CENTRAL ELECTRICITY REGULATORY COMMISSION
NEW DELHI

PETITION NO. 283/GT/2014

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

Date of Hearing :07.10.2015
Date of Order : 25.01.2016

In the matter of:

Petition under Section 62 and Section 79 (1) (a) of the Electricity Act, 2003 read with Chapter V of the Central Electricity Regulatory Commission (Conduct of Business) Regulations, 1999 for approval of tariff for the Kahalgaon Super Thermal Power Station, Stage II (1500 MW) for the period 1.4.2014 to 31.3.2019

And in the matter of:
Application for placing on record the relevant material and documents in pursuance of the order dated 7.9.2015 passed by the Hon'ble High Court of Delhi in Writ Pettion No. 1641 of 2014.

And
In the matter of:

NTPC Limited - Petitioner

Versus

GRIDCO Limited and Ors - Respondents

Parties Present:

Shri M.G. Ramachandran, Advocate, NTPC
Ms Poorva Saigal, Advocate, NTPC
Shri Sitesh Mukherjee, Advocate, APP
Shri R.B. Sharma, Advocate, BRPL & GRIDCO
Shri S. Vallinayagam, Advocate, TANGEDCO
Ms. Swapna Seshadri, Advocate, GUVNL
Shri A. K. Haldar, NTPC
Shri Bhupinder Kumar, NTPC
Shri Ajay Dua, NTPC
Shri A.K. Bishoi, NTPC

Shri A. Basu Roy, NTPC
Shri K.K. Shah, NTPC
Shri Navneet Goel, NTPC
Shri T. Vinod, NTPC
Shri Nishant Gupta, NTPC
Shri Somes Bandopadhyay, NTPC
Shri S.R. Sarangi, GRIDCO
Shri Rajesh Tiwari, MPPGCL
Shri J.A. Ansari, MPPGCL
Shri Nishant Grover, BYPL
Shri Sameer Singh, BYPL
Ms. Megha Bajpeyi, BRPL

ORDER

The Commission in exercise of its powers under section 61 read with section 178(2)(s) of the Electricity Act, 2003 (Electricity Act) has specified the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014 (2014 Tariff Regulations) for determination of tariff of the generating companies and transmission licensees regulated by the Commission for the tariff period 2014-19. The Petitioner, NTPC Limited (hereinafter referred to as **`NTPC')**aggrieved by certain provisions of the 2014 Tariff Regulations has filed Writ Petition No. 1641 of 2014 before the Hon'ble High Court of Delhi. Association of Power Producers (APP), Lanco Amarkatak Power Limited (LAPL) and Udupi Power Corporation Limited (UPCL) have also filed writ petitions in the Hon'ble High Court of Delhi challenging some of the provisions of the 2014 Tariff Regulations.

2. One of the provisions of the 2014 Tariff Regulations challenged in the writ petitions is the computation of Gross Calorific Value of Coal (GCV of Coal) under Regulation 30(6) which provides as under:

> "(6) Energy charge rate (ECR) in Rupees per kWh on ex-power plant basis shall be determined to three decimal places 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)

b. For gas and liquid fuel based stations

ECR = GHR x LPPF x 100 / {CVPF x (100 – AUX)}

Where,

AUX = Normative auxiliary energy consumption in percentage.

CVPF = Weighted Average Gross calorific value of coal as received, in kCal per kg for coal based stations.

c. Weighted Average Gross calorific value of primary fuel as received, in kCal per kg per litre or per standard cubic meter, as applicable for lignite, gas and liquid fuel based stations".

3. Caloric Value of Primary Fuel or CVPF has been defined in the above formula as equal to the “the weighted average Gross calorific value of coal as received, in kCal per kg for coal based stations”. According to NTPC and other the writ petitioners, the measurement of GCV of coal should be on ‘as fired basis’ instead of ‘as received basis’. During the course of the proceedings before the Hon’ble high Court, an issue has arisen as to the stage at which the GCV of coal on ‘as received basis’ has to be measured i.e. whether from the wagons on its arrival at the generating station or at the stage after the crusher installed in the premises of the generating station. The Hon’ble High Court in their order dated 7.9.2015 have directed the Commission to decide the issue i.e. at what stage the GCV of coal on ‘as received basis’ should be measured and pass appropriate order. The order of the Hon’ble High Court has been extracted as under:

“1. The petitioner – NTPC Ltd. which is a Government of India undertaking, is engaged in the business of generation and supply of electricity.

2. The main writ petition is filed with a prayer to declare certain provisions of the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2014 notified by the Central Electricity Regulatory Commission (CERC) in exercise of the powers conferred under the Electricity Act, 2003 for determination of tariff for the Power Generating Stations as ultra vires the Electricity Act, 2003 apart from being violative of Article 14 of the Constitution of India.

3. Along with the main petition, the petitioner also filed CM C.M.No.3421/2014 seeking stay of the operation of the impugned Tariff Regulations, 2014. However, no such relief is granted and this court by order dated 03.03.2015 made it clear that the participation of the petitioners in the tariff proceedings shall be without prejudice to their rights in the main petition.

4. The present application came to be filed in April, 2015 again praying for stay of implementation of the impugned Tariff Regulations, 2014 as well as the proceedings for determination of tariff for the generating stations of NTPC till the disposal of the writ petition.

5. We have heard the learned counsel for both the parties.

6. The Electricity Act, 2003 has been enacted consolidating the Indian Electricity Act, 1910, The Electricity (Supply) Act, 1948 and the Electricity Regulatory Commissions Act, 1998 and also making certain changes in the manner of operation of electricity industry in India. In terms of Section 76 of the said Act, the CERC established under the repealed Electricity Regulatory Commissions Act, 1998 is deemed to be the Central Commission for the purpose of the Electricity Act, 2003. The Central Commission is empowered under Section 178(2)(s) of the Electricity Act, 2003 to make Regulations providing for the terms and conditions for determination of tariff for supply of electricity by a generating company to a distribution licensee and etc. In exercise of the power so conferred, the Central Commission notified the Tariff Regulations from time to time. So far as the period 2014-2019 is concerned, the impugned Tariff Regulations were notified vide notification dated 21.02.2014 and the same came into force on 01.04.2014.

7. As could be seen from the averments in the writ petition, the computation of Gross Calorific Value (GCV) of coal is one of the essential factors for fixation of tariff. It is pleaded in the petition that the computation of GCV since inception was on ‘as fired’ basis, i.e., the GCV samples would be taken just before feeding the coal into the bunkers of the generating unit for power generation. The grievance of the petitioner is that a departure has been made in the impugned Regulations for measurement of GCV by adopting ‘as received’ basis for the computation of GCV. It is explained that as per ‘as received’ basis the GCV samples would be taken at the time when the coal is unloaded from the wagons of Indian Railways. The petitioner is primarily aggrieved by adoption of ‘as received’ basis instead of ‘as fired’ basis for computation of GCV. It is contended by the petitioner that the change in the

methodology of measurement of GCV under the impugned Regulations was affected without affording proper opportunity for the petitioner and others to represent their case and that the new methodology adopted on 'as received' basis is not workable since it is impossible at the time when the coal is received to measure the quality of coal in same manner as it is measured at the time when the coal is fired in the generating stations.

8. The present application has now been filed pleading that the Central Commission in its counter affidavit dated 21.07.2014 described the concept of 'as received' basis as taking samples after the secondary crusher and before stacking and that the same has been reiterated in the counter affidavit filed on 18.10.2014 in W.P.(C)No.2050/2014 filed by the Association of Power Producers. However, a different stand has been taken in the sur-rejoinder dated 25.03.2015 filed by the Central Commission stating that due to inadvertence it was wrongly stated in the counter affidavit dated 21.07.2014 that in terms of 'as received' basis the measurement of GCV of coal would be after the secondary crusher and that the measurement of coal in fact would be at the Railway wagon stage itself as per the concept of 'as received'. While contending that the admission made by the Central Commission in its earlier counter affidavits cannot be given a go by merely on the ground of inadvertence, it is further pleaded that the contradictory stand now taken by the Commission in the sur-rejoinder would cause serious prejudice to the petitioner since the petitioner had already submitted the data in the tariff proceedings on the premise that the GCV of coal would be measured only after the secondary crusher.

9. Shri M.G.Ramachandran, the learned counsel appearing for the applicant/petitioner submitted that in fact there is no crushing activity at all at the wagon stage and therefore the question of measurement of GCV at that stage is not possible. The learned counsel also refers to the Coal Supply Agreement entered into between NTPC and Northern Coal Fields Ltd. which provides for the measurement only at the secondary crusher stage. It is also submitted by the learned counsel that the homogenous mixture would be available only at the secondary crusher stage and, therefore, a direction may be issued for measurement of the GCV of coal after the secondary crusher.

10. The application has been opposed by the Central Commission contending that the Central Commission has decided to switch over from earlier practice of measuring the GCV on 'as fired' basis to 'as received' basis in order to induce transparency, efficiency in fuel handling by generating companies and computation of energy charges in a just, fair and equitable manner. It is stated in the counter affidavit that the present application is nothing but an attempt to stall the tariff determination process by not providing the data as required by the respondent. The contention of the petitioner that there was an admission in the counter affidavit initially filed on behalf of the Central Commission with regard to the measurement of GCV has been categorically denied.

11. As mentioned above, the primary contention in the main writ petition is that the measurement of GCV of coal on 'as received' basis is erroneous and ultra vires the provisions of the Electricity Act, 2003. Without prejudice to its rights and contentions in the main petition that the measurement of GCV shall be only on 'as fired basis', it is contended in the present application that even as per the measurement of GCV on 'as received' basis the stage of the collection of samples shall be after second crushing only but not at the unloading point.

12. While it is vehemently contended by the learned counsel for the petitioner that no data is available with the petitioner regarding GCV measurement of coal at unloading point and therefore subject to the outcome of the writ petition, the petitioner may be permitted to submit the data collected after secondary crushing stage for the purpose of the determination of tariff under the impugned regulations, the learned counsel appearing for the respondent has seriously opposed the same contending that it would virtually amount to granting stay of operation of the impugned regulations.

13. In the light of the voluminous material produced by both the parties to substantiate their respective contentions, it appears to us that the question as to at what stage the samples have to be collected for measurement of GCV of coal on 'as received' basis is a highly technical issue which needs to be considered, in the first instance, by the expert body like the Central Commission.

14. Therefore, we deem it appropriate to direct the Commission to decide, in the first instance, the claim of the petitioner that even as per the measurement of GCV of coal on 'as received' basis, the samples are to be taken after secondary crusher only.

15. Accordingly, without expressing any opinion on merits of the case, particularly, the rival submissions made by the parties with regard to the stage of collection of samples for measurement of GCV of coal on 'as received' basis, the application is disposed of with a direction to the Central Commission to decide the issue i.e. the stage at which the GCV of coal has to be measured on 'as received' basis and pass an appropriate order within four weeks from today.

16. The petitioner is at liberty to place before the Central Commission the relevant material to substantiate its plea that the collection of samples for measurement of GCV of coal shall be only after the secondary crusher stage within one week from today.

The application is, accordingly, disposed of."

4. In compliance with the above directions, NTPC vide affidavit dated 14.9.2015 placed its submission and materials on record in Petition No. 283/MP/2013.

Thereafter, the Commission issued a public notice on its website on 17.9.2015 informing the beneficiaries of thermal coal based generating stations of NTPC and other generating companies to participate in the proceedings and sought the responses of stakeholders on the submissions of NTPC. Association of Power Producers (APP) also filed C.M. No. 20272 of 2015 in W.P. (C) No.2050 of 2014before the Hon'ble High Court of Delhi which was disposed of by the Hon'ble High Court vide order dated 22.9.2015 with the liberty to APP to participate in the proceedings before the Commission. During the hearing of the petition by the Commission on 24.9.2015, learned counsel for APP submitted that in the proceedings before the Commission, APP would rely on the submissions made by NTPC vide its affidavit dated 14.9.2015 and APP's submission before the Hon'ble High Court of Delhi. The Commission allowed APP and respondent beneficiaries to file their submissions on the issue. Submissions have been made by APP, Grid Corporation of Odisha Limited (GRIDCO), Gujarat Urja Vikas Nigam Limited (GUVNL), Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO), Uttar Pradesh Power Corporation Limited (UPPCL), BSES Rajdhani Power Limited. (BRPL), Madhya Pradesh Power Management company Limited (MPPMCL), and Madhya Pradesh Power Generation Company Limited (MPPGCL).

