii) GUARANTEES:

OPGCL shall ensure that; "Performance Guarantees" shall be explicitly mentioned in Bidding Document with suitable liquidated Damages (LD)/Rejection clause for major parameters related to FGD operation such as:

1. *SO2 Removal Efficiency*
2. *Limestone consumption of FGD System*
3. *Auxiliary Power Consumption of FGD.*
4. *Availability of FGD Plant.*

(iv) PROJECT COMPLETION SCHEDULE:

1. *UNIT-03 FGD Completion – 21 Months*
2. *UNIT-04 FGD Completion – 23 Months*
3. *Final completion of all FGD facility – 24 Months"*

Irrespective of the timeline mentioned above, OPGC is required to meet the timeline as prescribed by appropriate Pollution Control Board.

8. In its recommendation, CEA has intimated vide letter dated 22.01.2019 that a representative from GRIDCO be deputed for participating in the bidding process, which was complied by GRIDCO vide its letter dated 04.04.2019.

9. The petitioner has submitted that it has made following exceptions from CEA recommendation keeping in view its specific requirement and from more conservative considerations.

   a. Sulphur in Coal considered 0.6% Vs 0.5% by CEA.

   b. New wet stack with twin flue cans were considered in OPGC tender specification. However, CEA recommendation was to use existing chimney for FGD.

   c. Estimated Project completion schedule considered as Unit#3-30 Months, Unit#4-36 months and final completion in 38 months.

   d. Instead of "SO_2 removal efficiency" OPGC has considered "SO2 emission guarantee of 75 mg/Nm3" as one of the performance Guarantees. CEA specification indicates that for compliance of emission norms of 100 mg/Nm3, the required SO2 removal efficiency of FGD system to be installed shall be in the range 90- 95%. But in case of OPGC the removal efficiency is more than 96% considering the inlet flue gas parameters. Hence

stipulation of SO2 emission guarantee of 75 mg/Nm3 in OPGC bid document meets the regulatory requirement.

10. Further, the petitioner says that it has taken care of the subsequent norms of CEA vide its notification dated 07.02.2020. For complying with CEA norms, OPGC has stated that there is requirement of installation of Wet Flue Gas Desulphurisation (FGD) system for controlling SO_x emissions, Flue Gas Conditioning (FGC) system for complying with emission norms of Suspended Particulate Matter (SPM) and Selective Catalytic Reduction (SCR) system for controlling NOx emissions. For the time being, it is excluding SCR due to the reason that trial of it by NTPC is still going on.

11. Against the CEA norm of Rs.0.37 Cr./MW for installation of FGD, the petitioner has proposed the following cost for approval.

Break-up of Proposed Capital Expenditure for FGD& FGC System at OPGC

Sl. No	Particulars	Capex Estimate Rs Cr	Capex Estimate Rs Cr/MW	Remark
1.0	**Direct Cost**			
1.1	Wet Lime Stone Based FGD System	648.36	0.49	Discovered Price based on DCB for FGD and FGC. Subject to Price Variation.
1.2	FGC	25.20	0.02	
1.3	Total FGD EPC Base Cost	673.56	0.51	
1.4	GST @ 18%	121.24	0.09	
1.5	Total Direct Cost (EPC Contract)	794.80	0.60	
2.0	**Indirect Cost**			
2.1	Owner's Engineer	2.36		Discovered Price + 15% additional for manpower
2.2	Owner's Cost & Construction Management	61.76		Estimated @ 8% of the Direct Cost.
2.3	Performance Test	14.282		Cost of Raw Material and Start Up power required in EPC
2.4	Contingency	119.22		Estimated@15% of the Direct Cost
2.5	Total Indirect Cost	197.62	0.15	
3.0	**Total Direct & Indirect Cost excluding IDC**	**992.42**	0.75	
4.0	IDC @ interest rate of 11% pa	93.30	0.07	Estimated based on Capex Phasing.
5.0	**Total Estimated Project Cost**	**1086.72**	0.82	

