BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
Principal Bench, New Delhi
In
Original Application No. 459/2018

In the matter of:-

Rashmi Singh — Applicant

Versus

National Thermal Power Corporation Ltd. & Ors. — Respondent(s)

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11.	Annexure-09: A copy of Order placed to Chhattisgarh Rajya Van Vikas Nigam Ltd. (CGRVNN) for plantation.	

(Nazimuddin)
Scientist F
Central Pollution Control Board
Parivesh Bhawan, East Arjun Nagar
Delhi110032

Place- Delhi
Date- 16.08.2022

Quarterly Report (April to June 2022) of the OversightCommittee
in the matter of Rashmi Singh Vs NTPC Limited &Ors (OA No. 459/2018)

M/s NTPC Limited is located at village Sipat, Tehsil Masturi, District Bilaspur (Chhattisgarh) for generation of 2980 MW power in its Super Thermal Power Plant (STPP). The EC for stage I and Stage II was granted in year 1999 and 2004 respectively with subsequent amendment thereon. The applicant had challenged the compliance of EC conditions in its OA No 459/2018. Hon'ble NGT had called detailed compliance report by constituting a committee in the case and disposed of the application vide its order dated 06.04.2021**(ANNEXURE-01A)** with direction to Oversight Committee as under-

"We direct the oversight committee to further verify compliance status periodically. The objections of the applicant as well as the report of the collector, Bilaspur may also be taken in to account by the NTPC and the oversight committee. The oversight committee may function at least for a period of one year and thereafter as may be decided by the Chairman CPCB"

In the meantime applicants had made an appeal in Hon'ble Supreme Court as Civil Appeal No 212 of 2022whichwas heard on 28.02.2022**(copy of the order is placed as Annexure-01 B)** with certain directions to Oversight Committee as under-

"Hence, having regard to the above backdrop, we direct that the Oversight Committee shall after verifying compliance on a quarterly basis commencing from 1 April 2022 submit periodical reports to the NGT together and seek such further directions as may be warranted so as to secure compliance with the EC. The appellants would be at liberty to move the Oversight Committee in respect of such grievances which remain to be attended so that the Oversight Committee may after due verification seek appropriate directions from the NGT. Hence, the impugned order of the NGT will not stand in the way of the Oversight Committee: (i) Submitting quarterly status reports commencing from 1 April 2022; and (ii) Seeking appropriate directions from the NGT which would secure compliance with the EC conditions"

In compliance of Hon'ble Supreme Court Directions dated 28.02.2022, the oversight committee comprising of following members has visited NTPC, Sipat on 23.05.2022. The

initimation about visit of the committee was sent to Applicant and Collector Bilaspur in mail on 17.05.2022.

1. Dr. R. P. Mishra, Scientist-D, Central Pollution Control Board, RD, Bhopal
2. Dr. Bhardwaj Adiraju Scientist 'C' MoEF&CC, IRO Raipur

The committee has collected and perused the objections submitted by the applicants and report submitted by Collector Bilaspur, to evaluate the status of compliance done by NTPC Sipat. The observation and finding of the committee is summarised as under:-

Observation & Finding on EC Conditions

Sl. No	EC Condition	Present Status of Compliance verified during visit to NTPC site
1	Coal should be used @ 10 MT/ year for Stage-I with Sulphur content not exceeding 0.24%. The coal should be transported from Korba Coalfields by Captive MGR in closed wagons to avoid dust pollution.	EC granted for Stage-I with restricting Sulphur content not exceeding 0.24% was amended vide MoEF& CC vide letter no. J-13011/10/1996-IA-II (T) dated 08.09.2014 and has allowed PP to use coal with sulphur content not exceeding 0.40%. It was informed thatPP has conducted study of coal quality by Center for Energy Studies, IIT Delhi. It was also informed by PP that the report stated Sulphur content was found to be within 0.4% and the report is in the records of Hon'ble NGT. It was observed on the day of visit that coal was being transported in closed wagons and the wagons are covered using tarpaulin. **Hence-Complied**
2	i) As per the proposal submitted for Ash Utilization, it should be ensured that fly ash is used in cement industry, brick making and in raising the ash dyke etc.	It was informed by PP that dry fly ash is being issued free of cost to fly ash brick manufacturers. The Oversight committee has visited few fly ash brick making plant in the area as well as fly ash brick making plant being

	ii) Efforts should also be made in the area of mine filling, land development and agriculture etc.	operated by NTPC Sipat. **Hence Complied** It was observed on the day of visit that pond ash is being supplied to NHAI, Bilaspur Pathrapali, Raipur Kodebad highway projects, Low lying area development and dyke raising work. PP has submitted comprehensive details of fly ash supplied to completed and ongoing works in projects of NHAI to Oversight committee and also quantity of fly ash filled in low lying area along with area details. TPP has also submitted details of quantity of ash utilization as below- **(Annexure -3)** Ash generation in FY 2021-22 : 51,97,660 MT Ash Utilization in FY 2021-22 : 30,80,320 MT Balance unutilized in FY 2021-22 : 21,17,340 MT Closing balance of legacy ash in ash ponds : 39.39 million MT (includes unutilized ash of FY 2021-22) NTPC Sipat has signed MoU with Manikpur Open cast mine to send ash for disposal in mine void. **Hence Complied**
	iii) For brick making, about 50 acres of land with all infrastructure facilities should be earmarked.	MoEF&CC has provided EC exemption for 50 acres land condition on 24.12.2021 with the stipulation that Afforestation through Miyawaki technique shall be carried out in 10 acres of land in Bilaspur district, preferably within 10 km from plant boundary.PP has informed that identification of land work is in progress. **Hence Not Complied** Fly Ash Utilisation Notification of September,

		from plant boundary. PP has informed that identification of land work is in progress. **Hence Not Complied**
	iv) Full fly ash utilization should be ensured at the end of 9th year from the date of commissioning of the project.	Fly Ash Utilisation Notification of September, 1999 has been modified in 31.12.2021. Hence may be considered as **Complied.** Photographs taken during visit is placed at **Annexure-02.**
3	i) Keeping in view the location of SonthiPahar Reserved Forest, additional Monitoring Station should be installed at the site to assess the ambient air quality. Monitoring should be initiated immediately to ascertain the project status and the scenario after commissioning of the project.	PP has submitted ambient air quality monitoring reports for the period from October 2021 to April 2022. The same was examined and found within prescribed limits.It was also observed that SO2 values at SonthiPahar Reserve Forest are well within permissible limit stipulated for ecologically sensitive area.Ambient Air Quality monitoring stationwas found operationalby out sourced agency during visit. Oversight Committee also visited the site on 23.05.2022 and it was observed that monitoring of ambient air quality is being done at SonathiPahar Forest Area. **Hence Complied.**
	ii) A special study should be undertaken to ascertain impact of SO2 on the flora in the project impact zone particularly the forest patches.	Study on Terrestrial ecology was conducted in 2002 and in 2015 which concludes negligible effect on Eco system and the report is in the records of Hon'ble NGT. **Hence Complied.**
4	i) Regular monitoring for SPM, SO2, NOx around the power plant may be carried out and records maintained.	It was found that three CAAQMS are installed at plant boundary including one at adjoining NTPC township boundary and real time monitoring is connected with CPCB and CECB Server. PP is regularly submitting ambient air quality monitoring reports and examination of

	ii) A Monitoring Station should be established near SonthiPahar forest in NE direction of the power plant.	latest report for the period from October 2021 to April 2022 revels that all the parameters monitored are within prescribed limits. **Hence Complied.** It was also observed that one manual ambient air quality station has been installed and operational at SonthiPahar forest in NE direction of the power plant. **Hence Complied**
5	Since maximum concentration for SO2 near SonthiPahar is likely to be close to permissible levels for sensitive area, continuous monitoring and analysis of ambient air quality in the region should be undertaken during planning, construction and operational phase of the project.	It was observed on the day of visit that AAQ monitoring is being done in nearby villages namely Janji, Kaudia and Karra manually at regular interval and records were found maintained by NTPC. PP has submitted ambient air quality monitoring reports for the period from October 2021 to April 2022. The same was examined and found within prescribed limits. **Hence Complied**
6	i) Utilization of land for Stages I & II of the project shall be restricted to 4382.44 acres, which is already in possession of the project authorities. ii) 70 acres of additional land will be acquired by M/s. NTPC for ash based units.	As per records produced by NTPC-Sipat before Oversight Committee it seems that only 4360 acres of land had been acquired for project including MGR switch yard and township. **Hence complied** As per Amendment granted by Government of India, Ministry of Environment, forests and Climate change (Impact Assessment Division), Vide No.J-13011/10/96-IA.II (T), dated 24.12.2021, 10 acres of land shall be identified outside the project boundary in the Bilaspur District (preferably within 10 km radius of the project cover area) to carry out Afforestation using Miyawaki Plantation technique with more

		than 90% survival rate as committed by the PP vide Letter No. CC: ESE: 9518:2021:GEN, dated 23.11.2021. (Annexure-4) It was informed by the Project Proponent that the identification of the 10 Acres land outside the project boundary in the Bilaspur district within 10 k.m. radius for Afforestation is under process. **Hence Not Complied**
7	Ash generated to the tune of 2.15 million tonnes per year shall be used in a phased manner as per the provisions of the Fly Ash Utilisation Notification of September, 1999 and its subsequent amendments. By the end of ninth year, full fly ash utilisation should be ensured. The cost of ash utilisation measures proposed in the total project cost should be intimated. ***Note-Fly Ash Utilisation Notification of September, 1999 has been modified in 31.12.2021.***	It was informed by PP that dry fly ash is being issued free of cost to fly ash brick manufacturers. It was also informed by PP that PP is supplying fly ash free of cost to nearby Cement / ash based industries. It was observed on the day of visit that pond ash is being supplied to NHAI Bilaspur Pathrapali, Raipur Kodebad highway projects, Low lying area development and dyke raising work. TPP has also submitted details of quantity of ash utilization as below-**(Annexure -3)** Ash generation in FY 2021-22 : 51,97,660 MT Ash Utilization in FY 2021-22 : 30,80,320 MT Balance unutilized in FY 2021-22 : 21,17,340 MT Closing balance of legacy ash in ash ponds : 39.39 million MT (includes unutilized ash of FY 2021-22) NTPC Sipat has signedMoUwith Manikpur Open cast minefor disposal of ash in mine void. In the preview ofFly Ash Utilization Notification dated 31.12.2021 may be considered as **Complied.**
8	i) Details of the plan to develop	i) As said condition has been amended by

	ash utilizing industrial units in the 70 acre plot proposed by the project proponent should be worked out in consultation with the State Government and the draft plan in this regard should be submitted to MOEF within 6 months of environmental clearance.	MoEF&CC for plantation by Miyawaki Plantation technique, hence submission of plan for development of ash utilizing industrial units in 70 acres of plot seem to be ruled out. **Hence Complied**
	ii) 70 acres of land will only be utilized for setting up ash based industries. *Said EC Condition has been amended as-* *As per Amendment granted by Government of India, Ministry of Environment, forests and Climate change (Impact Assessment Division), Vide No.J-13011/10/96-IA.II (T), dated 24.12.2021, 10 acres of land shall be identified outside the project boundary in the Bilaspur District (preferably within 10 km radius of the project cover area) to carry out Afforestation using Miyawaki Plantation technique with more than 90% survival rate as committed by the PP vide Letter No. CC: ESE: 9518:2021:GEN, dated 23.11.2021. (Annexure-4)*	ii) After said amendment it seem to be not applicable. **Hence Complied**
9	Regular monitoring of the air quality should be carried out in	TPP has submitted ambient air quality monitoring reports for the period from October

	and around the power plant and records be maintained. Periodic six monthly reports should be submitted to this Ministry.	2021 to April 2022. The same was examined and found within prescribed limits. PP has submitted latest six monthly reports to MoEF&CC – Raipur Office on 16.04.2022. **Hence Complied**
10	i) A long-term study on radioactivity and heavy metals contents on coal to be used shall be carried out through a reputed institute.	i) It was informed by PP that study of radioactivity has been done by BARC Mumbai, and it is concluded in the report that the radiation levels in and around the Sipat Super Thermal Power Station of NTPC Ltd., is comparable with the National average values. The naturally occurring radionuclide levels in groundwater / surface water / drinking water samples is observed well below the Atomic Energy Regulatory Board (AERB) and World Health Organization (WHO) prescribed limit / guideline values. The activity concentration of naturally occurring radio nuclides in soil, food matrices, flora and fauna is comparable to the national background levels. PP has submitted the radiological survey report conducted by BARC to MoEF&CC – Raipur Office. **(Annexure -5) Hence Complied**
	ii) Thereafter mechanism for an in-built continuous monitoring of radioactivity and heavy metals in coal and fly ash (including bottom ash) shall be put in place.	It was observed that study on heavy metals in coal and fly ash was completed through IICT Hyderabad and the same has been submitted to Committee. **(Annexure -6)** PP has informed the committee that there are no technology/instruments available for in built continuous monitoring of radioactivity & heavy metals in coal & fly ash (including bottom ash). As & when technology/ instruments are