5. Learned counsel for NTPC clarified during the course of hearing on 7.10.2015 that NTPC generating stations have only one crusher each. In its affidavits, NTPC has used the word crusher or crusher house. Accordingly, the word 'crusher' has been used in this order in place of 'secondary crusher'.

Submissions of NTPC

6. NTPC in its affidavit dated 14.9.2015 has submitted that the term `as received' can be and should be applied only with reference to the measurement of the GCV of the coal when the samples are taken during movement on the Conveyor Belt and when it also undergoes the crushing to the requisite size and has passed through the Automatic Mechanical Sampler (AMS) or has been taken by manual sampling, and not at the stage when the wagon arrives at the power plant and is stationary. Based on a Coal Flow Diagram attached as Annexure A to the affidavit dated 14.9.2015, NTPC has explained that the railway wagons are taken to the location where the coal has to be unloaded into a hopper either through the wagon tippler or through manual means to track hopper into a pit from where it is immediately moved via a Conveyor Belt towards the crusher house. NTPC has submitted that two types of wagons are used for conveyance of coal, namely, Bottom Opening Wagons (BOBR) and BOXN wagons. NTPC has explained its difficulties to take samples from both types of wagons as under:

> (a) In pit-head stations, BOBR rakes are used to carry coal from the mines to power stations through NTPC's dedicated MGR systems. At the track hopper, the bottom gates of wagons are opened and coal falls onto the hopper through gravity. During the process, the coal rakes stop for a very brief period of time for unloading only. For collecting samples from BOBR wagons, it is necessary to send the personnel to the top of the wagon. The unloading process has to be stopped entirely during the process of collection of samples keeping in the view safety of the people collecting the samples from the wagon top. This would involve stoppage of the rakes for a significant period of time to complete the process of sample collection and unloading of the

wagons. This would result in very high turnaround time and will impact the coal receiving capability seriously.

(b) In the case of Indian Railways rakes, coal is normally transported through BOXN wagons. In this case, for unloading purpose, each wagon is separated and turned upside down through an equipment called wagon tippler to unload coal from wagons to the hopper. In this case also, for sample collection, personnel have to go to wagon top and collect the samples. This can be done only through sequential operation i.e. first sample collection process has to be completed and then only the wagons can be tipped for unloading. Sample collection is not possible when the coal is getting unloaded considering the safety of persons. This would also lead to significant delays in the unloading process and will impact the coal receiving capability of the stations.

7. NTPC has further submitted that the distance between the wagon tippler/track hopper place to the crusher house ranges from 200 meters to 500 meters. The conveyor belt speed being in the range of 3 meters per second, the time taken for moving the coal from one wagon of approximately 60 metric tonnes, namely, unloading and moving the same through the Conveyor Belt to the crusher house for sampling is not more than a few minutes. NTPC has submitted that the process of unloading the coal, either through the wagon tippler or through the track hopper, and the movement of the coal up to the crusher house is continuous in most of the stations, without any break except in case of Badarpur TPS where there is a provision to take coal to primary stockyard without crushing, if required. NTPC has further explained that the distance from the wagon tippler/track hopper to the crusher

house when the coal is moved through the Conveyor Belt is used for undertaking essential operations, namely, removal of boulders, stones and other external materials through manual process and through magnetic separator. At the crusher house, coal is crushed to the required size for sampling and the GCV of coal is measured from the samples so drawn. In most of the generating stations, the GCV is measured through the AMS and in the generating stations where AMS has not been established, the GCV is measured through manual sampling from Conveyor Belt. According to NTPC, the computation of GCV as per the process explained is done on a sample duly crushed and taken out while the coal is in transit, and not when the coal is stationary. After the above process of taking samples, the coal from the crusher house is taken to the stockyard unless the coal is immediately required for firing for generation of electricity in which case it is taken to the bunkers directly. NTPC has submitted that the samples drawn in the above manner is the homogenous mixture of the coal drawn almost immediately on the unloading of coal from the railway wagon and duly crushed to the required size. NTPC has submitted that in the above process, the coal which is taken to the crusher house and sized is the most representative of the coal which has been supplied by coal companies without there being any factors affecting the GCV of the coal from the stage of wagons arriving at the generating station till the crusher house and therefore, there cannot possibly be any argument as regards the loss of GCV in the above movement of the coal from the railway wagon till the crusher house. NTPC has further submitted that the GCV of coal needs to be measured after (a) removal of boulders, stones and other foreign materials; and (b) after crushing the samples to the required size. The crusher house with an attached AMS serves exactly the same

purpose but in a contiguous manner as in the case of measuring the GCV of the coal samples taken from the railway wagons.

8. NTPC has further submitted that collecting samples from the railway wagons can never be an effective and appropriate process for computing the GCV of the coal received at the generating stations and in the context of Regulation 30 (6) of the 2014 Tariff Regulations, the computation of GCV of coal `as received' should necessarily be at the stage of the crusher house due to the following reasons:

(a) Since inception, NTPC as well as almost all other generating companies have been following the method of computing GCV of the coal on `as fired' basis at the bunker stage i.e. immediately before the coal is fed into the boiler for generation and sale of electricity. Such a coal is a homogenous mixture, and not heterogeneous in nature consisting of materials which have characteristics of coal as well as materials which have no characteristics of coal.

(b) The purpose of adopting measurement of GCV of the coal on as received basis in the 2014 Tariff Regulations in place of as fired basis in the earlier regulations is to avoid losses which occur during stocking and handling upto the boiler on account of self-ignition, windage and spillage etc. In the reasoning given by the Commission as well as in the CPRI Report or the CEA recommendations, there is no reference to anything other than the loss of moisture content, self-ignition and efficiency of the generating companies in maintaining the coal after it is received. All the above relate to the activities

after the stage of crusher and are not in any manner related to the short time spent on unloading of the coal and movement to the crusher house. Therefore, the measurement of GCV on `as received' stage should replicate the same process as at the stage of `as fired'. If a homogenous coal mix was essential and was considered important for the purpose of measuring of the coal on `as fired' basis, the same should necessarily be adopted for the purpose of computing the GCV on `as received' basis also.

(c) If the GCV of the coal is not measured in a homogenous manner, it will not serve the basic purpose of sampling of coal and the measurement of the GCV. The samples taken from the railway wagons on an adhoc selected quantum would not be representative of the GCV of the entire coal 'as received' at the generating station. Even if the samples are collected from the railway wagons, it is still to pass through the various process of crushing as referred to in the CPRI Report (Table 12). Finally, the coal of the requisite size is obtained which is taken to the laboratory for computation of the GCV. In the process indicated by NTPC regarding the movement of coal through the conveyor to the crusher house and thereafter, the sampling is completely akin to the above process of crushing samples taken and measuring GCV. The advantage in the process described by NTPC is that the sampling of homogenous mixture, and not on adhoc random samples taken from the railway wagons, is considered. Therefore, the samples taken at the crusher house serves the correct purpose of measuring the GCV of coal on `as received' basis.

(d) The procurement of coal and its arrival in the generating station is a continuous process. In various generating stations of NTPC, the railway wagons carrying coal is received on a continuous basis i.e. in a day about 500 wagons (for a 2000 MW station). If the coal has to be measured through samples drawn from the wagons, the wagons will be held up for considerable time till the samples are collected by manual means. This would amount to delaying the entire process involved in the rake movement cycle, making even the receipt/ unloading of the entire requirement impossible to achieve. NTPC will be subject to huge amount of demurrage, and cycling of coal received and taking it to the stockyard cannot be maintained. This is more particularly as the Commission has directed that NTPC should maintain the GCV of the coal separately for various forms of purchase of coal, namely, linked coal, e-auction purchase, imported coal etc. The entire efficacy of the operation of the generating stations in regard to the coal handling will be seriously prejudiced. On the other hand, there is absolutely no difference or disadvantage to the beneficiaries in the computation of the GCV, if it is done with homogenous nature of coal after the crusher house.

(e) It is also of utmost importance that the samples collected are of a small size. In case the samples are to be collected from the wagon top, it has necessarily to be of a larger coal size. Generally, NTPC gets coal of size in excess of 250 mm size at its stations from the various coal mines. Considering the sampling point for 'as received' coal to be from loaded wagon, it will involve handling of huge quantity of coal for sampling purpose. This would become a very unwieldy process and may not result in a correct approach for

measurement of GCV. As per the IS 'Methods for sampling of Coal and Coke' the weight of gross samples is related to the size of coal for which sampling is to be done. Hence, for coal of size more than 250 mm at a 2000 MW coal station would require the total handling of 21000 kg of coal sample each day. If the samples are collected at the crusher stage, this issue gets resolved.

9. In support of its submission that samples taken from the wagon shall not be representative in character for measurement of GCV of coal, NTPC has relied on the following standards and authorities on the coal sampling process:

(a) Para 0.3.4.2 of the Indian Standard :436 Part I/Section 1 – 1964 : Methods for Sampling of Coal and Coke
(b) Para 2.1 of the Indian Standard: 436 (Part II) – 1965 : Methods for Sampling of Coal and Coke;
(c) Para 3 of Indian Standard: 436 (Part I/Sec 2)-1976 : Methods for Sampling of Coal and Coke;
(d) Report of CPRI submitted to the Punjab State Electricity Regulatory Commission on Fuel Audit of generating stations of Punjab State Power Corporation Limited;
(e) A paper on "An Experience of third party sampling of coal presented by Director and Assistant Director of Central Fuel Research Institute, Dhanbad in the Seminar titled "New Challenges for Indian Coal";
(f) Office Memorandum of the Ministry of Environment and Forest, Government of India dated 26.8.2015 regarding Protocol for sampling, analysis of coal and reporting compliance with respect to the GSR 02 (E) dated 2.1.2014;
(g) Chapter 2 on Sampling and Sample Preparation in the book Coal Analysis by James J. Speight;
(h) Study conducted by George S. Pope on the 'Methods of Sampling Delivered Coal' in 1916, under the aegis of the Bureau of Mines, US;
(i) Study by IEA Clean Coal Centre of International Energy Agency

(j) United States Environment Protection Agency's research study for coal sampling in 1985;

(k) Para 4.7 of the Fuel Supply Agreement dated 24.7.2009 entered into with Northern Coalfield Ltd in respect of Singrauli STPS.

NTPC has submitted that a combined reading of the above authorities unequivocally establishes that (a) the coal samples for determining the GCV should not be taken from the wagons when the coal is in a stationary form but should be taken when the coal is in movement i.e. when the coal is unloaded and is moving on a Conveyor; (b) Sampling of coal should be after the external material like Boulders, Stones etc. are manually removed which is done during the short time when the coal passes through the Conveyor till it reaches the crusher; (c) Sampling of the coal should be done on the required size of coal of less than 20 mm as fully described in the CPRI Report which occurs at the crusher stage; and (d) sampling of coal of homogeneous mixture occurs only at the crusher stage. NTPC has submitted that the sampling of the coal at the crusher stage is the true sample of the coal on 'as received' basis for computation of the GCV of the coal.

Submissions of Association of Power Producers (APP)

10. APP in its affidavit dated 5.10.2015 has submitted that tariff of several members of APP are subject to determination in accordance with 2014 Tariff Regulations and the said members are similarly placed as NTPC and are equally affected by the 2014 Tariff Regulations and therefore, APP supports the NTPC's case for coal sampling after the crusher stage for the purpose of measurement of GCV of the coal. APP has further submitted that most of its members have secondary crushers at the power plants covered under the Tariff Regulations, or have a single crusher which performs the function of primary and secondary crusher.