12. OPGC has stated that the above Total Capital Expenditure of Rs.1086.72 Crore (0.82 Cr./MW) is higher than the Indicative Capital Expenditure of Rs.0.35 Cr./MW by Rs.0.47 Cr./MW due to following reasons:

(i) The Total Base Cost of Rs.0.51 Cr./MW is higher than that considered by CEA as Rs.0.35 Cr./MW (difference Rs.0.16 Cr./MW). One part of this Cost is EPC Base Cost comprising majorly of FGD cost discovered through competitive bidding for various site-specific reasons including space constraint and bidders' assessment of cost. The other part is installation of FGC which is not envisaged by CEA in its advisory.

(ii) Other than the above direct cost OPGC has envisaged Indirect cost of 0.15 Cr./MW against the various activities mentioned in the above table, which has not been envisaged by CEA in its recommendation.

(iii) Balance difference of Rs.0.16 Cr./MW is due to the following components that were explicitly specified by the CEA and not included-

(a) Taxes and duties – GST @ 18% of Total Base Cost i.e. Rs.0.09 Cr./MW).

(b) IDC – Estimated with expenditure phasing being financed in 80:20 Debt-Equity ratio with interest cost considered @11% pa. This difference is Rs.0.07 Cr./MW.

13. With regard to opportunity cost, OPGC has stated that it is entitled to the same as part of Capital cost in line with the recommendation of CEA considering shutdown period of 30 days for installation of each unit and projected Annual Fixed Cost (AFC).

14. In addition to the above, for OPGC the following annual O&M cost may arise.

- Reagent costs.
- Electric power costs.
- Makeup water costs.
- Wastewater and by product disposal costs.
- Consumables costs
- Operating labour costs.
- Maintenance materials and labour costs.

The costs for reagent, electric power, makeup water, waste-water, and by-product disposal are variable annual costs and are dependent on the amount of pollutant removed. Operating

and maintenance materials and labour are fixed annual costs and will not vary with these factors.

Annual fixed maintenance consisting of labour and material costs are estimated at Rs.8,26,32,000/-. Annual variable maintenance consisting of limestone, by-product disposal, water, booster fans and auxiliary power cost, are estimated at Rs.1,01,90,42,000/-. Auxiliary Power consumption quoted by the successful Bidder is 8550 kW per 660 MW Unit i.e. 1.30%.

15. Shri P. K. Mohanty, Sr. Advocate on behalf of GRIDCO has made his submissions citing various flaws, omissions, etc. in the petition. GRIDCO has submitted that they are not having the necessary expertise to verify the Emission Control System Technology as well as the corresponding price and its reasonableness. However, considering the statutory requirement of installation of the FGD and the urgency of installation of the same, GRIDCO is not having any objection to grant in principle approval for installation of FGD for Unit-3 and 4 of OPGC. GRIDCO has prayed for verification of proposed cost by the Commission. Further, the capital expenditure may be verified by an independent agency in accordance with the OERC Generation Tariff Regulations, 2014.

16. TPCODL has submitted that in principle approval may be granted in terms of the CEA recommendation which serve as guiding principle. The final and actual cost may be allowed after prudence check. The additional expenditure estimated by the Petitioner is not justified and the approval / reliefs claimed by the Petitioner for the installation of FGD may not be granted at this stage. TPCODL has submitted that the opportunity cost may be allowed to be claimed at the time of true up based on actual time of shut down and proportionate AFCs to be approved for the respective periods. Further, OPGC should be directed to take consent of the beneficiaries before going under the shut down for construction, installation and commissioning of the FGD and FGC so that off-peak period can be utilised.

17. In the latest submission dated 14.09.2020, the petitioner has justified its earlier filing and the proposed cost as below.

    (a) FGD technology is as per CEA recommendation, which says cost of retrofitting should be discovered through competitive bidding.

    (b) CEA's cost of Rs.0.37 Cr./MW is indicative only and it is only the base cost.