		available then NTPC shall install the same. **Hence Not Complied.**
11	Monitoring of surface water quantity and quality shall also be regularly conducted and records maintained. The monitored data shall be submitted to the ministry regularly. Further, monitoring point shall be located between the plant and drainage in the direction of flow of ground water and records maintained. Monitoring of heavy metals in ground water shall be undertaken.	TPP has submitted surface water quality monitoring reports for the locations in surrounding 11 villages namely Hardadih, Sukhripali, Ralia, Rank,Janji, Kaudia, Bhilai, Gatora,Darrabhata, Nawadih and Deori and heavy metals analysis reports for the period from October 2021 to April 2022 to MoEF& CC Office, Raipur. The same was examined and found within prescribed limits. It was also observed on the day of visit that monitoring records of surface water quality are maintained by TPP. It was informed by TPP authorities that water is sourced from Hasdeo RBC. In order to ensure minimum required flow, NTPC has surrendered 27 MCM water out of earlier allocation of 120 MCM(as per water agreement with CG Water resource department), leaving present allocation 93 MCM. TPP has submitted Ground water monitoring and heavy metal analysis reportsfor the period from October 2021 to April 2022 to MoEFF&CC, Raipur Office. The same was examined and found within prescribed limits. **Hence Complied**
12	Minimum required environmental flow suggested by the competent authority of the state Govt. shall be maintained in the channel/Rivers (as applicable) even in lean season.	It was informed by TPP that water is sourced from Hasdeo RBC. In order to ensure minimum required flow,NTPC has surrendered 27 MCM water out of earlier allocation of 120 MCM(as per water agreement with CG Water resource department), leaving present allocation 93

		MCM.**(Annexure -7) Hence Complied**
13	Fly ash shall not be used for agriculture purpose. No mine void filling will be undertaken as an option for ash utilization without adequate lining of mine with suitable media such that no leachate shall takes place at any point of time. In case, the option of mine void filling is to be adopted, prior detail study of soil characteristics of the mine area shall be undertaken from an institute of repute and adequate clay lining shall be ascertained by the state pollution control board and implementation done in close co-ordination with the state pollution control board.	On the day of monitoring it was observed that Fly ash was not found used for agriculture purpose. It was also observed that Vide OM Ref: F.No.22-13/2019-IA.III dated 28.08.2019, MoEF& CC, has issued notification for utilization of fly ash in reclamation of low lying area and stowing in abandoned mines/quarries as per SOP developed by CPCB. NTPC Sipat got allocation of Manikpur OCM void for ash filling purpose. SECL has agreed for filling of 2888529 CUM flyash in Manikpur OCM vide its letter number 241 dated 05.12.2020 but filling of mine void has still not started. **Hence Complied**
14	CSR schemes should address Public hearing issues and shall be undertaken based on need base assessment in and around the villages within 5 Km of the site and in constant consultation with the village Panchayat and the district administration. As part of CSR prior identification of local employable youth and eventual employment in the project after imparting relevant training shall be also undertaken. Development of fodder farm, fruit bearing	TPP has submitted comprehensive CSR details from the Financial Year 2015-2016 to 2021-2022 specifying major CSR activities and the fund total spent.**(Annexure – 8)** **Hence complied**

	orchard, vocational training etc. can form a part of such programmes. Company shall provide separate budget for community development activities and income generating programmes. Vocational training programmes for possible self-employment and jobs shall be important to identify villagers free of cost	
15	The environment statement for each financial year ending 31st march in form-V as is mandated to be submitted by the project proponent to the concern state pollution control board as prescribed under the Environment (protection) rule, 1986, as amended subsequently, shall also to be put on the website of the company along with the status of compliance of Environmental clearance conditions and shall also be sent to the respective regional offices of the ministry by e mail.	It was informed by TPP that Environment statement for the financial year 2021-22 ending 31st march 2022was submitted on 26.04.2022 to the Regional Office of CECB. **Hence Complied**
16	Top surface of the coal wagons shall be completely covered with tarpaulin sheet/Cloth so that coal will not get exposed to atmosphere and becomes secondary emissions. This will avoid fugitive dust emissions	It was informed by TPP that they have already taken up with RDSO Lucknow, the designer of BOBR wagons for mechanical covering of coal wagons. It was also informed by TPP authorities that token fee has already been paid to RDSO, Consultancy Project proposal is awaited. It was observed on the day of visit that coal has

	during the transport. Water sprinkling shall be done on the top surface of coal at loading point before covering with tarpaulin sheet. Due safety procedures shall be followed so that the covered sheet doesn't open up and fly away during transport which will endanger safety of nearby people, agricultural fields, etc. Water sprinkling measures as proposed at loading and unloading point shall be continued. Progress report of implementation shall be submitted to this ministry and concerned Regional office as part of Compliance report.	been transported in closed wagons and the wagons are covered using tarpaulin. **Hence Complied**
17	Dense avenue plantation shall be developed on either side of the track wherever habitations/agricultural lands exists in consultation with local forest department to minimize the dust and noise pollution.	It was also informed by TPP representative that 25,000 saplings will be planted through CGRVVN in the current year monsoon. **(Annexure-9)** TPP has submitted letter to Managing Director CGRajya Van Vikas Nigam Limitedregarding Tree Plantation in NTPC Land along the MGR Track to MoEF&CC office, Raipur. TPP has submitted noise level monitoring reports for the period from October 2021 to April 2022 for 5 locations to MoEF&CC Office, Raipur. **Hence Not Complied**

18	AAQ monitoring within 1 km on either side of track, close proximity to nearby habitation, shall be continued once in a quarter and the progress report shall be submitted.	NTPC Sipat has submitted ambient air quality monitoring reports along MGR within 1 km at 6 locations and on either side of track, close proximity to habitation for the period from October 2021 to April 2022 to MoEF&CC Office, Raipur. Ambient Air Quality monitoring station was found operational by out sourced agency during visit. **Hence Complied**
19	Health survey study of the local people shall be carried out. The report should clearly bring out the impact on surrounding forests, agriculture/crop patterns, percentage of yield, public health due to open wagon coal transportation, etc.	This condition was imposed in the EC amendment issued on 17.05.2018. It was informed by TPP representative that they had conducted the study through CIMS Bilaspur wherein it has been mentioned that "*the prevalence of Chronic Obstructive Pulmonary Disease (COPD) found in our study is similar with the prevalence of COPD among non-coal dust exposure area in the country"*. It is submitted that Study for impact on forest, crop etc carried out by TCB College of agriculture, Bilaspur. Study is completed and there is no adverse finding in report. The copy of study reports are on record in Hon'ble NGT. **Hence Complied**
20	As stipulated by the earlier EAC on 31.03.2016, PP should study alternative methodologies / technologies being utilized including abroad, to prevent coal dust blow from moving open wagons carrying coal, if any. The results of this study should be submitted within one year.	It was informed by PP that they have already taken up with RDSO Lucknow, the designer of BOBR wagons for mechanical covering of coal wagons. It was also informed by PP that token fee has already been paid to RDSO, Consultancy Project proposal is awaited. **Hence Complied**

Observation and finding on other compliance points

Sl. No	Compliance Point	Present Status of Compliance verified during visit to NTPC site
01	Water logging in agriculture fields in close proximity with the ash dyke was observed during visit in compliance of Hon'ble NGT observation in its order 27.02.2020. The Oversight committee had recommended for its study and action taken accordingly.	As per recommendation of the Oversight committee NTPC Sipat got study conducted by IIT Roorkee and as per suggestion made in the report started construction of CC drain along the road adjacent to agriculture field. The photographs of the same is presented in **Annexure-02. Hence Complied.**
2	M/s Sipat Super Thermal Power Station was directed by Central Pollution Control Board to install FGD in unit #01and 02 by 31.12.2022 and Unit # 03, 04& 05 by 31.12.2021 so as to comply SO_2 emission limit.	In compliance of Hon'ble Supreme court order dated 21.07.2020 NTPC Sipat is submitting quarterly progress report in Hon'ble NGT. At the time of visit civil work for construction of two FGD stack, reaction tank and connecting duct was found completed. The progress of project is in consonance with PERT chart modified according to direction of Hon'ble Supreme Court. The date for completion of the project is March 2023 for unit I and III, December 2023 for unit II and June 2024 for Stage II plant.

RECOMMENDATIONS:-

1. NTPC shall develop dense avenue plantation on either side of track wherever habitation / agriculture lands exit in consultation with local forest department to minimize the dust and noise pollution.

2. NTPC, Sipat to obtain further directions from MOEF&CC regarding those EC conditions which are declared as impossible (Continuous monitoring of radioactive emission) and R&D activities in for modifications in coal wagons in the same line of EC amendment in case of NTPC, Ramagundam (AP) and NTPC Unchahar (UP).

3. NTPC Sipat shall prepare time bound action plan for disposal of ash in accordance with ash utilization notification dated 31.12.2021.

4. NTPC Sipat shall identify 10 Acres land outside the project boundary in the Bilaspur district within 10 k.m. radius for Afforestation using Miyawaki Plantation technique with more than 90% survival rate as committed vide Letter No. CC: ESE: 9518:2021:GEN, dated 23.11.2021.

(Dr.Bhardwaj Adiraju)
Scientist 'C'
MoEF&CC, IRO, Raipur
Member- Oversight Committee

(Dr. R.P. Mishra)
Scientist 'D'
CPCB, RD, Bhopal
Nodal Officer- Oversight Committee

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Nodal Officer- Oversight Committee

Item No. 01 Court No. 1

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

(By Video Conferencing)

Original Application No. 459/2018
(Earlier O.A. No. 196/2014 (CZ))
&
(I.A No. 96/2021: For placing on record the response of the reports filed by the Committee)

(With report dated 05.03.2021)

Rashmi Singh Applicant

Versus

National Thermal Power Corporation Ltd. & Ors. Respondent(s)

Date of hearing: 06.04.2021

CORAM: HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON
HON'BLE MR. JUSTICE SUDHIR AGARWAL, JUDICIAL MEMBER
HON'BLE MR. JUSTICE BRIJESH SETHI, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

Applicant: Mr. Saurabh Sharma, Advocate
Mr. K.M Nataraj, ASG with Mr. Sudhanshu Prakash, Advocate for NTPC
Mr. Shailesh Madiyal, Advocate for R-2

ORDER

1. The issue for consideration is compliance of environmental norms by National Thermal Power Corporation (NTPC). The Tribunal in its order dated 05.01.2016 noted following points for consideration:

> *"(1). Discharge from the plant into the Lilagar river contrary to the EC conditions.*
>
> *(2). The quality of the coal being used, in particular reference to the conditions imposed for sulphur content.*
>
> *(3). The sulphur dioxide emissions as a result of coal of higher sulphur content than what is prescribed in the EC condition.*
>
> *(4). Ash content in the coal being beyond the prescribed standard.*
>
> *(5). Fly ash disposal in terms of the MoEF Notification of 2009.*

(6). Not complying with the green belt requirement

……additional monitoring station on the Sonthi Pahad (reserved forest) be located for assessing the ambient air quality as also the requirement of FGD installation. In addition to the above, as provided in condition No. 2(ii), the requirement for having continuous monitoring facility at each of the stacks was required to be complied with."

2. Vide order dated 22.03.2017, following directions were issued:

"We direct that the MoEF while carrying out the inspection shall also in particular take specific note of the allegations made in the Original Application and submit their observations with regard to the same.

Learned Counsel for the State submitted that since remaining plantation work of compensatory afforestation is likely to be taken up in the coming monsoon season of 2017, the matter may be taken up for hearing after 15.07.2017.

In view of the same, the Learned Counsel for the parties submits that the matter may be listed on 18.07.2017. The complete figures in this behalf shall be provided along with the copies of the inspection report by the Learned Counsel for the Respondent."

3. Thereafter, a report was sought about the status of compliance from the Regional Office of MoEF&CC. The matter was considered on 27.02.2020 in light of report of the Regional Office of MoEF&CC dated 20.06.2019 and objections of the applicants thereto. The report gave status of various issues as 'complied', 'partially complied' and 'being complied'. The Tribunal directed NTPC to comply with the observations in the said report. With regard to the objections of the applicant, the Tribunal directed the Committee to look into the same. The operative part of the order of the Tribunal is as follows:

"13. We are of the view that these aspects may be considered by the Committee constituted on 14.02.2019 in O.A. No. 200/2018, Dukalu Ram & Ors. v. Union of India & Ors., mentioned above. The NTPC may give its response in respect of the above to the Committee within one month from today. If considered necessary, the Committee will be at liberty to undertake visit to the site.