Therefore, power plants that receive coal which have a single crusher can be treated in the same manner as power plants which have a secondary crusher and coal sampling for “as received GCV” ought to be done after crushing. In case of power plants where there is no crusher since such plants receive already crushed coal, sampling for “as received GCV” should be done after unloading and from the conveyor belt. In this regard, APP has adopted the submissions made by NTPC that it is impractical to carry out the sampling directly from the rail wagon, and it is advantageous to carry out the sampling while the coal is in motion on the conveyor belt as stones, overburden, sand, soil and other external matter are segregated at this stage. APP relying upon the recommendations of the Central Electricity Authority, Commission’s order dated 4.8.2014 disposing of the representation of APP, paras 29 and 31 of the counter-affidavit filed by the Commission in response to the writ petition of APP has submitted that the objectives of the Commission in switching over to measurement of GCV from as fired basis to as received basis are to ensure that (a) the generating companies are prevented from passing on their inefficiencies in the form of handling and storage losses to their beneficiaries and (b) the measurement of GCV on as received basis takes care of the stones, overburden, sand, soil etc. at that stage. APP has submitted that the stated policy objectives behind shifting from as fired GCV to as received GCV will be served only if the coal sampling for GCV measurement is done after crushing.

Submissions of Madhya Pradesh Power Generation Corporation Limited (MPPGCL)

11. MPPGCL has submitted that if samples are taken from static railway wagons, such procedure will be against the IS recommendations as contained in para 0.3.4.2 of IS 436 Part I/Section 1 – 1964, para 2.1 of IS 436 (Part II) – 1965 and para 3 of IS:

436 (Part I/Sec 2)-1976. MPPGCL has submitted that sampling of moving coal at unloading point from wagons can only be done when they are tilted upside down. This will be highly unsafe for the men taking samples and may not be practicable. Samples so taken cannot be true representative as they will not be from all portions of the wagon. IS itself provides that sampling should not be done from surface of wagon and recommends that sampling should be done from conveyor belts, and not from static wagons as middle and bottom part of coal is not equally exposed for sampling in static wagons.

12. MPPGCL has given the following reasons for not taking samples from wagons during unloading:

(a) For unloading, the wagons have to be separated from each other and turned upside down. While doing sampling, the wagons cannot be emptied as it would result in serious threat to safety of human workers taking samples. Thus, for taking samples from rakes, wagons will have to be made static. Normally, it takes about 15 to 20 minutes to take one sample from one wagon. The rake consists of about 58 wagons. Thus, about 4 hours will be required to take sampling of 25 rakes, even if 4 teams are deployed. Total time permitted to unload the rake is about 4 hours. Thus, the time permitted to take samples will be more than the time permitted to unload the rakes. This will result in demurrage which is an additional cost. Even if the cost is made pass through, idle halt time of the rakes will result in national waste of resources, which can be effectively and economically used for more transportation of coal meant for generation of electricity.

(b) The unloading capacities installed at the generating station are designed to support the capacity of the power station. In case, unloading time increases, the coal unloading capacity of the facilities reduces, having adverse effect on overall generating capacity of the station and consequently the national interest and public at large.

(c) As per their siding declared grade, coal companies always try to top up the wagon with good quality of coal in order to maintain the grade, which becomes part of the sample but not uniformly distributed/filled inside throughout the wagon. Further, coal companies also try to get the stones picked and removed after the loading of wagons from the top of the wagons so that these stones would not become the part of samples and GCV is maintained as per their declared grade of siding which is supplied to the consumers. Thus, sampling from top layer of the wagons, if taken from static wagon, will land generators in deep trouble.

(d) During the transportation of coal, the superficial layer at top of the wagons becomes dry and moisture percolates by gravity inside the wagon and some moisture evaporates. The sampling from the top of the wagon does not give the correct value of Total Moisture and GCV as a whole present in the coal.

13. MPPGCL has submitted the following reasons for taking samples after the crusher:

(a) Coal supplied from sidings of CIL is coming from various adjoining mines where different sizes of coal varying from 0-250 mm are received. There are cases where over-sized/uncrushed coal and lumps of shell/stones

are also received. Thus, it becomes very difficult to quantify samples to be collected as it varies from wagon to wagon. Therefore, the sampling of coal should be done in small sizes from large number of locations, to have more representative samples. This can be achieved only if the coal is sampled from any conveyor belt on which the coal is passing in thin layer and not from a heap, like contained in static wagons, in which case it is not possible to take coal from middle/bottom layer.

(b) In order to avoid any human interference in sampling, Automatic Mechanical Sampler (AMS) should be used. They can easily be installed after the crusher.

(c) Sampling should be done from the homogeneous representative coal. It is not possible to pick up coal samples from middle and lower parts of the coal wagon, if sampling is done from static rakes. However, if sampling is done from a point after the crusher, the coal taken will be more representative.

(d) There can be many unloading facilities, like number of wagon tipplers and/ or bottom opening coal unloading facility. Most of the coal has to pass through the secondary crusher before reaching to bunker or stock yard. If the coal is sampled from a point just after crusher, the coal being stocked at yard will be analyzed before stocking and thus, the beneficiary's claim for not bearing handling inefficiencies of the generators can also be taken care. It takes few minutes to transport the coal from wagon unloading point to the crusher and this transit time will not affect/change coal quality.

Submissions of the respondent beneficiaries

14. The respondent beneficiaries such as TANGEDCO, UPPCL, GUVNL, MPPMCL, GRIDCO and BRPL have opposed the measurement of GCV after the crusher. Their submissions are hereinafter.

15. TANGEDCO has submitted that if NTPC's contention for collection of coal samples after the crusher is accepted for computing the energy charges, it would tantamount to continuing with the existing procedure of calculation of the energy charges based on the GCV of Coal on as fired basis as there is no operation after the coal passes through the crusher and it is fed to the Bunker/Boiler only.As regards NTPC's contention regarding non-feasibility of collection of samples from the wagons, TANGEDCO has submitted that the Indian Standard specifications deal with the issue of collecting the samples from the stock pile or from moving wagon or at any point prior to secondary crusher. TANGEDCO has submitted that the documents placed on record by NTPC in support of its claim also deal with the sampling method to be followed before the coal is passed through the crusher. TANGEDCO has further submitted that as per Indian Standards, "for obtaining reliable conclusions, it is recommended that coal may be sampled when it is in motion, that is, from conveyors or during loading or unloading". TANGEDCO has submitted that coal samples collected from wagons during unloading operation will give reliable results and many power stations are following this collection procedure for 'as received' samples. TANGEDCO has rejected NTPC's contention that coal samples collected only after the secondary crusher will provide a homogenous mixture as factually incorrect since samples will have to be prepared after collection to form a homogenous mixture as per methodology stipulated in reputed standards,

before using for testing. As regards NTPC's contention that removal of boulders, stones, external material can be facilitated only during movement from wagons to crusher, TANGEDCO has submitted that the said contention presents a misleading view that samples collected from elsewhere are analysed with boulders and foreign materials. TANGEDCO has further submitted that irrespective of the point of collection, all coal samples need to be free from external material before analysis and testing and therefore, even if samples are collected from wagon unloading point, boulders, foreign material etc. need to be removed before testing. In response to NTPC's contention that collection of samples after crusher facilitates reduction of size of coal, TANGEDCO has submitted that even if samples are collected after the crusher, sizing of coal has to be done before using the sample for testing. TANGEDCO has submitted that only the point of unloading from wagons can be considered as the earliest receipt end of the power plant and hence will yield the true as received GCV results whereas the crusher end will not present the true as received value of GCV. According to TANGEDCO, the decision to switchover from the earlier practice of measuring the GCV on "as fired basis" to "as received basis" in the 2014 Tariff Regulations is to induce transparency and efficiency in fuel handling by the generating companies, optimum performance of power plants and computation of energy charges in a just, fair and equitable manner which can be achieved only if the GCV is truly on "as received" basis at the receiving end of the power plant.

16. UPPCL has submitted that for the purpose of measurement of GCV of coal on as received basis, the sample must be taken just before the point of injection of

stacked coal and Automatic Mechanical Sampler should be installed before the point of mixing of the ground stacked coal with the freshly ground coal.

17. GUVNL has submitted that the change in the 2014 Tariff Regulations was for the purpose of introducing a more transparent mechanism so as not to pass on the inefficiencies in coal storage and management to the consumers which is within the control of the generating company. The objective of introducing this Regulation has been clearly captured in the Statement of Objects and Reasons to the 2014 Tariff Regulations. GUVNL has further submitted as under:

(a) In response to the Coal Flow Diagram and movement of coal submitted by NTPC, GUVNL has submitted that the Coal Flow Diagram is an internal procedure developed by NTPC for handling of coal at its generating stations. GUVNL has submitted that as per the admission of NTPC, once the coal is received at the generating station through the railway wagons, the same is then taken to/transported to/unloaded into a hopper either through a wagon tippler or manually into a pit. Therefore, in so far as non-pithead stations are concerned, there is no difficulty for NTPC to take the sample of coal as it is received through the railway wagons. In respect of pit head stations, BOBR are used to carry coal from the mines to the generating stations through dedicated MGR system, admittedly through coal rakes for the purpose of unloading and therefore, there should not be any difficulty to take samples for measurement of GCV at the unloading point.

(b) As regards the high turnaround time for taking the samples at the time of unloading, GUVNL has submitted that it is only a question of deploying the

personnel to collect the samples at the relevant unloading points. GUVNL has submitted that in the generating stations of the Gujarat State Electricity Corporation Limited **(GSECL),** which is the State owned generating company of Gujarat, the GCV of coal is in fact measured at the point of unloading and on 'as received' basis. The generating stations of GSECL use wagon tippler to unload the coal and sample is collected without any wastage of time and safety threat to the persons collecting the samples. These samples are then tested in the laboratories to measure the GCV on "as received" basis. According to GUVNL, NTPC would have to do small procedural changes for taking the sample on as received basis when the coal is actually received at the generating station from railway wagons or MGR system, more particularly when for imported coal and washed coal, the sampling and measurement of GCV is being carried out on "as received" basis. As regards the safety concerns and waste of time raised by NTPC, GUVNL has submitted that absolutely no material has been placed on record by NTPC to show that there would be any safety threats to the personnel deployed for taking GCV of coal samples when the same is received at the generating stations. As regards the arguments that movement of coal would have to be stopped in order to take the GCV samples and this could cause substantial delays, waste of time and would affect the entire coal handling procedure is without any basis.

(c) In response to the contention of NTPC that crushed coal is the true representative for sampling, GUVNL has submitted that as per the admission of NTPC, most of the coal from the crusher is immediately taken to bunker and fired and only the excess coal is taken to the stockyard, and therefore, allowing

measurement of coal at the crusher stage is almost the same as allowing GCV on as fired basis and would render Regulation 30(6) meaningless. GUVNL has submitted that if coal received at the generating station is not a homogeneous mixture or does not even have the predominant characteristics of coal, then this is a serious issue which ought to be agitated by NTPC against the coal suppliers.