    (c) CERC has consistently held that CEA's cost is only indicative and is liable for upward revision based on actual cost discovered through open competitive bidding. In support of it, the petitioner has cited the orders of CERC [dt.11.11.2019 in petition

No.152/MP/2019 (Maithan), dt.22.06.2020 in petition No.168/MP/2019 (Coastal Gujrat Power Ltd.), dated 23.04.2020 in petition No.446/MP/2019 (Sasan) and petitions 209/MP/2019 & 210/MP/2019 (Sembcorp)].

(d) The cost discovered trough open competitive bidding has deviated from the CEA's indicative cost due to site/project specific requirement like (i) Sulphur content in the available coal, (ii) different stricter performance guarantee norm prescribed by MoEFCC notification. To take care of the variation in operating input parameters such as deterioration in coal quality, higher sulphur content in coal, higher flue gas temperature and flow, higher plant heat rate, etc., sufficient design margin needs to be considered on actual performance parameters of the plant.

(e) Against the recommendation of CEA to use existing chimney with addition of acid resistant lining, OPGC has considered for new Chimney to avoid shut down loss and to save fuel. OPGC has submitted that CEA recommendation allows such leeway to OPGC subject to detailed life cycle cost benefit analysis and feasibility needs.

(f) OPGC has stuck to installation of FGC in line with MoEFCC Notification dated 16.01.2015 and it costs very less, i.e., 0.02 Cr./MW.

18. The Petitioner, therefore, has prayed the Commission to grant in principle approval for the base cost of Rs.673.56 Cr. for installation of FGD and FGC (Rs.0.51 Cr./MW) and Rs.2.36 Cr. for engagement of Owner's Engineer discovered through the process of open competitive bidding. Further, it has requested the Commission to allow other indirect costs as per actuals to be submitted at the time of tariff application.

19. The petitioner however could not explain to the satisfaction of the Commission the reason behind high indirect cost. OPGC has however, submitted in para 15 of its latest submission dated 14.09.2020 that deducting the requirement of cost towards Electrical (including associated equipment)/Civil/Mechanical/erection/design engineering and FGC from the direct cost component of Rs.0.51 cr./MW in the main petition, the base cost of FGD comes down to Rs.0.4246 Cr/.MW. Taking the impact of inflation, the indicative cost of CEA would be Rs.0.3866 Cr./MW. Hence base cost of FGD (Rs.0.4246 Cr./MW) as projected by OPGC is comparable with escalated CEA cost (Rs.0.3866 Cr./MW).

20. The owner's engineer charge, owners cost and construction management cost, Contingency, etc. are purely estimates without proper justification, which come to about 30% of the base cost. This appears to be very high compared to the approval accorded by CERC in case of Coastal Gujarat Power Limited (CGPL), etc. The Commission, therefore, is not inclined to

accord approval for the same now. The Commission has examined the capital expenditure for FGD and FGC system proposed by OPGC.

21. In view of the above and considering the proposal made by OPGC to comply with the changed law, the Commission hereby accords in principle approval as below.

Sl. No.	Particulars	Proposed Capex Estimate Rs. Cr.	Proposed Capex Estimate Rs. Cr./MW	Commission's approval Rs. Cr.
1	Wet Lime Stone Based FGD System	648.36	0.49	648.36
2	FGC	25.20	0.02	25.20
3	Total FGD EPC Base Cost excluding GST	673.56	0.51	673.56

22. The Commission also allows the claim towards IDC, Taxes and duties at actual after commissioning of FGD system, which may be allowed after prudence check. As regards to the opportunity cost, the same is not considered at this stage as the petitioner can complete the process during periodic shut down. The Petitioner would consult the beneficiaries before availing such shut down. Since the O&M cost and other applicable costs are consequential, the same shall be considered in due course after prudence check at the Commission level on an application by the Petitioner.

23. Accordingly, the case is disposed of.

Sd/-
(G. Mohapatra)
Member

Sd/-
(S. K. Parhi)
Member

Sd/-
(U. N. Behera)
Chairperson