14. *As regards the conditions of installing FGD plant/system, while the MoEF&CC has suggested that period of two years may be given, having regard to the impact of absence of such device on the health of the citizens, such a long time cannot be allowed being against the 'Sustainable Development' principle which is part of right to life and also mandatory under Section 20 of the National Green Tribunal Act, 2010. Such device may be positively installed within six months failing which Chief General Manager of the concerned project of NTPC will be personally accountable and coercive measures may have to be taken for non-compliance. The installation of FGD system may be overseen by the Chairman, NTPC.*

15. *We also find that according to NTPC, MoEF&CC has relaxed condition of covering raw material/coal by tarpaulin which is otherwise an essential safeguard to prevent air pollution. We are of the view that such essential safeguard cannot be dispensed with and must be adopted being a mandate of Article 21 of the Constitution and 'Precautionary' and 'Sustainable Development' principles under Section 20 of the NGT Act, 2010. Such safeguards may be positively adopted within one month from today which will also be the responsibility of the Chief General Manager of the concerned project of NTPC which may be overseen by the Chairman, NTPC."*

4. Based on the above order, the NTPC filed Civil Appeal No. 2728/2020, *National Thermal Power Corporation Ltd. v. Rashmi Singh & Ors.* which was disposed of on 21.07.2020. Order of Hon'ble Supreme Court is as follows:

"1 This appeal arises from a judgment of the National Green Tribunal[1] dated 27 February 2020. The NGT has issued two directions for compliance by the appellant:

(i) The installation of an FGD Plant within six months; and
(ii) Ensuring that all railway wagons transporting coal are covered with tarpaulin.

2. Mr. Tushar Mehta, learned Solicitor General, submits that the process for installing the FGD plant has already commenced. However, it has been submitted that the Central Pollution Control Board[2] had on 11 December 2017 granted time for compliance until 31 December 2022 for Units 1 and 2 and until 31 December 2021 for Units 3 to 5. It has been submitted that it is physically impossible to complete the process within a period of six months which will expire in August 2020.

[1] NGT
[2] CPCB

3. Mr. Ritwick Dutta appearing on behalf of the respondents, submitted that the notification dated 7 December 2015 provided an outer time-line of two years for all thermal power plants to effect compliance. The CPCB, finding that there was noncompliance, issued a communication dated 11 December 2017 granting time until 31 December 2022 for Units 1 and 2 and 31 December 2021 for Units 3 to 5.

4. On the aspect of tarpaulin covers, the Solicitor General stated that the appellant is coordinating with the Ministry of Railways and the process will be completed in one month. Mr Ritwick Dutta on the other hand submitted that that the Environmental Clearance was granted in 1999 and it has taken an inordinately long period of twenty years to effect compliance. However, he has not opposed the suggestion of the Solicitor General that one month's time to complete all formalities and to effectuate compliance be allowed.

5. Having regard to the communication which has been issued by the CPCB on 11 December 2017 granting time for compliance in regard to the installation of the FGD plant until 31 December 2022 for Units 1 and 2 and 31 December 2021 for Units 3 to 5, respectively, we extend time for compliance as fixed by the NGT so as to be in accord with the timelines which have been indicated in the communication of the CPCB. Accordingly, time is extended until 31 December 2022 for Units 1 and 2 and 31 December 2021 for Units 3 to 5, respectively.

6. Time to complete the process of ensuring that all wagons are covered with tarpaulin sheets is extended by a period of one month from today.

7. ***The appellant must take all appropriate steps within the period which has been extended for installing the FGD plant to the satisfaction of the NGT. The appellant shall submit quarterly progress reports to the NGT so as to facilitate compliance being monitored. Since the proceedings are to be listed before the NGT on 28 July 2020, we direct that on that date an affidavit shall be filed by the appellant setting out the concrete steps which have been taken and which shall be taken hereafter to effect compliance."***

5. The matter was last considered on 20.08.2020 in the light of the above background. The Tribunal considered the compliance affidavit of the NTPC as well as report of the CPCB dated 24.07.2020 mentioning the surviving non-compliances. The Tribunal directed further remedial action and filing of the further report by the NTPC as well as by the joint

Committee already constituted. The operative part of the order is as follows:-

"5. Accordingly, NTPC has filed a compliance affidavit mentioning the status of steps taken and proposed to be taken. CPCB has also filed its report on 24.07.2020 expressing handicap in visiting the site on account of pandemic. However, after going into the issues and the data, following observations have been made:

"1) It is observed that all three conditions of EC regarding fly ash utilization is still as "partially complied".

2) Study of heavy metal in coal and fly ash has been completed and analysis submitted by IICT Hyderabad has been submitted by NTPC Sipat. (Annexure-09)

3) The report of study conducted by Indira Gandhi Krishi Vishwavidyalaya BTC College of agriculture and research station Sarkanda, Bilaspur has been submitted. (Annexure-07)

4) The details of treatment system reported by NTPC Sipat and further endorsement by CECB indicate that industry is capable to maintain ZLD

5) The coal analysis reports submitted by NTPC Sipat were found in consonance with data available on public domain and reveals to be as per EC condition. Moreover NTPC Sipat is in process of FGD installation.

6) EC compliance verification report of MoEF&CC has confirmed the compliance of Green belt development.

7) Perusal of reports submitted by NTPC Sipat and it endorsement by reports published by CEA (Central Electricity Authority) at national level concludes that figures filed by NTPC Sipat about generation and utilization of fly ash are reliable, but not complying the target.

8) The soil analysis report submitted through collector, Bilaspur has not indicated any adverse effect on fertility of soil in the villages in question. The report submitted is placed at Annexure-05.

9) As per report submitted by NTPC, Sipat work order for installation of FGD in, Unit #01, 02 & 03 has been issued and pert chart for progress of work prepared. Copy of work order is attached at Annexure-11.

SUBMISSION

Given the guidelines of Ministry of Home Affairs (MHA) regarding operation during the COVID 19 pandemic, the

committee could not visit the site and request for extension of time (two months) for site visit and to submit full report with recommendation as per direction issued by Hon'ble NGT in its order dated 27.02.2020."

6. *In view of the above,* ***let further action be taken by the NTPC. The Committee may complete its task within three months and give its report with a tabulated statement, verifying the submissions of NTPC. The report be furnished before the next date of hearing*** *by e-mail at judicial-ngt@gov.in preferably in the form of searchable PDF/ OCR Support PDF and not in the form of Image PDF."*

6. Accordingly, NTPC has filed its compliance report on 22.03.2021. Earlier, the NTPC filed affidavits on 03.10.2020 and 23.12.2020. The Collector, Bilaspur has filed report on 01.03.2021 showing the compliance status. The CPCB has filed report on behalf of the Oversight Committee on 05.03.2021. The applicants have filed response to the report of the joint Committee as well as to the report of the Collector, Bilaspur on 05.04.2021.

7. It will suffice to refer to the report of the CPCB which is based on site visit on 11.11.2020 and ground verification. The report is as follows:-

"In compliance of Hon'ble NGT order dated 20.08.2020, committee has visited site of M/s NTPC Limited, Sipat on 11.11.2020 and verified the status of EC compliance with operational condition of pollution control devices provided by NTPC. The observation and finding of the committee is summarized as under:-

Sl. No	***EC Condition***	***Present Status of Compliance verified during visit to NTPC site***
1	*Coal should be used @ 10 MT/ year for Stage-I with Sulphur content not exceeding 0.24%. The coal should be transported from Korba Coalfields by Captive MGR in closed wagons to avoid dust pollution.*	*EC granted for Stage-I with restricting Sulphur content not exceeding 0.24% was amended vide MoEF & CC letter no. J-13011/10/1996-IA-II (T) dated 8th September 2014. In the above said letter MoEF&CC has accorded amendment in the said EC for sourcing coal from operating SECL mine with maximum Sulphur content of 0.4 percent. (Annexure-02). NTPC in its reply submitted to the committee has informed about conducting study of coal quality by Centre for energy studies, IIT Delhi*

		in which Sulphur content was endorsed to be within 0.4%. The report is in the records of Hon'ble NGT. (Annexure-03) NTPC has started covering of coal wagons from 20.08.2020 with tarpaulin after Hon'ble Supreme Court upheld the order, in an appeal filed by NPTC, against the order passed by this Hon'ble tribunal regarding covering of coal wagons. ***Hence Complied***
2	*As per the proposal submitted for Ash Utilization, it should be ensured that fly ash is used in cement industry, brick making and in raising the ash dyke etc.* *Efforts should also be made in the area of mine filling, land development and agriculture etc. For brick making, about 50 acres of land with all infrastructure facilities should be earmarked. Full fly ash utilization should be ensured at the end of 9th year from the date of commissioning of the project*	*Ash utilization data presented by NTPC Sipat indicate very low percentage of fly ash utilization during 2015 to 2020. However in FY 2020-21 rising trend is observed which may be due to utilization of fly ash in raising of ash dykes.* *Dry fly ash was found being issued to fly ash brick manufacturers and Cement industries* *Pond ash was supplied in Bilaspur – Pathrapali and Raipur - Dhamtari NHAI project* *NTPC Sipat got allocation of Manikpur OCM void for ash filling purpose. SECL has agreed for filling of 2888529 CUM fly ash in Manikpur OCM vide its letter number 241 dated 05.12.2020 (Annexure-04).* *Possession of 70 acre land in Saler Village, near NTPC Sipat, in district Bilaspur had been given to CSIDC on 24-05-2016 for Micro Small Enterprises Cluster Development. Further, CSIDC has got approval for Land diversion from Agricultural to Industrial use. Landdiversion from Agricultural to Industrial use has been notified in Gazette on 08.05.2020. CSIDC has moved for Lay out plan approval with Town and country planning.* *Presently, about 100 ash-based industries are reported to be operational in the vicinity of NTPC, Sipat.* ***Hence not complied***
3	*Keeping in view the location of Sonthi Pahar Reserved Forest, additional Monitoring Station should be installed at the site to*	*Ambient Air Quality monitoring station was found operational during visit by out sourced agency. The photographs of monitoring*

	assess the ambient air quality. Monitoring should be initiated immediately to ascertain the project status and the scenario after commissioning of the project. A special study should be undertaken to ascertain impact of SO2 on the flora in the project impact zone particularly the forest patches	*station are placed at Annexure -01. Monitoring records were also presented before committee for verification and found satisfactory. Copy of few reports is placed at Annexure- 05.* *Study on Terrestrial ecology was conducted in 2002 & in 2015 which concludes negligible effect on Eco system. Copy of the report is in records of Hon'ble NGT.* ***Hence Complied.***
4	*Regular monitoring for SPM, SO2, NOx around the power plant may be carried out and records maintained. A Monitoring Station should be established near Sonthi Pahar forest in NE direction of the power plant*	*Three CAAQMS are found installed at plant boundary including one at adjoining NTPC township boundary and real time monitoring is connected with CPCB and CECB Server. Screen shot of its connectivity is placed at Annexure-06.* ***Hence complied.***
5	*Since maximum concentration for SO2 near Sonthi Pahar is likely to be close to permissible levels forsensitive area, continuous monitoring and analysis of ambient air quality in the region should be undertaken during planning, construction and operational phase of the project.*	*It was informed to the committee that AAQ monitoring is also being done in nearby villages namely Janji, Kaudia and Karra manually atregular interval. Records were found maintained by NTPC, copy of few monitoring reports are placed at Annexure-07.Photographs of monitoring station are placed at Annexure01.* ***Hence Complied.***
6	*Utilization of land for Stages I & II of the project shall be restricted to 4382.44 acres, which is already in possession of the project authorities. 70 acres of additional land will be acquired by M/s. NTPC for ash based units.*	*As per records produced by NTPC, Sipat before committee it seems that only 4360 acres of land had been acquired for project including MGR, switch yard and township.* ***Hence Complied.*** *The documents placed by NTPC Sipat, before the committee reveals that NTPC Sipat had approached District Collector, Bilaspur in 2005 for acquisition of 70 acre land as stipulated in EC.* *Copy of document is placed at Annexure- 08.* ***Hence not complied.***
7	*Ash generated to the tune of 2.15 million tones per year shall be used in a phased manner as per the provisions of the Fly Ash Utilisation Notification of September, 1999 and its subsequent amendments. By the*	*It was reported that NTPC has started its operation on full power generation capacity in year 2011 and simultaneously implemented use of fly ash in various defined sectors as per fly ash utilization notification 1999. At the time of*