(d) In response to the contention of NTPC that when the GCV of coal is measured after the crusher stage, a homogenous mixture is sampled and not an *adhoc* random sample when it is taken from the railway wagon, GUVNL has submitted that the Manual issued by the Bureau of Indian Standards being mainly relied upon by NTPC does not provide for taking samples after the coal passes through the crusher but in fact provides for taking samples from the wagons at the time of unloading. GUVNL has submitted that when the coal is loaded from the mines, the coal samples are taken directly from the wagons and as a natural corollary, to measure the GCV at unloading end, the samples needs to be taken from the wagons directly. As regards the materials produced by NTPC, GUVNL has submitted that none of the materials indicates that GCV cannot be taken on as received basis as contended by NTPC. GUVNL has also relied upon the judgement dated 14.12.2012 in Appeal No.47 of 2012 (Maharashtra State Power Generation Company Limited V. Maharashtra Electricity Regulatory Commission) and judgement dated 2.12.2014 in Appeal No. 98 of 2013 (Punjab State Power Corporation Limited V. Punjab State Electricity Regulatory Commission) and submitted that the Appellate Tribunal for Electricity in the said judgements has upheld measurement of GCV on as

received basis. GUVNL has submitted that NTPC is trying to hide its inefficiency in management of fuel at the power stations and trying to pass it on to the consumers through tariff which cannot be the possible interpretation of Regulation 30(6) of the 2014 Tariff Regulations.

18. MPPMCL has submitted that GCV of coal on as received basis at unloading point has to be considered and in case of failure on the part of NTPC to provide the GC on as received basis, at unloading point, GCV of coal as per the bill of the coal company may be considered. GCV of coal as provided by the petitioner measured after the crusher is as inefficient as GCV on as fired basis. As regards the contention of the petitioner regarding the impossibility of measurement of coal at the unloading point, MPPMCL has submitted that at the point of generation of invoice and delivery of the goods to the buyer, the sale is set to be completed and therefore, the point of measurement of GCV on 'as received basis' is the point of delivery of coal to the generating company, and the quality of coal and GCV indicated in the invoice should ideally be treated as GCV on 'as received basis'. MPPMCL has submitted that in the Standard Bidding Documents for Case II/UMPP issued by Ministry of Power, Government of India, the Model Power Purchase Agreement provides that GCV of fuel shall be as per suppliers' certification i.e. "GCV as billed". In order to alleviate the difficulty of generating companies in measuring the GCV at unloading point, MPPMCL has requested the Commission to consider GCV of coal as indicated by the supplier in the invoice, till such time the generators are able to measure the GCV at the unloading point. MPPMCL has submitted that all the practical problems mentioned by NTPC are an afterthought in view of the huge financial implication on account of inefficient coal handling within the plant and keeping in view the mandate for safeguarding the interest

of consumers as provided in section 61(d) of the Act, the location for measurement on as received basis should be at the point of unloading from the wagons.

19. GRIDCO has submitted that in Regulation 30(6) of 2014 Tariff Regulations, the Commission has defined CVPF as the weighted Average Gross Calorific Value of coal as received, in kCal per Kg for coal based stations with the objectives to protect consumer interest, encourage economic use of resources, to reward efficiency in performance and to introduce transparency in switching over from earlier practice of measuring the GCV on 'as fired' basis to 'as received' basis.GRIDCO has submitted that despite change in regulatory regime, NTPC has been insisting for measurement of GCV of coal on as received basis after the crusher only because the Automatic Mechanical Sampler has been installed alongwith the crusher which is misleading since this AMS was installed for measuring the coal on as fired basis. GRIDCO has further submitted that perusal of the provisions of Indian Standards quoted by NTPC in its application reveals that sampling can be done during unloading of the coal at the power station and therefore, there is no conflict in the sampling process of coal as prescribed by BIS and by the Commission. As regards the other documents filed by NTPC, GRIDCO has submitted that either they are not specifically related to the issue or the same have no relevance. GRIDCO has prayed for rejection of the contention of NTPC that the stage for drawing the coal samples on as received basis is at crusher stage in accordance with the 2014 Tariff Regulations.

20. BRPL in its affidavit dated 25.10.2015 has submitted that NTPC’s contention that even as per the measurement of coal on as received basis, the samples are to be taken after crusher only and not from the stationary railway wagons clearly shows that

the cost of inefficiencies in the upkeep of the coal which is the difference between the weighted average GCV of coal as billed and weighted average GCV of coal as fired can easily be shifted to the electricity consumers. BRPL has further submitted that the introduction of transparency inculcated by the Commission in measuring GCV of coal on as received basis would also force the coal companies to set their house in order as any blame by the coal companies would not be easy to apportion to the generating station. BRPL has submitted that IS 436 Part-1/Section 1-1964 which has been relied by the petitioner clearly shows that sampling can be done during unloading of the coal at the power station. BRPL has also referred to the draft audit report of CAG in which it has been observed that "review of energy charge rate furnished by the generating companies with the monthly energy bills revealed that discoms made payment to generating companies for calorific value of coal which was higher than the calorific value of coal declared by the generator to have been used in generation." BRPL has requested the Commission to take cognizance of the observation of CAG while dealing with the issue.

Submissions during hearing

21. During the hearing, the learned counsels for the parties reiterated their submissions as discussed above. While APP, MPPGCL and HPGCL supported the contention of NTPC, the respondent beneficiaries such as GUVNL, MPPMCL, TANGEDCO, BRPL etc. submitted that coal sampling should be from the wagons only. In response to the queries of the Commission, learned counsel for the petitioner clarified that (a) NTPC has only one crusher in each of its generating stations;(b) there will be difference in GCV if the sample is taken from the wagon and after the secondary crusher; (c) there will be no change in the GCV, when coal is

fired just after the crusher; and (d) there will be change in GCV if coal is stored in the bunker after crushing. After hearing NTPC and others, the Commission directed NTPC to submit on affidavit as to:(a) whether there would be any difference in the GCV of coal between the samples taken from wagon and the samples taken after the crusher, the time taken for movement of coal from wagon to crusher house and the manual intervention involved (both for box type and bottom open wagons); (b) submit a signed copy of the Fuel Supply Agreement and clarify that the unloading point as indicated in the FSA relates to AMS located after crusher; and (c) to clarify as to whether any effort has been made by NTPC for measuring GCV of coal from the wagons. Based on the submission of the learned counsel for GUVNL that the samples for GCV of coal are taken from wagons by the generating companies in State of Gujarat, the Commission directed the learned counsel for GUVNL to submit an affidavit in that regard.

22. In response to the directions of the Commission, NTPC vide its affidavit dated 27.10.2015 has submitted as under:

(a) The samples taken from the wagons and the samples from the crusher are unlikely to show the same GCV primarily due to the basic reason that contrary to the wagons, the coal mass available at the crusher is a homogeneous mixture. Any samples taken from the wagons will either show a GCV which is higher or lower than the average GCV of the entire coal mass. The process undertaken at Thermal Power Stations involves a time duration of few minutes (5-10 minutes) from the time it leaves track hopper/wagon tippler and reaches the crusher house for crushing.

(b) NTPC has placed on record copy of the Fuel Supply Agreement dated 16.9.2011 signed with the Eastern Coalfield Limited for supply to Kahalgaon STPS. NTPC has also submitted the videos showing the wagon tippler, presence of large boulders and stones in the coal, location of apron feeder and paddle feeder, movement of coal from paddle feeder to first transfer point, mechanism deployed for picking stones and boulders from conveyor, structure of AMS, coal handling from BOBR etc.

(c) The coal was taken out of the wagon top on some occasions for knowing the adhoc GCV of the coal received, particularly in the context of any claim with Coal India Limited or subsidiaries. These were adhoc sampling carried out only for the purpose of getting an indicative idea of the quality of coal being received. Such sampling of coal was not in any manner intended to be used for determining the quality of coal to be used for billing purposes.

23. GUVNL vide its affidavit dated 26.10.2015 has submitted that in the generating stations of Gujarat State Electricity Corporation Limited (GSECL), coal is being received through wagons/coal rakes and the samples are taken from the wagons/coal rakes in a representative manner without any wastage of time and safety threat to the persons collecting the samples. GUVNL has further submitted that representative samples taken from the wagons are then tested in the laboratories to measure the GCV on as received basis. For this purpose, Sampling Procedure for taking coal samples from the wagons has been developed for Wakanbori Thermal Power Station of GSECL. GUVNL has submitted that allowing the samples at crusher stage will virtually amount to setting aside the 2014 Tariff Regulations since once the coal is passed through the crusher, it is fired into the

boiler. NTPC has filed affidavit dated 3.11.2015 in response to the affidavit of GUVNL stating that the affidavit on behalf of GUVNL does not say that the samples for GCV are taken from the wagons for the purpose of determination of GCV either for billing purposes or otherwise. NTPC has submitted that in Gujarat, GCV of coal on as fired basis is considered in calculation of energy charges.

24. Subsequently, the Commission vide an interim order dated 20.11.2015 directed GUVNL to place on record a video recording of the process of collection of samples from the wagons/coal rakes and also a copy of the Sampling Procedure developed for Wanakbori TPS. The Commission also directed NTPC to submit video recording regarding the complete process of unloading of coal from wagons separately for BOBR and BOXN and transfer of coal from the unloading point to the crusher. NTPC and APP were also directed to clarify :(a) the names of the generating stations having MGR and Wagon Tipplers separately; and (b) the names of the generating stations where NTPC and member generating companies of APP have electrical tracts from mines upto the unloading point in case of MGR systems and from the railway siding upto the unloading point in other cases.

25. GUVNL has submitted a video recording of the collection of samples from the wagons and other information vide its affidavit dated 30.11.2015. In response to the contention of NTPC that GUVNL is getting energy charges on the GCV as fired basis and there is no purpose in taking samples at the wagon level, GUVNL has clarified that the sampling from the wagons is being done regularly at the generating stations of GSECL for laboratory testing and to take up the various issues with coal suppliers. GUVNL has further clarified that most Electricity Regulatory Commissions (ERCs)

adopt the regulations framed by the Commission and whenever there is a change in the regulations, other ERCs will adopt the same. NTPC has submitted the video recording and the other information vide its affidavit dated 20.11.2015. The video recordings submitted by NTPC and GUVNL can be accessed through the link cercind.gov.in. APP through its counsel vide letter dated 22.12.2015 has filed the information in respect of the generating stations of nine of its members and has requested for time to submit the data in respect of the generating stations of other members.

26. In the above background, the Commission now proceeds to consider and analyse the submissions of NTPC, APP, MPPGCL, respondent beneficiaries and other stakeholders to decide the issues as per the directions of the Hon'ble High Court of Delhi in order dated 7.9.2015.

Analysis and Decision

27. The Hon'ble High Court in the order dated 7.9.2015 has directed the Commission to decide in the first instance the claim of the petitioner that even as per measurement of GCV of coal on 'as received' basis, the samples are to be taken after the secondary crusher only. In para 15 of the said order, the Hon'ble High Court has issued directions to the Commission to decide the issue i.e. the stage at which the GCV of coal has to be measured on 'as received' basis and pass appropriate order. Therefore, the Commission has to decide two issues, namely, (a) the claim of the petitioner that the samples are to be taken after crusher only for the purpose of measurement of GCV on 'as received' basis, and (b) the stage at which GCV of coal has to be measured on as received basis.

Issue No.1: Whether the samples are to be taken after crusher for the purpose of measurement of GCV on as received basis?

27. In support of its contention that samples should be taken after crusher only and not from the wagons, NTPC, APP and MPPGCL have advanced the following reasons:

(a) It serves the objectives of switching over from the GCV as fired to GCV as received is to avoid losses;

(b) There are multifarious advantages of taking samples after the crusher. They are as under:

(i) Samples taken after the crusher are of small size and homogenous in nature while samples taken from the wagons are big in sizes and heterogeneous.

(ii) Time consumed for sample collection from the wagons is more leading to imposition of demurrage charges which can be avoided while taking samples after crusher.

(iii) The safety of persons collecting the samples is ensured if the samples are taken after crusher compared to samples taken from wagons.

(iv) The distance between the wagon tippler/track hopper is used for undertaking essential operations namely, removal of boulders, stones and other external materials.

(v) Samples taken from the wagon are not representative as good quality coal are loaded at the top and superficial layers become dry during transportation while the moistures percolates inside the wagons.

(c) The IS and various national and international authorities establish that the samples taken when coal is in motion is representative in nature.