	end of ninth year, full fly ash utilisation should be ensured. The cost of ash utilisation measures proposed in the total project cost should be intimated.	*inspection ash dyke raising was in progress in lagoon #02 and further ash dyke raising is to be taken in Lagoon # 01 and 03.NTPC Sipat has got weighting of its design for ash dyke raising by IIT/NIT.* *NTPC Sipat has obtained allocation of Manikpur OCM void for ash filling purpose. SECL has agreed for filling of 2888529 CUM flyash in manikpur OCM. CPCB has also imposed EC on thermal power plants of NTPC in its Sipat Unit. NTPC has made appeal in Hon'ble Supreme Court and obtained stay on payment of EC.* ***Hence not complied.***
8	*Details of the plan to develop ash utilizing industrial units in the 70 acre plot proposed by the project proponent should be worked out in consultation with the State Government and the draft plan in this regard should be submitted to MOEF within 6 months of environmental clearance. 70 acres of land will only be utilized for setting up ash based industries.*	*Detailed action taken in this context has been described at point 2.* ***Not complied.***
9	*Regular monitoring of the air quality should be carried out in and around the power plant and records be maintained. Periodic six monthly reports should be submitted to this Ministry.*	*M/s NTPC Sipat has produced monitoring records before the committee for verification and informed about regular submission of data to MoEF&CC. Copy of the monitoring reports is placed at Annexure-09.* ***Hence Complied***
10	*A long-term study on radioactivity and heavy metals contents on coal to be used shall be carried out through a reputed institute.* *Thereafter mechanism for an inbuilt continuous monitoring of radioactivity and heavy metals in coal and fly ash (including bottom ash) shall be put in place.*	*Study of radioactivity has been done by BARC Mumbai, and it is concluded in the report that the radiation levels in and around the Sipat Super Thermal Power Station of NTPC Ltd., is comparable with the National average values. The naturally occurring radionuclide levels in groundwater / surface water / drinking water samples is observed well below the Atomic Energy Regulatory Board (AERB) and World Health Organization (WHO) prescribed limit /guideline values. The activity concentration of naturally occurring radio nuclides in soil, food matrices, flora and fauna is comparable to the national background levels. Copy of the report is placed at Annexure-10.* *Study on heavy metals in coal and fly ash was completed through IICT Hyderabad. Copy of the report is*

		placed at Annexure-11. *NTPC has informed the committee that there are no technology/instruments available for in built continuous monitoring of radioactivity & heavy metals in coal & fly ash (including bottom ash). As & when technology/ instruments is available then NTPC shall install the same.* ***Hence Complied***
11	*Monitoring of surface water quantity and quality shall also be regularly conducted and records maintained. The monitored data shall be submitted to the ministry regularly. Further, monitoring point shall be located between the plant and drainage in the direction of flow of ground water and records maintained. Monitoring of heavy metals in ground water shall be undertaken.*	*Ground water and surface water quality was found being monitored monthly in surrounding 11 villages namely Hardadih, Sukhripali, Ralia, Rank, Janji, Kaudia, Bhilai, Gatora, Darrabhata, Nawadih and Deori. Lilagarh river and kharang river water quality is also monitored monthly* *Heavy metals are also monitored monthly in ground water in the plant peripheral six villages namely Hardadih, Sukhripali, Raliya, Bhilai, Gatura and Raank.* *Six monthly monitoring reports are submitted to the Regional office and head office of ministry and records were found maintained by NTPC. Copies of few reports are placed at Annexure12.* ***Hence Complied***
12	*Minimum required environmental flow suggested by the competent authority of the state Govt. shall be maintained in the channel/Rivers (as applicable) even in lean season.*	*Water is sourced from Hasdeo RBC. In order toensure minimum required flow NTPC has surrendered 27 MCM water out of earlier allocation of 120 MCM, leaving present allocation 93 MCM.* *Copy of surrender letter is placed at Annexure13.* ***Hence Complied***
13	*Fly ash shall not be used for agriculture purpose. No mine void filling will be undertaken as an option for ash utilization without adequate lining of mine with suitable media such that no leachate shall takes place at any point of time. In case, the option of mine void filling is to be adopted, prior detail study of soil characteristics of the mine area shall be undertaken from an institute of repute and adequate clay lining shall be ascertained by the state pollution control board and implementation done in close co-ordination with the state*	*Fly ash was not found being used for agriculture purpose.* *Vide OM Ref: F.No.22-13/2019-IA.III dated 28.08.2019, MoEF & CC, has issued notification for utilization of fly ash in reclamation of low lying area and stowing in abandoned mines/quarries as per SOP developed by CPCB* *NTPC Sipat got allocation of Manikpur OCM void for ash filling purpose. SECL has agreed for filling of 2888529 CUM fly ash in Manikpur OCM vide its letter number 241 dated 05.12.2020 but filling of mine void has still not started.*

	pollution control board.	***Hence Complied***
14	*CSR schemes should address Public hearing issues and shall be undertaken based on need base assessment in and around the villages with in 5 Km of the site and in constant consultation with the village panchayat and the district administration. As part ofCSR prior identification of local employable youth and eventual employment in the project after imparting relevant training shall be also undertaken. Development of fodder farm, fruit bearing orchard, vocational training etc. can form a part of such programmes. Company shall provide separate budget for community development activities and income generating programmes. Vocational training programmes for possible self-employment and jobs shall be important to identify villagers free of cost*	*CSR funds were found allocated as DPE guidelines and expenditures were found incurred on community development. More over CSR expenditures are decided as per direction/instruction from district collector. The annual budget allocated for CSR activity is about Rs 900 lakh per year on an average. List of CSR activity incorporating major activitiesare place at Annexure- 14.* ***Hence Complied.***
15	*The environment statement for each financial year ending 31st march in form-V as is mandated to be submitted by the project proponent to the concern state pollution control board as prescribed under the Environment (protection) rule, 1986, as amended subsequently, shall also to be put on the website of the company along with the status of compliance of Environmental clearance conditions and shall also be sent to the respective regional offices of the ministry by e mail.*	*Environment statement submission was found regular.* ***Hence Complied***
16	*Top surface of the coal wagons shall be completely covered with tarpaulin sheet/Cloth so that coal will not get exposed to atmosphere and becomes secondary emissions. This will avoid fugitive dust emissions during the transport. Water sprinkling shall be done on the top surface of coal at loading point before covering with tarpaulin sheet. Due safety procedures shall be followed so that the covered sheet doesn't open up and fly away during transport which will endanger safety of nearby people, agricultural fields, etc. Water sprinkling measures as proposed at loading and unloading point shall be continued. Progress report*	*NTPC Sipat has started covering of coal wagons with tarpaulin from 20.08.2020 after Hon'ble Supreme Court upheld the order, in an appeal filed by NPTC, against the order passed by this Hon'ble tribunal regarding covering of coal wagons. Photographs are presented at Annexure-01* *NTPC has appraised that company is pursuing with RDSO Lucknow for mechanical covering of coal wagons. Token fee has already been paid to RDSO. Consultancy Project proposal is awaited.* ***Hence Complied.***

	of implementation shall be submitted to this ministry and concerned Regional office as part of Compliance report.	
17	*Dense avenue plantation shall be developed on either side of the track wherever habitations/agricultural lands exists in consultation with local forest department to minimize the dust and noise pollution.*	*In order to ensure green belt along railway track of MGR, a large-scale tree plantation scheme was adopted by NTPC. As informed to committee plantation of 48919 plants along the MGR track has been completed on 30.04.2020 through CGRVVN Ltd. Bilaspur. Copy of report obtained from CGRVVN is placed at Annexure-15.* ***Hence Complied.***
18	*AAQ monitoring within 1 km on either side of track, close proximity to nearby habitation, shall be continued once in a quarter and the progress report shall be submitted.*	*AAQ monitoring is being conducted in six villages namely Lutra, Bitkula, Nirtu, Jhanj, Utarda and nevsa, along MGR track and report of the same are being submitted to ministry on quarterly basis. Monitoring report of the same is enclosed at Annexure-16.* ***Hence complied.***
19	*Health survey study of the local people shall be carried out. The report should clearly bring out the impact on surrounding forests, agriculture/crop patterns, percentage of yield, public health due to open wagon coal transportation, etc.*	*This condition was imposed in the EC amendment issued on 17.05.2018. NTPC had conducted this study through CIMS Bilaspur wherein it has been mentioned that "the prevalence of Chronic Obstructive Pulmonary Disease (COPD) found in our study is similar with the prevalence of COPD among non-coal dust exposure area in the country". Copy of the report is placed at Annexure-17. It is submitted that Study for impact on forest, crop etc carried out by TCB College of agriculture, Bilaspur. Study is completed and there is no adverse finding in report. Copy of the report is placed at Annexure-18.* ***Hence Complied.***
20	*As stipulated by the earlier EAC on 31.03.2016, PP should study alternative methodologies /technologies being utilized including abroad, to prevent coal dust blow from moving open wagons carrying coal, if any. The results of this study should be submitted within one year.*	*NTPC, Sipat has already taken up with RDSO Lucknow, the designer of BOBR wagons for mechanical covering of coal wagons. NTPC has started covered coal transport,* ***Hence Complied.***

In compliance of Hon'ble NGT order dated 27.02.2020 about issues of non-compliances raised by the applicant, the committee has also visited the specific sites and called the records to verify the facts. The issues to be looked into by this committee include:-

1. *Coal handling and its quality*
2. *Land area and its use*
3. *Fly ash utilization*
4. *Green belt development and its compliance*
5. *Ambient air quality monitoring*
6. *Compliance of zero liquid discharge*
7. *Court cases*
8. *Soil testing in villages around NTPC*
9. *Compliance of EC conditions*
10. *Installation of Flue Gas Desulphurisation (FGD)*

Sl. No.	***Non compliances according to applicant***	***Observation of the committee***
01	*EC condition No. (viii) for coal transport to be done through closed wagon transport has not being complied with and no exemption should be granted in this context.*	*NTPC has started covering of coal wagons from 20.08.2020 after Hon'ble Supreme Court upheld the order, in an appeal filed by NPTC, against the order passed by this Hon'ble tribunal regarding covering of coal wagons.*
02	*EC condition No. (ix)is not being complied despite more than 10 years of plant operation It is mentioned therein that 70 acres of revenue land has been identified at saler Village which has got transferred to Dept. of industries, Govt. of Chhattisgarh and then to CSIDC. It is mentioned therein that CSIDC has sought approval from concerned authorities and the same is awaited. It is also mentioned in the Report that NTPC is pursuing the matter with CSIDC for early implementation. All in all it is clear from a mere reading that the above mentioned EC condition No. (ix) is not being complied with.*	*The issue has been described at point 06 of EC compliance status*
03	*EC condition has not been complied with. It is stated that the maximum land for stage I and II of Sipat is 4382.44 acres. According to the Applicants this condition is being violated in a big way because of leakage from Ash Dykes, as more than 200 Acres of land has got marshy.*	*The committee has visited the site and observed marshy condition in agriculture fields but it was difficult to decide its reason as no leakage from ash dykes was observed. At site it was found that irrigation canal passing adjacent to agriculture field was also damaged at many places. Photographs taken during visit are placed at Annexure-01.* *Reasons are what so ever but interest of farmers shall be on priority. Hence its needs an in-depth study to find out the cause and formulate an action plan for its remediation. The cost of study should be paid by NTPC.*
4	*EC condition pertaining to Fly Ash utilization condition is being violated and even 49.54% figure of*	*Central Electricity Authority (CEA) is the agency for compilation of National data of fly ash generation and*

	use is not correct as maximum portion of the ash is being used for raising height of ash dam.	*utilization under various heads. CEA publishes its annual report on fly ash generation and utilization and made available in public domain as linkcea.nic.in/reports/others/thermal/tcd/flyash. As per the CEA reports Chhattisgarh is having maximum number of thermal power plants in India with annual utilization 77.12% of fly ash.* ***As per Environment (Protection) Amendment rules, 2020 notified in The Gazette of India on 21st May 2020, amendment made in Environmental (Protection) Rules, 1986 in rule 3, for sub rule (8) point 2(iv), Thermal Power Plants are permitted to dispose fly ash in abandoned or working mines (to be facilitated by mine owner) with environmental safeguards.*** *In this context NTPC Sipat has obtained permission for filling of fly ash in Manikpur coal mine.*
5	*Study on heavy metals in coal and fly ash said to have been done by the IICT Hyderabad but the same has not been brought on the record and NTPC is not complying the condition in this regard.*	*In compliance of applicant's observation about para 3 vi regarding study on heavy metals in coal and fly ash , NTPC Sipat has submitted copy of analysis report dated 29.05.2017 done by Indian Institute of Chemical Technology, Hyderabad. Copy of the report is placed at Annexure-11.*
6	*Study for impact on forest, crop etc. by TCB College of agriculture, Bilaspur, Chhattisgarh is under process i.e. still not done hence the non-compliance.*	*The said study has been completed and copy of the report is placed at Annexure-18.*
7	*There are ongoing court cases thereby proving that NTPC is in breach of mandatory requirements of environment regulations*	*NTPC has briefed about three cases i.e. 7893 of 2014 CJM, Bilaspur, OA No. 195/2014 Hon'ble NGT (CZ) and present OA No. 459/2018* *Copy of the decisions provided in favour of NTPC Sipat in case number 7893 of 2014 is placed at Annexure-19 and OA No. 195/2014 is at Annexure-20.*
8	*The capital cost on EMPIS has only been mentioned whereas no breakup/item wise details have been provided to ascertain the actual use*	*As desired NTPC Sipat, has provided copy of breakup details for capital cost of EMPIS. Copy attached at Annexure-21.*
9	*It is falsely stated that all conditions of MPSPCB's NOC dated 5th March, 1997 has been complied with. Condition No. 7 at*	*The basic nature of the TPP is air polluting however waste water generated from various section of the plant may be treated in ETP. The*

	page 23 of the MPSPCB's NOC annexed with Original Application states that Zero Liquid Discharge had to be achieved but a perusal of Annexure 6 at page 53 with the Original Application, Additional Affidavit of Applicant dated 21.01"2016 and para 7 of Reply to CECB's Affidavit of October, 2019 at pages 1082 to 1087 shows that there has been a discharge of polluted water from Ash dams and how such pollution is causing the land to become marshy and causing damage to the crops.	*major sources of wastewater generation are cooling tower blow down, boiler blow down, ash pond overflow and condenser water. NTPC has installed two ETP of total 15000 KLD capacity for waste water treatment. NTPC has also provided Ash water recycling system (AWRS) to reuse it in slurry formation to transport ash from plant to ash dyke. As per water balance chart maximum part of treated water is used as make up water in slurry formation. NTPC has installed continuous water quality monitoring system at the outlet of every ETP which is connected with server of CPCB and CECB. At the inspection AWRS and ETP were found operational. Photographs of AWRS are also presented at Annexure-01.* *The review of water pollution control system indicates that NTPC has sufficient capability to treat waste water generated in the plant.*
10	*EC condition No. 2 (viii) of using coal of only 0.24% sulphur. The NTPC violated this condition till 2014 and got the condition amended during the pendency of this application. Even the new norm 0.40% sulphur content is being violated as the sulphur content is much higher as evident from the chemical property chart filed by the applicant earlier.*	*After perusal of documents placed by NTPC committee is in view that EC for stage I was issued in 1999 with sulphur content 0.24 % but coal to be used from Dipika Mine. The sulphur content condition was modified upto 0.36% in 2002 and upto 0.4 % in 2014. The units of Stage I was made operational in year 2011.* *More over EC of Stage II was granted on08.06.2004 without any sulphur content condition but coal to be used from same Dipika Coal Mine. The operation of Stage II was started in 2008 i.e. before operation of Stage-I.* *Testing of sulphur content in coal of Dipika mine was done by IIT and regularly by CIMFR (for process use only) and report of IIT is placed at Annexure-03.*
11	*False information has been submitted by NTPC to MoEF&CC which has not BEEN verified independently. The Google image produced by the applicant has a calculation that instead of 259 acre of green belt area as claimed by the NTPC, hardly120 acre can be considered as green belt.*	*NTPC claims for plantation of 3,72,421 trees in residential area, plant premises, MGR Track and ash dyke though Chhattisgarh Rajya Van Vikas Nigam Limited and produced copies of work orders. Norms of plantation is 2000 trees per hectare i.e. 1000 trees per acre. As per norms of 80 percent survival total number of survived trees came to around 297936. As per plantation norms of 1000 trees per acre (297936/1000) it come to around 297 acres.*

OBSERVATION:-

1) *As per EC condition mechanism for an in-built continuous monitoring of radioactivity and heavy metals in coal and fly ash (including bottom ash) shall be put in place. In this context NTPC has informed that there are no technology/instruments available for in built continuous monitoring of radioactivity & heavy metals in coal & fly ash (including bottom ash). As & when technology/ instruments is available then NTPC shall install the same. Hence status of compliance could not be judged.*

2) *In compliance of Hon'ble NGT observation in its order 27.02.2020, the committee has visited the area in close proximity with the ash dyke and observed waterlogging in agriculture fields but it was difficult to decide its reason as no leakage from ash dykes was observed. At site it was also found that irrigation canal passing adjacent toagriculture field was also damaged at many places. Photographs taken during visit are placed at Annexure-01. In compliance to Hon'ble NGT Direction soil testing reports of land in villages Raliya, Hardadih, Raank, Bhilai, Kaudiya, Gatora and Sakhripali was called from collector Bilaspur. The said report is on the record of Hon'ble NGT. Copy of the report is placed on Annexure-22 indicates about no adverse effect on soil. In this context committee is in the view that reasons are what so ever but interest of farmers shall be on priority. Hence its needs that an in-depth study to find out the cause and formulate an action plan for its remediation shall be conducted. The cost of the project should be paid by NTPC.*

3) *In compliance of Ministry of Environment Forest & CC letter dated 7.12.2017, Central Pollution Control Board has issued direction to M/s Sipat Super Thermal Power Station, Bilaspur on 11.12.2017, under section 5 of the Environment (Protection) Act 1986, regarding compliance of emission limit notified vide notification No, S.O.3305 (E) dated 07.12.2015.* ***M/s Sipat Super Thermal Power Station was directed to install FGD in unit #01and 02 by 31.12.2022 and Unit # 03,04& 05 by 31.12.2021 so as to comply SO2 emission limit.***

In the above context M/s Sipat Super Thermal Power Station, NTPC Ltd has informed in its reply submitted to Oversight committee that work order for FGD installation has been awarded for Stage-I unit (3x660MW). Completion schedule submitted by NTPC for unit #01 & 03 is November 2021 and for Unit # 02 is February 2022. Stage II (2x500 MW) units proposal for installation of FGD is under tendering stage. Copy of work order and pert chart plan is attached at Annexure-23. In compliance of Hon'ble Supreme court order dated 21.07.2020 NTPC Sipat is submitting quarterly progress report in Hon'ble NGT. At the time of visit civil work for construction

of FGD stack was found in progress and in consonance with PERT chart submitted by NTPC. Photographs of the same are placed at Annexure- 01.

RECOMMENDATIONS:-

1. *Ministry of Environment, Forests and Climate Change vide its office memorandum dated 28th August 2019 has changed in conditions stipulated in the Environmental Clearances of Thermal power Plants and Coal Mines in line with the fly ash notification and subsequent amendment.* ***As per changes made vide this office memorandum, the guidelines prepared by CPCB for disposal of fly ash for reclamation of low lying areas and in stowing/backfilling of abandoned mines quarries shall be followed during disposal of ash in abandoned or working mines. In this context a committee may be appointed to ensure proper management of fly ash in the state and implementation of SOP developed by CPCB.***

2. ***NTPC, Sipat shall conduct an in-depth study though any reputed institute to find out the reasons for water logging in the fields near ash dyke. The scope of the work shall also include providing various options for remediation of agricultural field.***

3. ***NTPC, Sipat to obtain further directions from MOEF&CC regarding those EC conditions which are declared as impossible (Continuous monitoring of radioactive emission) and R&D activities in for modifications in coal wagons in the same in line of EC amendment in case of NTPC, Ramagundam (AP) and NTPC Unchahar (UP) Copy of EC is enclosed at Annexure-25.***

Note: This report was shared with Collector Bilaspur. Collector has provided his report to CPOB and MoEF&CC and has also directly submitted that report to NGT on 02.03.2021."

8. As against above, the objections of the applicant under different headings are:-

*"**COVERING OF COAL WAGONS***

3. *That according to the Joint Committee's Report NTPC has started covering of coal wagons from 20.08.2020 with tarpaulin after Hon'ble Supreme Court upheld the order, in an appeal filed by NPTC. It is stated that the above finding is negated by the Report of the District Administration as in it's Report at pages 2190 and 2200 the District Administration states that:*

"The spot verification of the coal transported from Korba Coalfields by captive MGR showed that the wagons are covered using tarpaulin and in these tarpaulin sheets there is considerable amount of wear asnd tear (Annex. A)

Hence the wagons are partially covered."

4. *In the Report of the district Administration it is also mentioned different dates i.e on 12.02.2021(page 2207), 13.02.2021(page 2208), 15.02.2021(page 2209) on which they have conducted site inspections in which the tarpaulin covering of coal wagons is torn. The matter had come up before the Court of Tehsildar, District Bilaspur where the issue of torn tarpaulin on coal wagons has come up on 16.02.2021 (page 2206). The District Administration has also annexed photographs corroborating it's stand to this effect from page 2210 showing torn tarpaulin covering the wagons.*

70 ACRES OF ADDITIONAL LAND AT SALER VILLAGE WILL BE ACQUIRED BY NTPC FOR ASH BASED UNITS

5. *That it is mentioned that 70 acres of revenue land has been identified at Saler Village which has got transferred to Dept. of Industries, Govt. of Chhattisgarh and then to CSIDC. CSIDC has sought approval from concerned authorities and the same is awaited. NTPC is pursuing the matter with CSIDC for early implementation. All in all it is clear from a mere reading that the above mentioned EC condition No. (ix) is not being complied with as according to the Report of the District Administration " No land has been earmarked by NTPC on it's own for ash based units of brick making. Also the land in Saler village has been acquired by CSIDC and CSIDC plans to use the same for Micro Small Enterprises Cluster Development (ANNEX E). Not complied" (page 2194).*

FLY ASH UTILIZATION ISSUE

6. *That according to the Applicant the EC condition pertaining to Fly Ash utilization condition is being blatantly violated and even 49.54% figure of use is not correct as maximum portion of the ash is being used for raising height of ash dam.*

According to the Report of the District Administration dated 01.03.2021 at page 2191 it is stated that:-

"No accounting has been provided by NTPC for ash which remains unutilized from the previous years. Hence only 12% of fly ash has been utilized till date which does not follow Fly Ash utilization policy 1999."

7. *A page 2195 it is mentioned that, "However as per NTPC only 12% of fly ash generated has been utilized till the 9th year of it's operation. Hence it is far behind it's target*

from fly ash utilization". This aspect has not been dealt with by the Joint Committee in proper perspective.

8. *That the Joint Committee has also annexed a study on heavy metals in coal and fly ash done by the IICT Hyderabad. It is stated by the Applicant that the IICT report clearly shows large number of heavy metals in coal and fly ash at page 1808 (Annexure 11) of the Joint Committee's Report. The CPCB may be asked to develop a Threshold Limit Value (TLV) for coal and fly ash with respect to thermal power plant.*

ZERO LIQUID DISCHARGE

9. *That a perusal of Joint Committee's Report shows that it is falsely stated that all conditions of MPSPCB's NOC dated 5th March, 1997 has been complied with. Condition No. 7 of the MPSPCB's NOC annexed with Original Application states that Zero Liquid Discharge had to be achieved but a perusal of Annexure 6 at Page 53 with the Original Application, Additional Affidavit of Applicant dated 21.01.2016 and para 7 of Reply to CECB's Affidavit of October, 2019 at pages 1082 to 1087 shows that there has been a discharge of polluted water from Ash dams and how such pollution is causing the land to become marshy and causing damage to the crops.*

10. *The District Administration in it's Report at page 2198 state:-*

However as per the Map given by NTPC and field verification marshy land has been noticed in areas nearby dykes (ANNEX I-a)

Also in the field visit by the team, around the dyke area it was found that considerable area has been turned into marshy land like areas in village Rank (Annex I-b)"

11. *That as per Recommendation 2 of the Joint Committee's Report, NTPC Sipat needs to conduct an in-depth study through any reputed institute to find out the reasons for water logging in the fields near Ash Dyke. The scope of work shall also include providing various options for remediation of agricultural field. Even the District Administration's Report has observed marshy areas around the ash dykes to be* ***subsurface leakage*** *from the dykes. Therefore, there is an urgent need to remedy the situation of* ***subsurface leakage around the Ash dykes in the surrounding agricultural fields****.*

SULPHUR CONTENT IN COAL

12. *That it is stated that the EC had a condition No. 2 (viii) of using coal of only 0.24% sulphur. The NTPC violated this condition till 2014 and got the condition amended during the pendency of this application. Even the new norm 0.40% sulphur content is being violated as the sulphur*

content is much higher as evident from the chemical property chart filed by the applicant earlier. Annexure A8 at page 58 with the Original Application and Additional Affidavit dated 21.01.2016 at para 6 may kindly be perused in this regard which clearly show that the sulphur content in the coal derived from Korba Coal fields is more then 0.40%. Copy of the chemical property chart of Western Coalfields Ltd. (A subsidiary of Coal India Ltd.) filed by the applicant earlier as Annexure A8 at page 58 with the Original Application is again annexed herewith as ANNEXURE- 1

13. *According to the Report of the District Administration at page 2190 states that:-*

"As per verification, no report has been presented by NTPC which states about the sulphur content of coal. Only a research paper from IIT Delhi 2004 has been submitted which gives a generic view about Indian Coal."