28. These concerns have been dealt with in the succeeding paragraphs.

(A) Objectives of switching from as fired to as received

29. The Gross Calorific Value (GCV) in relation to thermal generation has been defined in successive tariff regulations issued by the Commission since 2001 as "the heat produced in kCal by complete combustion of one kilogram of solid fuel or one litre of liquid fuel or one standard cubic meter of gaseous fuel, as the case may be". GCV is used to compute the Energy Charge payable by the Distribution Companies/Power Utilities to the generating companies. The normative energy consumption admissible per unit of electricity generated has been specified by the Commission in the tariff regulations as normative Station Heat Rate (SHR) in terms of kcal/kWh. The total admissible energy input for the electricity generated by the station would be the SHR multiplied by the units of electricity generated, and the resultant products divided by the Gross Calorific Value (GCV) of coal used would give the coal consumption admissible for the electricity generated. Therefore, the GCV being used for the computation of energy input becomes extremely important as any increase/reduction in GCV decreases/increases the admissible coal consumption correspondingly and this affects the cost of the power. The coal cost being 60-70% of the total cost of generation tariff, it has major impact on cost of supply of power to the beneficiaries and consumers. In order to be fair and to balance the interests of both the generating companies as well as the distribution companies (and ultimately the end consumers), the GCV of coal to be considered for computation of energy charges needs to be accurate and true representative of the coal consumption.

30. As per the standard industry practice, GCV can be measured at three stages. GCV of coal measured at loading point by the coal supplier and indicated in the dispatch invoice is known as GCV as billed which is used for making payments to

the coal companies. GCV of coal measured on receipt at the generating station is known as GCV as on received basis and is the true representative of the GCV for computation of energy charges, particularly in the changed scenario when the generating companies are required to resort to procurement of coal from various sources including imported coal with different calorific values. Measurement of GCV made before feeding the coal into the boiler of the generating unit for power generation is known as GCV as on fired basis. GCV of coal on as fired basis is more appropriate for internal computations of operational efficiency of process/equipment where accurate computation of equipment efficiency is the objective and the instant coal quality being fired is required to be considered.

31. The measurement of GCV for the purpose of computation of energy charges was on as fired basis during the periods 2001-04, 2004-09 and 2009-14. However, in the third amendment to the Central Electricity Regulatory Commission (Terms and Conditions of Tariff) Regulations, 2009 notified on 31.12.2012, it was provided that the generating companies would share the information with the beneficiaries regarding GCV as received in addition to other information with regard to energy charges. Therefore, the basic objective of the Commission was to introduce transparency in handling the fuel and computing the energy charges as the same is a pass through in tariff. In the concept paper floated at the beginning of the process of framing the regulations for the period 2014-19, the issue was flagged that on account of difficulty in verification of GCV of blended coal, it would be necessary to provide for payment of energy charges on as received basis for domestic and imported coal. However, in the draft regulations, GCV on as fired basis was proposed, with a clear-cut caveat in the Explanatory Memorandum that the

operational parameters would be revised in the light of the recommendations of Central Electricity Authority who is mandated under section 73 and Para 5.3.f of the Electricity Act, 2003 to advise on technical matters pertaining to generation of electricity including operating norms. CEA in its recommendations advocated for measurement of GCV on as received basis for the following reasons:

"13. GCV used for computations of Station Heat rate (SHR)

***13.1** It is also important to ensure that the computations of SHR are made in accordance with the spirit of the CERC tariff Regulations and the Regulations appropriately define the principles of computation of SHR.*

***13.2** From the Pro-forma for furnishing "Actual annual performance/operational data" prescribed by CERC it is seen that the following data regarding coal consumption and GCV is required to be submitted by the utilities/stations.*

14.1	*Consumption*
14.1.1	*Domestic Coal (Linked mine/ Other mines/e-auction/spot)*
14.1.2	*Imported Coal**
14.2	*Gross Calorific Value (GCV):*
14.2.1	*Domestic Coal (As Received)*
(As Fired)	
14.2.2	*Imported Coal (As Received)*
14.2.3	*Spot market/e-auction coal (As received)*

*Thus the utilities/stations are required to furnish the details of GCV on "**as received basis"** as well as **"as fired basis"** in respect of domestic coal as well as for the weighted average of domestic and imported coal.*

***13.3** However, the stations have furnished only the GCV "**as received"** for imported coal and Weighted average **GCV "as fired" (**for the blend of domestic and imported coal combined) and have not furnished the data for **"as received GCV"** of domestic coal**.** Thus in the absence of details of "**as received GCV"** from the stations, both in respect of domestic coal as well as for the weighted average, it is not possible to determine the basis of computation of Station heat rate (SHR) or verify the correctness of the same; as difference between the **as fired** and **as received** GCV increases the coal consumption correspondingly. For instance taking the "**as fired GCV"** as 100 kcal / kg lower than the **"as received GCV"** understood to be followed by some utilities would project around 3 % increase in the coal consumption for typical 3500 GCV coal.*

***13.4** It may be pertinent to mention that the billing of coal would be on the basis of dispatch GCV by the coal suppliers (which should be approximately same as "as received GCV"). Considering the issues of coal quality being faced by some of the*

*stations with CIL, there could be variations between the dispatch GCV and **as received GCV**; however, difference between the **as received GCV** vis-à-vis **"as fired GCV"** would be very marginal and would be solely on account of marginal loss of heat during the coal storage.*

***13.5** From the data received from stations, it is seen that most stations have very low storage of about 7-10 days coal requirements. The loss of heat value during storage depends on the type of coal and the period of storage. Some International publications indicate a loss of heat value of about 1 % for 1 year storage for high rank coals and 3 % for low rank coals. Thus considering a 3 % heat loss for Indian coals, the average loss of heat value for 10 days storage would be about 0.08% or about 3kcal/kg for a typical coal with 3500 kcal/kg GCV. The intent of this illustration is to just highlight that the storage losses of coal are almost negligible especially for low storage periods as in the Indian stations. Thus the SHR computations could be based on "**as received GCV"** basis; and if considered necessary CERC may provide for appropriate quantum of storage heat loss separately to account for heat loss due to storage. Any arbitrary practice of using **as fired GCV** for SHR computations without proper guidelines for determining the same would only lead to inflated claims of coal consumption.*

***13.6** It is thus felt that all SHR computations may be made on **as received** GCV basis, and the marginal difference between **as received** and **as fired** GCV could be compensated by providing a **coal storage loss** in terms of % of total coal on similar lines as coal transit loss. This will be in line with gate to gate energy accounting concept generally practiced Internationally and also envisaged under the PAT (Perform Achieve and Trade) mechanism under the National Mission on Enhanced Energy Efficiency."*

32. The above recommendations of CEA were posted on the website of the Commission on 16.1.2014 inviting their comments. Several stakeholders including NTPC responded to CEA's recommendations. The comments of NTPC are extracted below:

"2.0 CEA has recommended that Station Heat Rate computation may be done on as received basis and the marginal difference between as received and as fired GCV could be compensated by providing a coal storage loss in terms of % of total coal on similar lines as coal transit loss.

a) As per the FSAs signed with Coal India Limited (CIL) and its subsidiaries by PSUs, state utilities and other private power producers, the clause which provides for payment is based on GCV measured at loading end. This is a uniform clause historically applicable to all generators. Further, the current practice of using GCV as fired is in line with the PPAs signed.

b) It is not prudent to compute SHR based on as received GCV of coal. On migration from UHV to GCV based system w.e.f. 01.01.2012 and in the absence of

adequate infrastructure at mine end for sampling and testing there is large variation between GCV measured at mine end and station end. It was expected that with introduction of third party sampling w.e.f. 01.10.2013 the GCV difference issue will be resolved. However, there is no appreciable improvement in variation.

In view of above, existing system of computation of SHR basis on as fired GCV may be continued."

33. The Commission after considering the comments of the stakeholders including NTPC, the provisions in the Standard Bidding Documents issued by Ministry of Power (Government of India) under section 63 of the Electricity Act, the Report of CPRI on the study ordered by PSERC, various studies on the subject, international literature and the observations of the Appellate Tribunal for Electricity dated 14.12.2012 in Appeal No. 47 of 2012 (Maharashtra State Power Generation Company Limited versus Maharashtra Electricity Regulatory Commission) with regard to the variation of GCV of coal during handling at the generating stations decided to accept the measurement of GCV on as received basis. The reasoning of the Commission for adopting measurement of GCV on as received basis has been explained in the Statement of Reasons as under:

"Section 61(c) of the Electricity Act provides that the appropriate Commission shall be guided by the factors which would encourage competition, efficiency, economical use of the resources, good performance and optimum investment. The studies referred above and recommendations of CEA brings out clearly that there is negligible difference between the GCV of coal as received GCV and as fired when the stacking is for 8-10 days. There is no reason for allowing any difference to the benefit of the generator on account of GCV. The gross station heat rate norms fixed by the Commission for various sizes of units have sufficient margin to absorb this negligible difference. In view of the above discussions, the GCV measurement of coal has been shifted to „as received basis for the purpose of energy charges computation in the Tariff Regulation."

34. In view of the above discussion, it is crystal clear that the main objective of the Commission behind introducing measurement of GCV as on received basis was to

ensure transparency in the process of handling of coal and measurement of GCV so as to encourage efficiency, economical use of resources, good performance, optimum investment, competition and above all to protect consumer interest. The philosophy of the Commission for introducing the measurement of GCV on as received basis was also submitted before the Hon'ble High Court in the reply filed in response to the writ petition of NTPC. Relevant portion of the submission before the High Court is extracted as under:

> "GCV has received is in line with the current philosophy of introducing efficiency, transparency and accountability in fuel handling and energy accounting where the coal as input for energy constitutes 60 to 70% of the cost of generation of electricity. In the Commission's view, GCV 'as received' is the most representative of the actual heat content being received by the generating station and could be verified/correlated with respect to GCV 'as billed' for each coal consignment and would provide for a transparent mechanism for accounting of energy. Such a system of accurate and transparent energy accounting based on as received GCV is considered necessary for working out the coal consumption for energy charges in the true spirit of normative Station Heat Rate allowed by the Commission and would ensure computation of energy charges in a just, fair and equitable manner."

35. We are unable to accept the contention of NTPC and APP that the only purpose of adopting measurement of GCV as on received basis is to avoid the losses which occur during stocking and handling upto the boiler on account of self-ignition, windage and spillage etc. The purpose of adopting measurement of GCV on as received basis was to introduce transparency and accuracy for computation of energy charges in a just, fair and equitable manner so that end consumers are not unduly burdened.

(B) Advantages claimed by NTPC and APP etc. in collection of the samples from the AMS after the crusher

36. NTPC, APP and MPPGCL have claimed that collection of samples after the crusher has certain advantages vis-a-vis collection of samples from the wagons due

small and homogenous sizes of the samples, less time consumed for collection of samples and consequently avoidance of demurrage charges, safety of persons collecting samples, distance between wagon tippler/track hopper and crusher being utilized for carrying out essential operations like removal of boulders, stones and other materials from coal, and representative character of coal etc. The respondent beneficiaries have countered these objections and have stated that samples for measurement of GCV should be taken from the wagons in accordance with the provisions of the Indian Standards.