GREEN BELT

14. *That it is stated that the NOC of MPSPCB provides that green belt condition has to be complied with. It is stated that this condition has been violated blatantly by the Project Proponent. False information has been submitted by NTPC to MoEF&CC which has not been verified independently. The Google image produced by the applicant has a calculation that instead of 259 acre of green belt area as claimed by the NTPC, hardly 120 acre can be considered as green belt. (Page 18 of the Rejoinder dated 10.12.2015, Para 9 of the Additional Affidavit of November, 2016 and Rejoinder of August 2016 to Collector's report may kindly be perused in this regard.)*

15. *That the Joint Committee's Report says 262329 trees have been planted in 215 acres of the land which comes to 3015 trees/ha. However, it does not shows the survival rate. Therefore, just plantation of the trees cannot be considered as compliance of EC condition to have a green belt with a tree density of 1500-2000 trees/ha.*

16. *That the green belt plantation claimed by the NTPC is not on the periphery of the plant and they have planted trees in some other areas. Copy of the Google Map highlighting that NTPC has not developed any Green Belt in the periphery of the Plant is annexed as* ***ANNEXURE-2.***

17. *That a perusal of the Report of the District Administration at page 2201 states that the EC condition of Dense avenue plantation which was to be developed on either side of the track wherever habitation/agricultural lands in consultation with local forest department to minimize the dust and noise pollution„ the same has been mentioned to be "Partially Complied" with.*

18. *That a perusal of the Report titled "To study the impact of coal transportation among villagers residing along the railway track from Dipka mines to NTPC Ltd., Sipat by CIMS, Bilaspur-Annexure-17 which talks about at page 1898 that " Around MGR track-inadequate green belt was seen along the MGR track".*

SOIL TESTING REPORT

19. *That the report of Assistant Soil Testing Officer, Bilaspur at pages 1996-1997 clearly spells out about significantly low nitrogen in cropland of all the six villages. It is a well-known fact that Nitrogen, Phosphorus and Potassium are considered as an essential nutrient in agricultural practices. Low nitrogen concentration will certainly affect the crop yield in these villages. The report further also revealed that almost 50% of the collected soil samples is having low nitrogen which clearly shows less microbial activity which is essential of the natural decomposition process of organic matter.*

20. *That earlier the Joint Committee had filed a Report dated 24.07.2020 in which annexure 7 was a Preliminary Studies on Impact of Coal Dust on Soil, Crop and Tree Species due to Open Wagon Coal Transportation by Indira Gandhi Krishi Vishwavidyalaya, Bilaspur, Chhattisgarh. This Report is silent on distance wise total number of samples collected in various zones i.e. Crop land, forest and mixed zones. Report is also silent on the depth of samples used for the analysis of the Physic-chemical characterises of soil which is very important factor for determination of soil quality with respect to crop. The physic-chemical characterises of soil has been not given with respect to samples collected at various distance on the both the side of the track to in various zones i.e. Crop land, forest and mixed zones ascertain zone of influence. The Report clearly says that the grain yield is significantly lower within 10 meter distance of the railway track.*

AIR POLLUTION ISSUE

21. *That in response to EC condition "Keeping in view the location of Sonthi Pahar Reserved Forest, additional Monitoring Station should be installed at the site to assess the ambient air quality. Monitoring should be initiated immediately to ascertain the project status and the scenario after commissioning of the project. A special study should be undertaken to ascertain impact of SO2 on the flora in the project impact zone particularly the forest patches", it is stated that no additional Monitoring Station has been installed at the site to assess the ambient air quality. There is no special study undertaken to ascertain impact of SO2 on the flora in the project impact zone particularly the forest patches. Hence this EC condition has not been complied with.*

HEALTH STUDY

22. *That according to the Report of the District Administration at page 2203 it is mentioned that "NTPC has submitted a study conducted by CIMS Bilaspur in which sample of 900 people staying in around MGR Korba and Bilaspur were taken and as per the study 21.4 °A) have reported to have breathing difficulties. 17.2% people have stated cough problem, 12.1% have chest congestion,12.3 % have stated chest pain due to coughing, 8% have stated heavy breathing and 7.8% have stated insomnia."*

That even the Joint Committee has annexed this Report titled "To study the impact of coal transportation among villagers residing along the railway track from Dipka mines to NTPC Ltd., Sipat by CIMS, Bilaspur-Annexure-17 which talks about various health problems of Respondents at pages 1898 -1899.

(i) Breathing difficulties
(ii) Cough problem
(iii) Chest congestion
(iv) Chest pain due to coughing,
(v) Heavy breathing
(vi) Insomnia

23. *That it is stated that the study of study conducted by CIMS Bilaspur is only with respect to Corridors where Rail transport is moving and the findings that 21.4 °A) people are having breathing difficulties in a Rail corridor area is very high. It is stated that when the momentary exposure is so high the Health impacts on people in areas where it is mined i.e Coal Mines, areas where it is kept and burnt i.e Thermal Power Plants and areas having fly ash, the adverse health impact would be much higher and requires detailed assessment.*

Therefore the following actions are proposed by the Applicant:-

1. *Directions for conducting an in-depth study to identify the nature and extent of pollution in communities around coal-fired thermal power plant, and undertake clean up measures - air, soil and water sources (surface and underground). (For Health Study - involve state department of health, State Health Resource Center Chhattisgarh and Dept of Community Medicine from Raipur Medical College).*

2. *Direct the Health Department to provide proper health care and specialised treatments free of cost for all residents living within 10 KM of of the coal-fired power plants. (cost of healthcare to be borne by the polluter), in line with Dukalu Ram order.*

3. *Undertake measures so that the populations have safe water for drinking and other uses.*

4. *Initiate comprehensive and continuous monitoring of emissions in air, soil water sources, drinking water and fish in the region.*

5. *Apprehend polluters and take corrective remediation action to bring the levels of dust and heavy metals in residential areas to below detection limits.*

6. *Award the affected families punitive damages for responsible companies causing pollution neglecting norms and standards.*

7. *Impose a moratorium on any further expansion of the existing mines or setting up of new industries until comprehensive health impact assessments of the power plant is completed and its recommendations are implemented.*

ISSUE OF SURFACE WATER

24. *That in response to EC condition, "Monitoring of surface water quantity and quality shall also be regularly conducted and records maintained. The monitored data shall be submitted to the ministry regularly. Further, monitoring point shall be located between the plant and drainage in the direction of flow of ground water and records maintained. Monitoring of heavy metals in ground water shall be undertaken- it is stated that the number of parameters for which analysis has been undertaken by Public Health Engineering Department is not in accordance with Indian standard drinking water specification i. e IS10500:2012 (as amended 1st June, 2015). Therefore, No Indian standard on drinking water have been used in this case.*

25. *That by it's order dated 27.02.2020 this Hon'ble Tribunal had directed in para 11 that:-*

"...Wherever there is a 'partial compliance' or 'being complied', full compliance may be ensured and compliance report filed by 31.05.2020 to the Committee constituted by this Tribunal on 14.02.2019 in O.A. No. 200/2018, Dukalu Ram & Ors. v. Union of India & Ors..."

26. *That it is stated that a perusal of the Report dated 01.03.2021 of the District Administration shows that the following EC conditions are either Partially Complied with or Being Complied.*

S. No.	***EC/NOC of MPPCB***	***Status of Compliance as per the Report of The District Administration's Report who have conducted a site visit of the area***	***Page No. of the paper-book***

1.	*Sulphur content inCoal/ Wagon coverage by Tarpaulin*	*Partially Complied*	*2190*
2.	*Fly Ash utilization*	*Partially Complied*	*2191 and 2195*
3.	*70 acres of additional land at Saler village will be acquired by NTPC for ash based units*	*Not Complied*	
4.	*Zero Liquid discharge*	*Not Complied*	*2198*
5.	*Green Belt development/Avenue Plantation*	*Partially Complied*	*2201*
6.	*Health Survey study*	*Partially Complied*	*2203*

27. It is important to point out here that any condition which is 'Partially Complied with' also means it is 'Partially Not Complied'.

28. Therefore, in view of the above submissions/response it is clear that NTPC has not only not complied with the EC and NOC conditions of MPPCB but also the Order dated 27.02.2020 passed by this Hon'ble Tribunal as there are a number of EC/NOC conditions which are either 'partially complied' with or 'not complied' with and therefore necessary directions are forthwith required to be passed for imposing Environmental damage/remediation cost against NTPC and directions with respect to Health Issue may be granted as mentioned in para 23 above."

9. We have heard learned counsel for the parties. We do not see any reason why report of the Oversight Committee furnished by the CPCB on the issue of status of compliance should not be accepted. Accordingly, the said report is accepted and directions are issued in terms of observations and recommendations therein. Let the NTPC take further remedial action accordingly. We direct the Oversight Committee to further verify compliance status periodically. The objections of the applicant as well as the report of the Collector, Bilaspur may also be taken into account by the NTPC and the Oversight

Committee. The Oversight Committee may function at least for a period of one year and thereafter as may be decided by the Chairman CPCB.

The application is disposed of.

A copy of the order be forwarded to the NTPC, CPCB and District Magistrate, Bilaspur by email for compliance.

In view of the above order, no further order is necessary on I.A No. 96 of 2021 which stands disposed of accordingly.

Adarsh Kumar Goel, CP

Sudhir Agarwal, JM

Brijesh Sethi, JM

Dr. Nagin Nanda, EM

April 6, 2021
Original Application No. 459/2018
AB

IN THE SUPREME COURT OF INDIA
CIVIL APPELLATE JURISDICTION

Civil Appeal No 212 of 2022

Rashmi Singh and Another — **Appellants**

Versus

National Thermal Power Corporation (NTPC) and Others — **Respondents**

O R D E R

1 On 21 July 2020, this Court while considering Civil Appeal No 2728 of 2020 moved by the National Thermal Power Corporation[1] Limited against the judgment of the National Green Tribunal[2] granted an extension of time for installing the FGD plant, in terms of certain extended time-lines which were fixed by the Central Pollution Control Board[3]. This Court also issued directions to ensure that all wagons are covered with tarpaulin sheets. Paragraphs 5, 6 and 7 of the order of this Court are extracted below:

> "5 Having regard to the communication which has been issued by the CPCB on 11 December 2017 granting time for compliance in regard to the installation of the FGD

1 "NTPC"
2 "NGT"
3 "CPCB"

plant until 31 December 2022 for Units 1 and 2 and 31 December 2021 for Units 3 to 5, respectively, we extend time for compliance as fixed by the NGT so as to be in accord with the timelines which have been indicated in the communication of the CPCB. Accordingly, time is extended until 31 December 2022 for Units 1 and 2 and 31 December 2021 for Units 3 to 5, respectively.

6 Time to complete the process of ensuring that all wagons are covered with tarpaulin sheets is extended by a period of one month from today.

7 The appellant must take all appropriate steps within the period which has been extended for installing the FGD plant to the satisfaction of the NGT. The appellant shall submit quarterly progress reports to the NGT so as to facilitate compliance being monitored. Since the proceedings are to be listed before the NGT on 28 July 2020, we direct that on that date an affidavit shall be filed by the appellant setting out the concrete steps which have been taken and which shall be taken hereafter to effect compliance."

2 The NGT had appointed a Joint Oversight Committee[4] during the pendency of the proceedings. The report of the JC dated 5 March 2021, contains a tabulation in regard to compliance with the conditions stipulated in the Environment Clearance[5]. The report contains a separate elaboration of those conditions which were complied with and those which were not. It appears that apart from the report of the JC, the District Collector, Bilaspur submitted a report on 1 March 2021 to the CPCB and the Regional Director of MoEF & CC.

4 "JC"
5 "EC"

3 The NGT by its order dated 6 April 2021, disposed of the proceedings in terms of its discussion in paragraph 9 of the order, which is extracted below:

> "We have heard learned counsel for the parties. We do not see any reason why report of the Oversight Committee furnished by the CPCB on the issue of status of compliance should not be accepted. Accordingly, the said report is accepted and directions are issued in terms of observations and recommendations therein. Let the NTPC take further remedial action accordingly. We direct the Oversight Committee to further verify compliance status periodically. The objections of the applicant as well as the report of the Collector, Bilaspur may also be taken into account by the NTPC and the Oversight Committee. The Oversight Committee may function at least for a period of one year and thereafter as may be decided by the Chairman CPCB."

4 The above extract from the order of the NGT indicates that:

(i) The report of the Oversight Committee was accepted;

(ii) NTPC was directed to take further remedial action;

(iii) The Oversight Committee was directed to verify compliance periodically; and

(iv) The objections of the appellants and those of the Collector were to be taken into account both by NTPC and by the Oversight Committee. The Oversight Committee was directed to function for a period of one year and thereafter as decided by the Chairperson of the CPCB.