37. NTPC has submitted that the sizes of coal received at its generating stations are of 250 mm and above. Since the weight of the gross samples is related to the size of the coal as per the "IS Methods for Sampling of Coke and Coal", a generating station of 2000 MW would require handling of 21000 kg of coal which would be unwieldy and this issue would get sorted out if the samples are collected at crusher stage. NTPC has explained the size of samples with the help of following table:

Capacity of the plant	2000 MW
Total quantity of coal required every day	Around 33000 tonnes of coal (considering a specific coal of 0.7 kg/unit)
Total no. daily Rakes	Around 10 (considering a rake size of more than 3000 tonnes)
No. of sub-lots/ gross samples required, as per IS for each rake	6 (Clause 3.1, Table 1)
Weight of each gross sample	350 kg (Clause 3.2, Table 2)
Weight of gross sample for each rake	2100 kg (350 kg x 6)
Total weight of coal to be handled each day	21000 kg (21 tonnes for 10 rakes in a day)

TANGEDCO has submitted that samples whether taken from the wagons or after the crusher, the coal has to be sized before using for testing and this cannot be a valid reason for NTPC's argument. We have considered the matter in the light of the provisions of the Fuel Supply Agreement (FSA) dated 16.9.2011 between Eastern Coalfield and NTPC in respect of Kahalgaon placed on record by NTPC vide its affidavit dated 27.10.2015 and the IS. Para 4.3 of the FSA provides that the seller (Eastern Coalfield) shall deliver sized coal with the size conforming to specifications laid down in Schedule II. Para 4.6.1 of the FSA provides that the purchaser (NTPC) shall inform the seller all incidents of receipt/presence of oversized coal in terms of specification in Schedule II, in any specific consignment(s) immediately on its detection at the delivery point and/or unloading point and the seller shall take all reasonable steps to prevent such ingress at its end. Schedule II of the FSA provides that the top sizes of coal will be 250 mm, 100 mm and 50 mm. Therefore as per the FSA, ECL is required to supply coal of sizes 250 mm or less and in case coal above 250 mm is detected at the loading point or unloading point, NTPC is required to bring the same to the notice of ECL who will take steps to stop ingress of such coal. Further para 4.7.1 of the FSA provides that samples of coal shall be collected jointly by manual method during each shift and each of the delivery points and where the loading is through silo, the seller shall install AMS for taking samples. Para 4.7.2 of the FSA provides that detailed modalities for collection, handling, storage and preparation of samples shall be as per Schedule IV which provides that for selection of sub-lots IS:436(Part I/Section 1) 1964 shall be followed for collection of samples. If the samples can be collected jointly by the coal supplier and NTPC at the mines end for testing from the coal sizes ranging from 50 mm to 250 mm, there is no reason why the samples cannot be taken at the unloading point at the generating station

from the same rake in a similar manner. In any case, size of the coal is immaterial in so far as the collection and preparation of samples is required to conform to the prescribed standards of BIS. Therefore, size of coal received at the generating station cannot be a reason for taking samples after the crusher instead of taking samples from the wagons at the unloading point.

38. Another point canvassed by NTPC, APP and MPPGCL in support of taking samples after the crusher is that time consumed for sample collection from the wagons is more leading to payment of demurrage charges which can be avoided if sample is taken after the crusher. MPPGCL has submitted that for taking samples from the rakes, wagons have to be made static. There are 58 wagons in a rake. Since it takes about 15 to 20 minutes to take samples from one wagon, accordingly 4 hours will be required to take samples from 25 rakes, even if four teams are deployed. Since 4 hours is available for unloading a rake beyond which demurrage charges are payable, this will result in additional cost. GUVNL has submitted that high turn around time can be taken care of by deploying additional personnel at the unloading point. GUVNL has submitted that in the generating station of GSECL, coal samples are taken from the wagons without any wastage of time. We have considered the submissions. NTPC has submitted that for a 2000 MW plant, the total quantity of coal required per day would require 33,000 tonne considering specific coal consumption of 0.7 kg per unit. NTPC has further submitted that the number of daily rakes would be around 10 considering a rake size of more than 3000 tonnes. IS: 436 (Part I/Sec I)-1964 provides for preparation of sub-lots of the lot (rake) for the purpose of preparation of samples. As per Table 1 of IS, for the weight of the lot of more than 3000 tonnes, the lots shall be divided for six sub-lots. As per 7.1.1 of IS,

one gross sample shall be drawn from each of sub-lots so that there are as many gross samples as the number of sub-lots. As per Appendix A to the IS, 18 wagons are to be randomly selected out of the six sub-lots for the purpose of taking samples. As per the submission of MPPGCL, it takes about 15 to 20 minutes for taking samples manually from one wagon. However, in case of GUVNL, it is noticed that samples are collected through hydraulic auger which takes around 5 to 10minutes for collecting the samples. Therefore, with a judicious deployment of adequate number of personnel and requite equipment, it is possible for the generating station to collect the samples from the wagons at the unloading point and unloading the wagons within the stipulated time allowed by railways. We leave it to the generating station to arrange the requisite personnel and equipment by exercising due prudence.

39. NTPC and MPPGCL have raised the issue of safety of personnel while collecting samples from the wagons. NTPC has submitted that in both BOBR and BOXN wagons, the unloading has to be stopped keeping in view the safety of the persons collecting samples from the wagon top. According to GUVNL, NTPC has not placed on record any material in support of its contention that safety of persons is not ensured if samples are taken from the wagon. We have considered the submissions of NTPC, MPPGCL and GUVNL. The wagons are unloaded either through wagon tippler or through track hopper. Collection of samples at the point of unloading will be hazardous to the persons deployed on sample collection. Therefore, safety of the persons can be ensured by collecting samples from the static wagons. Another safety concern for the persons collecting the samples from the wagon is that of the live traction line. In the data submitted by NTPC, it is seen

that none of the generating stations served exclusively by MGR, there is electric traction. In five stations of NTPC, coal is supplied through both MGR and wagon tippler. However, there is no traction line from the railway siding to the unloading point. In two stations, wagon tippler is under erection and there appears to be no provision for electric traction. Only in four stations having wagon tippler have electrical tracts upto unloading point. In case of APP, the information regarding the electrical tracts has not been furnished. Therefore, in all generating stations of NTPC except 4 generating stations and the generating stations of APP in whose respect information has been submitted, there is no safety concern on account of live traction lines. In case of FSA in respect of Farrakka and Kahalgaon STPS, para 1.2(k) provides that "in case of having overhead traction line, the parties shall ensure that power in the overhead traction is switched off to facilitate collection of joint samples from BOXN/BOBR wagons…..". In line with the above provisions, the generating stations of NTPC having traction lines upto the unloading point may in coordination with Indian Railways, if required, switch off the traction lines while deploying the personnel for collection of samples from the wagons. In respect of other generating company, similar protocol may be decided and followed in consultation with Indian Railways.

40. NTPC has further submitted that the distance between the wagon tippler/track hopper to the crusher house ranges from 200 meters to 500 meters and it takes a few minutes to unload the coal from a wagon of 60 tonnes and move it on the conveyor belt to the crusher house. The distance between the wagon tippler/track hopper and crusher is used for removal of stones, boulders and other external materials. At the crusher house, coal is crushed to the required size for sampling and

the GCV of coal is measured from the samples so drawn. NTPC has submitted that the coal which is taken to the crusher house and sized is the most representative of the coal which has been supplied by the coal companies without any loss of GCV of the coal from the stage of wagons arriving at the generating station till the crusher house. NTPC has further submitted that the crusher house with an attached AMS serves the same purpose but in a contiguous manner as in case of measuring the GCV of coal samples taken from the railway wagons. APP has submitted that there is a grade slippage between the GCV of coal as billed and GCV of coal as received. According to APP, change of GCV measurement on as received basis without providing for an elaborate mechanism of testing coal in order to take care of grade slippage will not only aggravate the problem of generator but also place the entire risk of coal suppliers on the generating companies. Both APP and MPPGCL have submitted that at the time coal is received coal at the power plant, sampling can be done from the coal lying on the top of the wagons at the station end and due to different types of coal lumps, the samples collected from the wagon top does not represent the entire samples as there are differences in as distribution in different size fractions. MPPGCL has submitted that coal companies top up the wagon with good quality of coal and get the stones picked and removed in order to maintain the declared grade, whereas the same coal is not uniformly distributed / filled inside the wagons. MPPGCL has further submitted that during transportation of coal, moisture percolates by gravity inside the wagon and some moisture evaporates as a result of which sampling from the top does not give the correct value of total moisture and GCV as a whole. APP has submitted that the best practice to monitor GCV of coal requires that coal be crushed below 50 mm which as a routine manner is done in the power plant and samples of the crushed coal after the Coal Handling Plant are

collected between bunker and gravimetric coal feeder. TANGEDCO has submitted that the contention of NTPC is not correct as samples have to be prepared in accordance with the specification in IS which provides for collection of samples from the wagons.

41. We have considered the above submissions. As regards the issue of grade slippage raised by APP, this is a matter between the generators and coal companies and inability of the generators to sort out the matter with the coal companies cannot be passed on to the consumers. As regards the submission of MPPGCL regarding the variation in coal quality between the top and bottom part of the wagon, this matter has to be sorted out by the generating company concerned with the coal supplier and consumers cannot be burdened on account of the same. However, the Commission after taking note of the issues between the generators and coal companies has prescribed for measurement of coal on as received basis which takes care of the grade slippage between the loading point at mines end and unloading point in the generating station. Therefore, it is of no relevance to bring the issue of grade slippage when the question of point of measurement of coal on as received basis is being discussed. There is another aspect of measurement of coal on as received basis which is conveniently being overlooked by the generators. If the measurement of coal on as received basis from the wagons on its arrival at the generating station is taken by following Gate to Gate concept, it will crystallize the quantum of grade slippage between the loading point at mines end and unloading point in the generating station and the concerned generating company can take up the issue with the coal companies. The Commission during the hearing on 7.10.2015

had directed NTPC to place record the results of measurement of GCV on as received basis if any. NTPC in its affidavit dated 27.10.2015 has submitted as under:

> "Prior to 1.4.2014, since the GCV of the coal was to be computed on 'as fired' basis and not on 'as received basis', there was no occasion for sampling of coal at the stage of 'as received' basis either from the wagon top or immediately when the coal is unloaded or moved towards the conveyor/crusher. The coal was taken out of the wagon top on some occasions for knowing the adhoc GCV of the coal received, particularly, in the context of any claim with Coal India Limited (or its subsidiaries). These were ad hoc samplings carried out only for the purpose of getting an indicative idea of the quality of coal being received. Such sampling of the coal was not in any manner intended to be used for determining the quality of coal to be considered for the billing purposes, as at the relevant time the Regulation provided for computation of the GCV on 'as fired' basis."

From the above contention of NTPC on affidavit, it clearly emerges that NTPC had resorted to taking samples from the top of the wagons in the context of considering the claims of CIL or its subsidiaries on the basis of the quality of coal received. There is no reason as to why the GCV of coal on 'as received' basis cannot be measured from the top of the wagons for the purpose of computation energy charges to be paid by the consumers. For an apple to apple comparison of the GCV of coal as billed with the GCV of coal as received, it is necessary that the same procedure as followed at the time of loading at the delivery point is followed while measuring the GCV on as received basis by taking the samples from the wagons. Para 1.2 of the Schedule IV to the FSA provides for collection of samples from the wagons at the delivery point and the same process can be followed for taking samples from the wagon at the unloading point. As regards the removal of external materials, the same has to be segregated while preparing the samples as per the IS. Moreover, the IS provides for elaborate procedure for selection of sub-lots, drawal of samples, preparation of samples and purpose is to ensure that external materials are removed and homogenous mixture of sample is prepared. IS does not prescribe that the

samples should be collected after the coal is crushed to a particular size in the crusher. IS prescribes an elaborate procedure for preparation of the samples under laboratory conditions for the purpose of testing which has also been elaborated in the CPRI report and the said procedure could be followed for taking samples from wagons.

(C) Representativeness of the samples based on the IS and other standards

42. NTPC and APP have argued that samples taken from the top of the wagons is not homogenous and representative of the coal being delivered at the generating station in a lot. In support of its contention, NTPC has relied upon standards, various authorities and literature as discussed as under:

(a) NTPC has relied upon the provisions of para 0.3.4.2 of IS-436 Part I/Section.I-1964 in support of its contention that samples taken from the coal when it is stationery are not representative. Para 0.3.4.2 of the IS-436 Part I/Section I-1964 is extracted as under:

> "0.3.4.2. For obtaining reliable conclusions, it is recommended that coal may be sampled when it is in motion, that is, from conveyers or during loading or unloading. For this purpose, the sampling procedure as laid down in 3, 4 and 5 shall be followed. If, however, it is desired to sample the coal when it is stationary as, for example, from a stock pile or a loaded wagon, the procedures as laid down in 6,7 and 8 may be followed. It may, however, be mentioned that the representativeness of the samples drawn in this manner and hence the reliability of the conclusions is not likely to be assured."