5 We have heard Mr Ritwick Dutta, learned counsel appearing on behalf of the appellants and Mr Shailesh Madiyal for NTPC.

6 Mr Ritwick Dutta drew attention to the report of the District Collector which laid emphasis among other things on the health hazards which have been faced by the local residents. The submission which has been urged by Mr Dutta is that the NGT having disposed of the proceedings, there is no recourse provided to the appellants in regard to compliances which are still to be effected. In this context, it has been submitted that the NGT has simply entrusted the process of monitoring compliance to the Oversight Committee without any further recourse.

7 On the other hand, Mr Shailesh Madiyal, learned counsel appearing on behalf of the first respondent submits that the Oversight Committee was constituted by the NGT itself and its report has been carefully considered in the course of the proceedings. As regards the report of the District Collector, it was emphasized that it has been found that the prevalence of respiratory ailments is no greater than the proportion in the general population.

8 The NGT has, in the course of its operative directions, left it to the Oversight Committee to monitor compliance. The Oversight Committee has been directed to do so periodically, bearing in mind the objections which may be raised by the appellants as well as the report of the Collector, Bilaspur. The

directions which have been issued by the NGT must be supplemented by permitting the Oversight Committee to move the NGT for such further directions as may be necessary to secure compliance with the conditions of the EC including those which are still to be complied with. The report of the Oversight Committee (Annexure A-11) contains a separate tabulation of those aspects of the EC which were complied with and those which have not been complied with.

9 Hence, having regard to the above backdrop, we direct that the Oversight Committee shall after verifying compliance on a quarterly basis commencing from 1 April 2022 submit periodical reports to the NGT together and seek such further directions as may be warranted so as to secure compliance with the EC. The appellants would be at liberty to move the Oversight Committee in respect of such grievances which remain to be attended so that the Oversight Committee may after due verification seek appropriate directions from the NGT. Hence, the impugned order of the NGT will not stand in the way of the Oversight Committee:

(i) Submitting quarterly status reports commencing from 1 April 2022; and

(ii) Seeking appropriate directions from the NGT which would secure compliance with the EC conditions.

10 The appellants as well as the District Collector, Bilaspur will also be at liberty to draw the attention of the Oversight Committee to such areas which require remedial attention. The Oversight Committee would seek clarifications from NTPC before taking a view on the status of compliance.

11 The appeal shall stand disposed of in the terms of the above modifications to the order passed by the National Green Tribunal.

12 Pending applications, if any, stand disposed of.

.....J.
[Dr Dhananjaya Y Chandrachud]

.....J.
[Surya Kant]

New Delhi;
February 28, 2022
CKB

ITEM NO.32 Court 4 (Video Conferencing) SECTION XVII

S U P R E M E C O U R T O F I N D I A
RECORD OF PROCEEDINGS

Civil Appeal No.212/2022

RASHMI SINGH & ANR. **Appellant(s)**

VERSUS

NATIONAL THERMAL POWER CORPORATION (NTPC) & ORS. **Respondent(s)**

(With appln.(s) for IA No.2998/2022-EXEMPTION FROM FILING C/C OF THE IMPUGNED JUDGMENT)

Date : 28-02-2022 These matters were called on for hearing today.

CORAM :
HON'BLE DR. JUSTICE D.Y. CHANDRACHUD
HON'BLE MR. JUSTICE SURYA KANT

For Appellant(s) **Mr. Ritwick Dutta, Adv.**
Ms. Srishti Agnihotri, AOR
Mr. Saurabh Sharma, Adv.
Ms. Sanjana Grace Thomas, Adv.

For Respondent(s) **Mr. Shailesh Madiyal, AOR**
Mr. Sudhanshu Prakash, Adv.
Mr. Vaibhav Sabharwal, Adv.
Mrs. Neha Jain, Adv.

Mr. Abhinay Sharma, AOR
Mr. Utsav Trivedi, Adv.
Ms. Manini Roy, Adv.
Ms. Unnati Vijay, Adv.

UPON hearing the counsel the Court made the following

O R D E R

1 The appeal is disposed of in terms of the signed order.

2 Pending applications, if any, stand disposed of.

(CHETAN KUMAR)
A.R.-cum-P.S.

(SAROJ KUMARI GAUR)
Court Master

(Signed order is placed on the file)

ANNEXURE-02

-: Photographs Taken During Visit of Joint Committee:-

Ash disposal in reclamation of low lying area

Ash Utilization in NHAI Road Construction

Ash Utilization in Brick Manufacturing plant installed and operated by NTPC, Sipat

Ash Utilization in Brick Manufacturing plant installed and operated by NTPC, Sipat

Construction of CC drain by NTPC Sipat along the road between ash dyke and agriculture field

Operation of Ambient Air Quality Station at Sonathi Pahar

Annexure-2

ANNEXURE-03

(xiv). Details of coal consumption: (Past four years):

Year	Coal receipts (indigenous) (MTS)	Coal Receipts (Imported) (MTS)	Total Consumption	Remarks / Details of Coal linkage
2019-2020	13917101.120	101604.9	114059932.71	Coal linkage fro Dipka mines. F Supply Agreement with SECL.
2020-2021	15224213.78	0	14994990.91	
2021-2022	13986065.62	284283	14066964.43	

(xv). Details of production: (past four years):

Products	Consented Quantity	Actual production			
		2018-19	2019-2020	2020-201	2021-2022
Electricity	2980 MW (26105 MU at 100% PLF)	23907 MU	22530 MU	23525 MU	21221 MU

(xvi). Implementation of recommendations of the Corporate Responsibility for Environment Protection (CREP) :

(xvii). Details of Separate Environmental Management Cell: Name, designation, qualificatio of the officers and their administrative setup: **Name of the Officers, designatio qualification, and structure of reporting.**

Attached as Annexure- 3

(xviii). Details of stack: Stack height, monitoring and details of parameters monitored: Monitored by……; Frequency: Parameters monitored: …. ; Details of online monitoring …..

Attached as Annexure- 4

Details of fly ash generation and its disposal: (past four years):

Sl. No.	Year	Quantity produced in (Tons)	Quantity transported (Tons)	Stock available (Million Tons)
(i)	2021-22	5197660	3080320	39.39
(ii)	2020-21	5247332	3025841	37.27
(iii)	2019-20	4905238	2408429	35.05
(iv)	2018-19	4800059	2377815	32.59

(xix). C di

Sl. N

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(xxiii)

(xxiv)

(xxv)

(xxvi)

Annexure-4

ANNEXURE-04

F. No. J-13011/10/1996-IA.II (T)
Government of India
Ministry of Environment, Forests & Climate Change
(Impact Assessment Division)

Indira Paryavan Bhavan
2nd Floor, Vayu Wing,
Aliganj, Jor Bagh Road
New Delhi – 110 003

Dated: 24th December, 2021

To,

Dr. Vijay Prakash
The Head of Department Environment Engineering
M/s NTPC Limited
NTPC Engineering Office Complex, Sector-24,
Noida, Gautam Buddha Nagar – 201 301
Uttar Pradesh

Sub: Sipat Super Thermal Power Project Stage-I of 3x660 MW in an area of 4382.44 acres located at Village Sipat, Masturi Tehsil, Bilaspur District, Chhattisgarh by M/s NTPC Limited – For Amendment in Environmental Clearance - reg.

Sir,

This has reference to your online Proposal No. IA/CG/THE/223393/2021 and letter dated 5th August, 2021 submitted to the Ministry for amendment in Environmental Clearance to the project cited in the subject.

2. The Ministry of Environment, Forest and Climate Change has considered the application. It is noted that the proposal is for amendment of Environmental Clearance dated 22nd February, 1999 to Sipat Super Thermal Power Project Stage-I of 3x660 MW in an area of 4382.44 acres located at Village Sipat, Masturi Tehsil, Bilaspur District, Chhattisgarh by M/s NTPC Limited.

3. The proposal was considered by the Expert Appraisal Committee (EAC) for Thermal Power Projects in its 14th & 16th EAC Meeting held on 16th August, 2021 & 18th November, 2021 respectively. The comments and observations of EAC on the project may be seen in the Minutes of the meeting which are available on the web-site of this Ministry.

4. It has been noted that Environmental Clearance for Sipat STPP Stage-I (3x660) MW was accorded by MOEF&CC vide letter no. J-13011/10/96/IA.I (T) dated 22nd February, 1999 for capacity of 2000 MW (4x500 MW). The Condition No. (ix) of the said EC are as follows:

"Condition No. (ix): "As per the proposal submitted for Ash Utilization, it should be ensured that fly ash is used in cement industry, brick making and in raising the ash dyke etc. Efforts should also be made in the area of mine filling, land development and agriculture etc. For brick making, about 50 acres of land with all infrastructure facilities should be earmarked. Full fly ash utilization should be ensured at the end of 9th year from the date

of commissioning of the Project."

Also, Amendment has been requested in EC amendment letter granted by MoEF&CC vide letter no. J-13011/10/96/IA.II (T) dated 8th September, 2014 The Condition no. *(iii)* of the amendment in EC dated 8th September, 2014 are as follows:

"Condition No. (iii) A long term study of radio activity and heavy metals contents on coal to be used shall be carried out through a reputed institute. Thereafter mechanism for an in-built continuous monitoring for Radio activity and heavy metals in coal and fly ash (including bottom ash) shall be put in place."

5. In view of above, PP has desired amendment to reduce the 50 acres of land for brick making infrastructure facilities as stipulated to 10 acres and since inbuilt continuous monitoring for Radioactivity and heavy metals in coal and flyash in technically not possible, it may be amended with regular periodical monitoring for Radio activity and heavy metals in coal and fly ash.

6. It has been informed that there are is a cluster of Thermal Power Plants (NTPC Korba TPS, BALCO & BCPP, Dr. Shyama Prasad Mukherjee Thermal Power Station, Hasdeo Thermal Power Station, Darri, CSEB East TPS, CSEB West TPS, DB Power Plant, RKM Powergen plant, Moneet Ispat captive power plant, SKS Power plant etc.) which generate about 5000 MW of electricity within 100 km radius (aerial) of Sipat STPP. Hence, there is limited scope of ash brick manufacturing in and around NTPC Sipat and there will be no more takers for ash for brick, even if manufactured. There is no single chunk of land (40 acres) is currently available in Sipat STPP to accommodate all infrastructure facilities for expansion of ash brick plant, as Stage-II and FGD system construction works already occupied the space in layout. Further, Sipat Stage-III (1x800 MW) Project is also under planning stage, which will be accommodated within the existing plant premises.

Hon'ble NGT in it is order dated 6th April, 2021 in OA no. 459/2018 has directed NTPC to obtain further directions from MoEF&CC regarding above EC conditions of Radioactivity and Heavy metals which are impossible. Further, it has been informed that the continuous online instruments are not available for monitoring study of radioactivity in coal and ash and there are no BIS standards/regulations for monitoring of Radioactivity in coal and ash in India.

7. The sectoral Expert Appraisal Committee after detailed deliberations in its 16th meeting held on 18th November, 2021 through Video conferencing on the information submitted and as presented, recommended the proposal for amendment in Environmental Clearance. Based on recommendation of EAC, Ministry, hereby grants the amendments as requested by the project proponent in condition at Sr. No. (ix) of EC letter dated 22.02.1999 and Condition at S. No. (iii) of EC letter dated 08.09.2014 to Sipat Super Thermal Power Project Stage-I of 3x660 MW in an area of 4382.44 acres located at Village Sipat, Masturi Tehsil, Bilaspur District, Chhattisgarh by M/s NTPC Limited, under the provisions of EIA Notification, 2006 and as amended subject to the compliance of the following additional terms & conditions/ specific conditions for environmental safeguards:

i. Fly ash utilization plan shall be adhered and 100% Ash utilization shall be

carried out strictly as per extent rules and regulations of the Ministry.

ii. Backfilling in the low lying area shall be carried out as per the CPCB guidelines.

iii. 10 acres of land shall be identified outside the project boundary in the Bilaspur district (preferably within 10 km radius of the project cover area) to carry out afforestation using Miyawaki plantation technique with more than 90% survival rate as committed by the PP vide letter no. CC:ESE:9518:2021:GEN Dated 23.11.2021.

iv. Other conditions of the EC letter dated 22.02.1999, 30.04.2002 and 08.09.2014 shall remain unchanged.

8. All other conditions stipulated in EC dated 22nd February, 1999 and EC amended dated 30th April, 2002, 8th September, 2014, 8th February, 2017 and 17th May, 2018 shall remain unchanged.