NTPC has submitted that as per the process described by NTPC in Annexure A, movement of coal after unloading to the conveyor and reaching the crusher house being one contiguous and immediate process, samples drawn at the crusher house becomes the appropriate coal for measurement of GCV in accordance with para 0.3.4.2 of IS 436. GUVNL has submitted that para 7 specifically deals with sampling

from the loaded wagons and gives all the safeguards to ensure representativeness of such samples. GUVNL has further submitted that if these safeguards are followed by NTPC, there should be no reason as to why the samples should not be a representative one. We have closely examined the provisions of IS 436 (Part 1/section 1) 1964. The IS deals with sampling from conveyor (para 3), sampling from wagons during loading or unloading (para 4), sampling from ship during loading or unloading (para 5), sampling from stockpiles (para 6), sampling from loaded wagons (para 7), and sampling from loaded ships (para 8).The IS recommends for sampling of coal from the conveyor or during loading or unloading when the coal is in motion. But for collection of samples from stockpile or loaded wagons or loaded ships, the IS states that the representativeness of the samples and reliability of the conclusion are not likely to be assured. At the same time, IS also prescribes an elaborate procedure for taking samples from the loaded wagons.. The petitioner in its affidavit dated 27.10.2015 has submitted the video recording of the coal handling at its generating station. The videos show that there is no space for installing AMS at the location of apron feeder or paddle feeder when the coal is unloaded through wagon tippler. Even in case of BOBR, there is space constraint to install sampling device. Therefore, AMS cannot be installed at the unloading point or at the apron feeder/paddle feeder under the present arrangement at the power stations. The only place left for taking the samples is from the wagon in accordance with para 7 of the IS. It is pertinent to mention that at the time of issue of IS in 1964, advanced mechanical devices for collection samples from the loaded wagons had not been developed and therefore, there were certain limitations to collect samples in a representative manner from the loaded wagons. With the advancement of technology, hydraulic augers are now available which have been successfully

functioning in the Wanakbori TPS of GSECL. The use of hydraulic auger has reduced the human intervention for collection of samples from wagons. The augers are capable of taking representative samples from any depth of the wagons. Therefore, argument of NTPC and others regarding lack of representativeness of samples taken from the wagons is not of much relevance in the present context.

(b) NTPC has also relied upon the following provisions of IS:436(Part II)-1965 regarding sampling of coke:

> "SAMPLING OF COKE
>
> 2.1 General – Samples collected from the surface of coke in piles, bins, or wagons are, in general, unreliable, because of size segregation. Coke shall be sampled, wherever possible, in motion while it is being loaded into or unloaded from wagons, barges or trucks or, when it is being discharged from supply bins."

The above provision states that coke shall be sampled wherever possible in motion while it is loaded or unloaded from wagons. For the reasons recorded in sub-para (a) above, reliance of NTPC on the above provision has relevance.

(c) NTPC has relied upon the provisions of IS 436 (Part I/Section 2) 1976 regarding method of sampling. Relevant paras of the said IS are extracted hereunder:

> "3. MECHANICAL SAMPLING SYSTEMS
>
> 3.0 General – An essential condition of sampling is that the whole bulk of coal to be sampled should be exposed, so that all parts are equally accessible to the sampling implement and have the same chance of being included in the sample. The most favourable situation in which the whole of the coal is exposed for sampling is when it is being conveyed on a belt or similar device so that it passes the sampling point in a stream. If the belt is stopped and a section of adequate length is taken across the whole width of the belt, all the coal particles in this section can be taken so that there will not be any significant bias. Sampling from a stopped belt is therefore the most satisfactory way of ensuring that the sample is free from bias and it is recommended as the reference method.

3.0.1 In many installations, it is not possible to stop the belt without considerable interference with the work in the installation and other methods of sampling have therefore to be used. Alternatively, samples from the cross section of a moving stream are collected, to ensure that each increment is representative of the cross section. It is this principle on which most of the mechanical sampling systems work."

4.2 Automatic Samplers for collection of increments

4.2.0 General – It is desirable to use a sampler which cuts through the full width of a falling stream of coal. However, where it is not possible, an alternate method is to scoop the sample from a moving conveyor belt. While using the alternate method it is important to have the sampler properly adjusted to the belt curvature across its width so that true cross section of the conveyed material is removed, including fine particles which segregate to the bottom of the material on the belt while in motion. The cutter employed should also not cause turbulence while sweeping through the stream of coal pushing aside large coal pieces and thus rejecting them. Therefore, its speed has also to be carefully adjusted to avoid taking a biased sample.

The above provisions talk about collection of samples through AMS from a stopped belt or alternative method of collection of samples from moving stream or scooping the samples from the moving conveyor belt. These provisions do not support the proposition of the petitioner for collection of samples from the AMS installed after the crusher.

(d) NTPC has also referred to the CPRI report in support of its contention that samples should be crushed to the requisite size before sampling. NTPC has submitted that the process described in Table 12 of CPRI Report clearly brings out that samples drawn at the crusher house would be appropriate method for determination of the GCV. It is noticed that Table 12 of the CPRI Report deals with the Procedure for coal sample preparation of received coal at the three PSPCL plants. Moreover, Table 12 does not deal with the point of collection of sample of GCV as on received basis but deals only with preparation of samples under

laboratory conditions after the samples are collected from the wagons. Para 2.3 of the CPRI Report talks about taking samples from the wagons and therefore, supports the proposition that samples for measurement of GCV of coal can be collected from the wagons.

(e) NTPC has also relied upon the following findings in a study by Central Fuel Research Institute on the third party sampling of coal:

> "Manual method of wagon top sampling of large size raw coals is not only difficult but also violates some of the fundamental principles of sampling. As per requirement, samples are to be drawn from the full depth of the wagons, which is impossible to be collected manually. Furthermore, due to size segregation the samples collected from the wagon top does not satisfy the criteria of representativeness of the whole samples. Since the ash distribution in the different size fractions is not homogenous, results from the samples, which do not reflect the true size distribution of the lot, are likely to be biased. More importantly, sample collection by a shovel from the top is a function of human discretion and not governed by the probability rule. Wagon sampling when practiced in other parts of the globe is done on smaller and uniform sized washed or blended coals (say, below 50 mm), normally by auto-mechanical auger systems."

We have gone through the study which has been placed on record. It is interesting to note the conclusion of the study which is extracted as under:

> "It is a well known fact that sampling from the wagon top introduces bias. However, as this practice is likely to continue for some more time, there is a need to evolve a procedure that will give results with lesser variance. It needs to be stressed that meticulous supervision of sampling and preparation procedure, increasing number of increments and expressing the daily result as a mean of different sub-lots may increase the precision but in no way decreases the bias that is inherently present in the system. The precision value can be used by the customer and seller to match the results from the loading and unloading ends to settle the disputes on the results, if any."

Therefore, the study does not provide for stoppage of collection of samples from the wagon nor does it advocate for collection of sample after the crusher. In fact, the study recommends for evolution of procedure to increase the precision to match the results at loading and unloading ends. In other words, the study prescribes for

collection of samples from the wagons at the unloading points subject to certain safeguards.

(f) NTPC has relied upon para 5.0 of the Office Memorandum dated 26.8.2015 issued by Ministry of Environment & Forests in which it has been stated that “in case of manual monitoring, coal samples may be taken from a moving conveyor belt since sampling from stationery coal such as coal storage pile or rail cars may be problematic.” The OM pertains to the protocol for sampling, analysis of coal and reporting of compliance with respect to ash contents in coal to be supplied and used by the thermal power plants. Para 9.1 of the OM provides that coal samples shall be strictly collected as per the guidelines of Coal Controller or Bureau of Indian Standards which means that collection of samples from the wagon is permissible. In any case, the OM does not advocate for collection of samples after the crusher.

(g) NTPC has also relied upon (i) Wiley – James J. Speight in the Handbook of Coal Analysis; (ii) Study conducted by George S. Pope on the ‘Methods of Sampling Delivered Coal’ in 1916, under the aegis of the Bureau of Mines, US; (iii) Study by IEA Clean Coal Centre of International Energy Agency and (iv) United States Environment Protection Agency's research study for coal sampling in 1985. NTPC has submitted that as per these authorities, sampling of coal taken from the wagons when they are stationary is not correct and sampling should be done when the coal is unloaded or is moving on a conveyor. In our view, none of studies relied by NTPC supports the contention that samples should be taken after the crusher.

(h) NTPC has also relied upon the para 4.7.1 of the Fuel Supply Agreement in support of its contention that FSA also provides for measurement of coal after the crusher stage. Para 4.7.1 of the FSA reads as under:

> "4.7 Assessment of Quality of Coal
>
> 4.7.1 Sample Collection:
>
> i) Samples of Coal shall be collected by third party by manual method during each of the shifts and at each of the Delivery Points for determining the quality of Coal provided that in case of loading through Silo the Seller shall install AMS within a period of 24 months of signing of this Agreement at all such Silo loading points which are not having AMS at present. The AMS existing at the Silo loading point shall be made operational by the Seller within a period of 6 months from the date of signing of this Agreement. In the event of AMS at Silo loading point not being operational beyond the above specified period, the sample shall be collected jointly through the AMS at the Purchaser's unloading point till such time the loading end AMS becomes operational. The Seller shall also ensure that AMS at the Silo loading points shall be operational for 90% of the period in a year. Also if, for any reason the AMS at Seller's Silo loading point remains non operational for a continuous period of more than 10 days, then the samples shall be collected jointly through the AMS at the Purchaser's unloading point till such time the loading end AMS becomes operational."

NTPC has submitted that since AMS is situated after the crusher in most of its plants, the unloading point for the purpose of sampling of coal is the secondary crusher stage as per the FSA. A close scrutiny of the provisions of FSA reveals that coal samples shall be collected jointly by manual method during each of the shifts and each of the delivery point for determining the quality of coal. The exception is that in case of loading through silo, the seller shall install AMS within a period of 24 months at all such silo loading points which are not having AMS at present. If AMS is not made operational beyond 24 months, then samples shall be collected jointly at the purchaser unloading point. Therefore, the requirement is that AMS shall be installed at the unloading point of the purchaser. Unloading point has been defined in the FSA as "the place/point at the purchaser's power station end at which coal

from/through the Purchaser's Container is received / unloaded." Therefore, the AMS should be located at the receiving or unloading point at the generating station in order to qualify under the provisions of para 4.7.1 of the FSA and not after the crusher as contended by the petitioner. It may be seen that the Fuel Supply Agreement entered into with the Fuel Supplier Coal India Limited by the Petitioner only provides for the collection of coal samples jointly through the AMS at the Purchaser's unloading point till such time the loading end AMS becomes operational and not after the crusher. Further para 4.7.2 of the FSA provides that detailed modalities for collection, handling, storage and preparation of joint samples shall be as per procedure given in Schedule-IV. The said schedule provides for collection of samples from wagons, samples of coal despatched by road, collection of samples by conveyor belt and collection of samples from stockpiles. Therefore, depending on the agreement between seller and purchaser, and the mode of transportation, modality of collection of samples can be determined. Therefore, the provisions of the FSA do not support the contention of NTPC that sampling shall be taken from the AMS installed after the crusher.

43. From the above discussion, we come to the conclusion that claim of NTPC and others that collection of samples of coal from the AMS installed after the crusher inside the generating station being the correct stage for measurement of GCV on as received basis, cannot be accepted.

Issue No.2 : The stage at which GCV of coal has to be measured on as received basis.

44. A generating station receives coal from various sources such as linked mine of CIL/subsidiaries through the Indian Railways, through MGR system from the pit

head mines, through transportation by road and through ships. When the coal reaches the generating station and GCV is measured by taking samples, it is known as GCV as received. IS:436 (Part1/Sec1)-1964 prescribes the methods for sampling of coal from (a) conveyor, (b) wagons, (c) ships, (d) stock piles, and (e) seams. In so far as sampling from wagons and ships are concerned, IS separately provides for the procedure for sampling from loaded wagons or ships and sampling during loading or unloading from wagons or ships.

45. There is no dispute about the measurement of imported coal on as received basis as the samples are taken from the ships or wagons. In so far as coal received from Indian Railways or MGR is concerned, the generating companies like NTPC insist that samples of coal for measurement of GCV on as received basis should be taken after the crusher. As per the IS, the samples from the coal received through Indian Railways or MGR systems could be taken from the following places:

(a) Sampling from the Conveyors;

(b) Sampling from the wagons during unloading;

(c) Sampling from loaded wagons.

46. As regards the sampling from conveyor, para 3.2.1, 3.2.2, 3.2.3, 3.2.4 and 3.2.5 of IS 436(Part 1/Section 1)-1964 are relevant which are extracted as under:

> "3.2.1 The increments shall preferably be taken from the full cross-section and thickness of the stream in one operation. When coal is in motion, the most reliable means of obtaining such increments is to sample at a point where the coal discharges from the belts. The best possible increment is one which cuts across entirely a falling stream of the material by means of a suitable receptacle passed from one side of the stream to the other without allowing the receptacle to overflow. If the whole of the stream cannot be covered by one increment without overfilling the receptacle, the stream should be sampled systematically by taking material from all portions.

3.2.2 If it is not possible to sample satisfactorily at a point of discharges, the increments may be drawn from the moving belt itself. In this case, the increments shall be collected from the centre and the left and right sides of the belt along the same width. To ensure that very small material is also correctly obtained in the sample, the scoop should sweep the bottom of the conveyer.

3.2.3 If it is practicable to stop the belt periodically, increments may be collected from the whole cross-section of the stream by sweeping the whole of the coal lying between the sides of a suitable from placed across the belt. The frame should be inserted in the coal until it is in contact with the belt across its full width.

3.2.4 In case automatic samplers are available they may be utilized for drawing increments form a conveyer belt. The setting of such machines shall be carefully adjusted to ensure that the whole thickness of the stream is taken.

3.2.5 The material collected from all the increments in a sub-lot shall be mixed together and shall constitute a gross sample."

From the above, it is seen that samples from the conveyor can be taken from three places, namely, where the coal discharges from the belts, from the moving belt itself, by stopping the belts occasionally, by drawing the samples through automatic samplers through a conveyor belt.

47. As regards the drawal of samples while loading or unloading, para 4.2.1 of the said IS is relevant which is extracted as under:

"4.2.1 A minimum of 25 percent of the wagons shall be selected at random from the sub-lot and to ensure the randomness of selection the procedure as given in Appendix A may be followed. The number of increments to be taken from the selected wagons and the weights of the increments and the gross sample shall be in accordance with Table 3. The increments shall be evenly distributed over the selected wagons, with a view to determining the necessary number of increments that should be collected from each of the selected wagons of the sub-lot for making up the gross sample. These increments shall be drawn with the help of a suitable scoop or shovel, depending upon the size of the coal at regular intervals at the time of loading or unloading of the wagons."

As per the above procedure, they will be drawn with the help of suitable scoop or shovel depending on the size of the coal at regular interval at the time of unloading.

48. As regards the collection of samples from the loaded wagons, paras 7.2 and 6.1.2 of IS 436 (part 1/Section 1)-1964 are relevant which are extracted as under:

> "The gross sample shall be collected from a sub-lot according to the method described in 6.1.2. For this purpose a minimum of 25 percent of the wagons shall be selected from the sub-lot at random and one point shall be located at random on the coal surface of each of the selected wagons. At every selected point a sample shall be collected by taking the whole section of coal from top to bottom over an area of 30 cm diameter as described in 6.1.2.
>
> 6.1.2 In case the height of the stock pile is not more than 1.5 m, the material shall be collected at every selected point by taking the whole section of coal from top to bottom over the area of a circle of 30 cm diameter. For doing so, coal from the surface up to a depth of approximately 50 cm shall be collected at first. The bottom of the hole so formed shall then be covered by a plate and the coal lying on the sides shall be removed up to that plate so that when the hole is dug further (to collect further samples), the coal from the sides may not fill up the hole by falling down. This procedure is repeated till the bottom is reached."

49. Reliance has been made on para 0.3.4.2 of the IS 436 (part 1/Section 1)-1964 to contend that coal taken from the stationary wagons are not representative and the reliability of the samples is not assured. Para 0.3.4.2 is extracted as under:

> "0.3.4.2 For obtaining reliable conclusions, it is recommended that coal may be sampled when it s in motion, that is from conveyers or during loading or unloading. For this purpose the sampling procedure as laid down in 3, 4 and 5 shall be followed. If, however, it is desired to sample the coal when it is stationary as, for example, from a stock pile or a loaded wagon, the procedures as laid down in 6, 7 and 8 may be followed. It may, however, be mentioned that the representativeness of the samples drawn in this manner and hence the reliability of the conclusions is not likely to be assured."

50. It is apparent from the above provisions that the IS 436 (Part1/Sec1) -1964 recommends sampling from conveyers, or at the time of loading or unloading for

obtaining reliable conclusions. As regards the sampling from stockpiles or loaded wagons/ships, the IS states that the reliability of the conclusion is not likely to be assured.

51. Let us consider which of the procedures should be adopted for taking samples based on the existing ground conditions prevailing in the generating stations of NTPC, members of APP, MPPGCL and generating stations of GSECL. The Commission vide its order dated 27.11.2015 sought certain information with regard to the generating stations of NTPC, particularly the names of the generating stations having MGR and Wagon Tipplers separately, and names of the generating stations where NTPC has electrical tracts from mines upto the unloading point in case of MGR and from railway sidings upto the unloading points in other cases. Similar information was sought in case of the generating stations of the members of APP. The petitioner vide its affidavit dated 26.11.2015 has filed the following information:

Station	Stations having MGR System	Stations where NTPC has electrical track from mines to unloading point in case of MGR	Stations having Wagon Tippler	Stations where electrical track from Railway siding upto Wagon Tippler approach
Singrauli	Yes	No	No	Not Applicable
Rihand	Yes	No	Yes	No
Unchahar	No	Not Applicable	Yes	Yes
Tanda	No	Not applicable	Yes	No
Vindhyachal	Yes	No	Yes	No
Badarpur	No	Not Applicable	Yes	No
Dadri Thermal	No	Not Applicable	Yes	Yes
Mouda	No	Not Applicable	Yes	Under Commissioning
Korba	Yes	No	Under erection	Not Applicable
Sipat	Yes	No	Under erection	Not Applicable

Ramagundam	Yes	No	Yes	No
Simhadri	No	Not Applicable	Yes	Yes
Farakka	Yes	No	Yes	No
Kahalgaon	Yes	No	Yes	No
Barh	No	Not Applicable	Yes	Yes
Talcher Super	Yes	No	No	Not Applicable
Talcher TPS	No	Not Applicable	No	Not Applicable

52. It is noticed from the above table that out of the 17 stations of NTPC for which information has been furnished, two stations have only MGR, seven stations have both MGR and Wagon tippler, seven stations have only wagon tippler, and station has neither of them. In none of the stations where MGR is in operation, the electrical track is upto the unloading point. In case of wagon tippler, electrical tract is upto unloading points in five cases including one generating station under commissioning.

53. APP vide its letter dated 22.12.2015 has submitted information in respect of 20 generating stations of 9 of its members. In case of 3 stations both MGR and wagon tipplers are there. In case of two stations, there is MGR only and in case of 11 stations, there are wagon tipplers only. APP has not given any information about electric track.

54. NTPC and the generating stations of APP receive the coal through Indian Railways or through the MGR system. In case of coal received through Indian Railways, each wagon is separated and then the coal is unloaded through a wagon tippler. In case of MGR system, bottom opening wagons are used for unloading the wagons. NTPC is on record stating that it is neither possible to install the AMS near the belt on account of shortage of space nor it is advisable to collect the samples manually from the stream of coal at the time of unloading or from the belt due to hazards involved. On examination of videos recording submitted by NTPC vide their

affidavit dated 29.10.2015 and affidavit dated 27.11.2015, it appears that it may be difficult to take samples of coal just after unloading at wagon tipplers or at Mannual Unloading Track Hopper (MUTH).

55. The only practicable alternative is to take samples from the wagons either manually or by installing Hydraulic Auger at the suitable places. GUVNL vide affidavit dated 30.11.2015 has submitted the video recording of the samples of coal being collected from the railway wagon at the generating stations of GSECL, namely at Ukai TPS and Wanakbori TPS. They have also filed the laboratory testing procedure of the samples taken from the wagons/ Coal Rakes at Wanakbori TPS. From the examination of the video recording, it is observed that samplings of coal were being collected from the railway wagons using Hydraulic Auger. The process of taking samples was found to be smooth, capable of taking representatives samples from any depth of the wagon, from different locations without taking too much of time and the process appears to be safe and reliable. GSECL has been successfully using the Hydraulic Auger for collection of samples from the top of the wagons and NTPC and other generating companies can adopt and improvise the protocol for collection of samples from the wagons. As regards the threat to the safety of the personnel, the issue has been discussed in detail in para 41 of this order and the safeguards suggested in the said para should be adopted.

56. The generating companies should establish suitable protocol for collection of samples from the wagon. Since the generating companies like NTPC are Collecting samples from wagon for measuring the GCV of imported coal, it will not be difficult to quickly put a system in place. After the samples are collected in the manner given in

IS 436(Part 1/Section 1)-1964 and its subsequent revisions, the samples can be prepared as per the procedure prescribed in IS 436 (Part 1/Section 1)-1964 which has also been elaborated in CPRI Report to PSERC.

57. The Commission is of the view that measurement of GCV of coal on as received basis from the loaded wagons at the generating stations is the most appropriate method for computation of energy charges for the following reasons:

(a) It would reflect the difference between the “GCV As billed” and “GCV as received” in a transparent manner and will enable the generating companies to take up the matter with the coal suppliers with regard to grade slippages between the loading point at the mine end and unloading point at the power plant.

(b) GCV of domestic coal as on received basis would get correlated with the GCV of imported coal when blended as the GCV of imported coal is measured on as received basis. This will bring much desired transparency and accountability in the computation of energy charges in the interest of the consumers.

(c) Inefficiency of the generating companies, if any, in handling of coal between the point of unloading at the boundary of the generating station and the point of feeding to the bunkers should not be allowed to be passed on to the consumers.

(d) At the loading end of the mines, the coal sampling is done directly from the wagons and similarly, for measurement of GCV at unloading end, sampling has also to be done from the wagons following “Gate to Gate” concept.

58. In view of the above discussion, the issues referred by the Hon'ble High Court of Delhi are decided as under:

(a) There is no basis in the Indian Standards and other documents relied upon by NTPC etc. to support their claim that GCV of coal on as received basis should be measured by taking samples after the crusher set up inside the generating station, in terms of Regulation 30(6) of the 2014 Tariff regulations.

(b) The samples for the purpose of measurement of coal on as received basis should be collected from the loaded wagons at the generating stations either manually or through the Hydraulic Auger in accordance with provisions of IS 436(Part1/Section1)-1964 before the coal is unloaded. While collecting the samples, the safety of personnel and equipment as discussed in this order should be ensured. After collection of samples, the sample preparation and testing shall be carried out in the laboratory in accordance with the procedure prescribed in IS 436(Part1/Section1)-1964 which has been elaborated in the CPRI Report to PSERC.

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