9. This issues with the approval of the Competent Authority.

Yours faithfully,

24.12.2021

(Yogendra Pal Singh)
Scientist 'E'
Email id: yogendra78@nic.in
Tele fax: 011-24695365

Copy to:

1) The Secretary, Ministry of Power, Shram Shakti Bhawan, Rali Marg, New Delhi - 110 001.
2) The Chairman, Central Electricity Authority, Sewa 1Bhawan, R.K. Puram, New Delhi – 110 066.
3) The Chairman, Central Pollution Control Board, Parivesh Bhawan, CBD cum-Office Complex, Last Arjun Nagar, Delhi – 110 032.
4) The Deputy Director General of Forests (C), Ministry of Environment, Forest and Climate Change, Regional Office (WCZ), Ground Floor, East Wing, New Secretarial Building, Civil Lines, Nagpur - 140 017.
5) The Principal Secretary, Environment and Forest Department, Government of Chhattisgarh, Chhattisgarh Bhawan, Room No. 308, D.K.S. Bhawan, Mantralaya, Raipur, Chhattisgarh.
6) The Chairman, Chhattisgarh Environment Conservation Board, Commercial Complex, Chhattisgarh Housing Board Colony, Kabir Nagar, Raipur, Chhattisgarh – 492 099.
7) The District Collector, Bilaspur District, Govt. of Chhattisgarh, Nehru Chowk, Bilaspur, Chhattisgarh – 495 001.
8) Guard file/Monitoring File.
9) Website of MoEF&CC.

24.12.2021

(Yogendra Pal Singh)
Scientist 'E'

Annexure -5

ANNEXURE-10 ANNEXURE-05

Government of India
Bhabha Atomic Research Centre
Health Physics Division

Ref: HPD/ESS/RAL/2018/ March 28, 2018

Sub: **Comprehensive Radiological Survey around Sipat Super Thermal Power Project, NTPC Ltd., Ujwal Nagar, Bilaspur, Chhattisgarh**

Please find herewith the radiological study report entitled **"Comprehensive Radiological Survey around Sipat Super Thermal Power Project, NTPC Ltd., Ujwal Nagar, Bilaspur, Chhattisgarh"** prepared by Health Physics Division, Health Safety & Environment Group, Bhabha Atomic Research Centre, Mumbai.

R.M. Tripathi 28/3/2018

(R.M. Tripathi)
Head, Health Physics Division

Shri Pankaj Sharma
DGM, EMG
Sipat STPP, NTPC Ltd.
Ujwal Nagar, Bilaspur
Chhattisgarh - 495555

cc: Dr. Sudhir Dahiya, Dy. General Manager (EMG), CC-EMG, EOC, Noida

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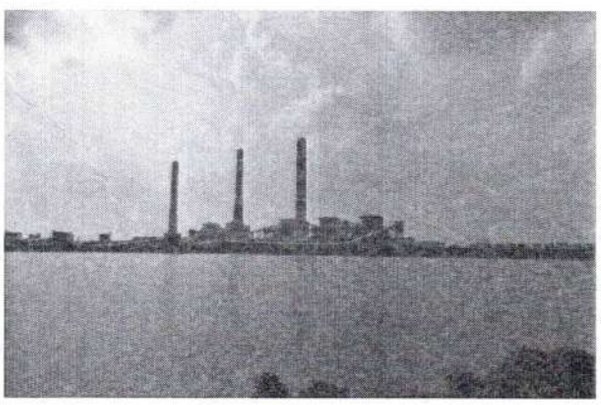
Report on Comprehensive Radiological Survey around Sipat Super Thermal Power Station, NTPC Ltd., Bilaspur, Chhattisgarh, India

Report submitted to

Sipat Super Thermal Power Station

NTPC Ltd

Bilaspur, Chhattisgarh



Studied by

Health Physics Division

Health, Safety & Environment Group

Bhabha Atomic Research Centre,

Trombay, Mumbai – 400085

Bhabha Atomic Research Centre

2018

II

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Report on Comprehensive Radiological Survey around Sipat Super Thermal Power Station, NTPC Ltd., Bilaspur, Chhattisgarh, India

Health Physics Division, Health, Safety & Environment Group,
Bhabha Atomic Research Centre, Trombay, Mumbai – 400 085

Executive Summary

NTPC Ltd. of India is operating a Super Thermal Power Plant in the village of Sipat, Masturi tehsil, Bilaspur district of Chhattisgarh to meet the power demand of the region. NTPC Sipat Super Thermal Power Plant (SSTPP) has 3 x 660 MW and 2 x500 MW coal based thermal power plants and the total installed capacity of plant is 2980 MW. NTPC authorities decided to have a comprehensive radiological baseline data in and around the Sipat plant site. Health, Safety and Environment Group (HS&EG), Bhabha Atomic Research Centre (BARC), Trombay, Mumbai was entrusted the work to carry out the required radiological study. The observed data will be the present reference radiological scenario for the plant site that will be compared with later stages of operation.

The radiological survey in and around the site was carried out during July 25 – 30, 2016 by a team of officers from Health Physics Division, HS&EG, BARC. During the time of survey, the plants are operational at their rated capacity.

The following NTPC officials provided all the logistic supports and help during the study

1. Shri Pankaj Sharma, DGM, EMG
2. Shri Nishant Parmar, Dy. Manager, EMG

The following BARC Team members for the radiological survey around the site

1. Dr. Rajesh Kumar, HPD, BARC, Turamdih
2. Shri Sunil K. Sahoo, HPD, BARC, Mumbai

The radiological survey is carried out as per the NTPC PO no. 8200 164069 dt. 22.02.2016 and the sampling locations are selected in consultation with the NTPC officials. The sampling locations are selected on the basis of higher occupancy of the workers in the plant areas and surrounding villages. Soil and groundwater samples around the Ash Dyke Area are collected as per the guidance of the NTPC officials.

The locations in and around the plant site was surveyed using gamma radiation survey meter, professional radon monitor and electronic radon detector as per the standard protocols. Soil, groundwater, surface water, drinking water and food samples were collected, processed and analyzed as per the BARC standard procedure and protocol. The ^{238}U, ^{232}Th, ^{226}Ra, ^{210}Pb and

^{40}K radioisotopes in soil and food samples was analyzed using high purity germanium (HPGe) detector. Alpha spectrometer was used for analysis of ^{238}U and ^{232}Th in water samples, emanometric technique for ^{226}Ra, Liquid Scintillation Analyser (LSA) for ^{210}Pb and double beam atomic absorption spectrophotometer (AAS) for potassium (^{40}K estimation indirectly) analysis. The strict quality assurance and quality control steps are adopted during the study.

The ambient gamma radiation levels in the plant premises were in the range of 50-140 nSv/hr, with an average value of 88.6 ± 26 nSv/hr at 95% confidence interval. The ambient gamma radiation levels in the surrounding villages up to 10 km radius of the plant site are observed in range of 60-160 nSv/hr, with an average value of 97±23 nSv/hr at 95% confidence interval.

The observed outdoor radon and thoron gas levels in the plant premises were in the range of 5 - 19 Bq/m^3 and <10 Bq/m^3, respectively. The indoor radon and thoron levels in the plant and surrounding villages were in the range of 45 - 80 Bq/m^3 (59 ±10) and 12 – 28 Bq/m^3 (19 ± 5).

The naturally occurring radionuclides like ^{238}U, ^{226}Ra and ^{232}Th levels in the soil samples were observed in the range of 45.5 – 105.6 Bq/kg (Mean: 70.3 ± 18.9); 43.5 – 74.6 Bq/kg (Mean: 55.4 ± 5.6) and 69.8 – 184.9 Bq/kg (Mean: 97.6 ± 8.7) respectively. ^{40}K activity in soil samples was found to be in the range of 291.8 – 652.6 Bq/kg (Mean: 443.55 ± 17.65 Bq/kg).

The activity concentration of ^{238}U, ^{226}Ra, ^{232}Th and ^{40}K levels in the coal samples were observed in the range of 46.4 – 53.7 Bq/kg (Mean: 49.2±4.8); 49.3 – 59.0 Bq/kg (Mean: 54.5±3.8); 60.4 – 70.1 Bq/kg (Mean: 61.5±5.3) and 130.3 – 186.5 Bq/kg (Mean: 149.5±8.6) respectively. The activity concentration of ^{238}U, ^{226}Ra, ^{232}Th and ^{40}K levels in the fly ash samples were observed in the range of 73.6 – 89.2 Bq/kg (Mean: 83.2±9.5); 72.8 – 85.9 Bq/kg (Mean: 80.0±4.0); 101.4 – 1318.8 Bq/kg (Mean: 114.9±6.3) and 339.0 – 400.3 Bq/kg (Mean: 374.9±10.4) respectively.

The activity concentration of ^{238}U, ^{226}Ra, ^{232}Th and ^{210}Pb in locally grown vegetation samples collected around the site were observed less than the minimum detection levels of the analytical technique. ^{40}K concentrations in vegetation samples were observed in the range of 11.19 to 210 Bq/kg of fresh weight basis.

The activity concentration of ^{238}U, ^{226}Ra, ^{232}Th and ^{210}Pb in flora and fauna samples collected around the site were observed less than the minimum detection levels of the analytical technique. ^{40}K concentration in vegetation samples were observed in the range of 50.69 to 113.98 Bq/kg of fresh weight basis.

The activity concentration of ^{232}Th and ^{210}Pb in 8 drinking water samples in villages collected around the plant were observed less than the minimum detection levels of the analytical technique. The activity concentration of U (Nat.) and ^{226}Ra were found in the range of 0.2 – 4.2 ppb and < 4.5 - 57 mBq/l. The ^{40}K activity concentration in 8 drinking water samples in villages collected around the plant were found to be in the range of 1.0 – 14.2 mBq/l.

The ^{40}K activity concentration in groundwater around ash dyke area, surface water and drinking water samples were found to be in the range of 2.3 – 38.6; 6.4 – 36.4 and 5.6 –7.9 mBq/l respectively. ^{226}Ra activity concentration in water samples were in the range of < 4.5 – 26 mBq/l which is well below the WHO action level (1000 mBq/l).

From the present study, it is revealed/concluded that the radiological levels around the NTPC Ltd., Sipat site is comparable with the national average values and the NORM levels in groundwater / surface water / drinking water samples is observed well below the AERB and World Health Organization (WHO) prescribed limit / guideline values.

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Report On
Comprehensive Radiological Survey around Sipat Super Thermal Power Station, NTPC Ltd., Bilaspur, Chhattisgarh, India

Health Physics Division, Health, Safety & Environment Group,
Bhabha Atomic Research Centre, Trombay, Mumbai – 400 085
Tel.: +91-22-2559 2665 / 2664, Fax: +91-22-2550 5313

1. Introduction

NTPC Ltd. Has set up Sipat Super Thermal Power Project in the village of Sipat in Bilaspur district of Chhattisgarh for meeting the regional power demand. Stage-I of Sipat Super Thermal Station comprises of 3 X 660 MW and stage-II is 2 X 500 MW, and have ultimate capacity of 2980 MW. Health, Safety & Environment Group, Bhabha Atomic Research Centre, Trombay, Mumbai has initiated the radiological study at the Sipat STPP, Bilaspur - on request from NTPC Ltd. The observed values will be used as baseline data for Bilaspur Site for future reference if any. The radiological survey at and around the site was carried out during July 25 - 30, 2016 by a team comprising of Dr. Rajesh Kumar, HPD, BARC, Turamdih and Shri Sunil K. Sahoo of Health Physics Division, HS&EG, BARC, Mumbai. During the time of survey, the plants are operational at their rated capacity. . The environmental radiological levels associated with coal fired thermal power plants and associated fly ash has been studied by environmentalists from time to time (U. C. Mishra, 2004). Furthermore fly ash brick is one of the major construction materials in modern days and radioactivity content and radon emanation if any from fly ash has also been studied extensively (Shukla et al., 1995). The data generated from this study will be used as a baseline data for future reference if any.

2. Objective of the Study

The major objectives and scope of the study are given below

a. Measurement of external ambient gamma radiation level in the plant premises
b. Measurement of atmospheric radon and thoron level in the plant premises
c. Measurement of external gamma radiation level in the villages surrounding the site upto 10 km radius
d. Measurement of Indoor radon and thoron level in houses in the surrounding villages
e. Measurement of naturally occurring radionuclides in soil and groundwater samples around the ash dyke area
f. Measurement of naturally occurring radionuclides in drinking water, surface water and locally grown food matrices

3. Literature Review on Natural Radiation and Radioactivity

Radiation is a form of energy, emitted from unstable nucleus due to spontaneous transformation. It is emitted either in the form of particles like alpha, beta, neutron or electromagnetic radiation like X-rays and gamma rays. Radioactivity is the phenomenon in which an unstable nucleus undergoes spontaneous transformation or decay process. The unit of radioactivity is Becquerel (Bq) which is equivalent to one disintegration per second.

Radioactivity is classified as natural and artificial depending upon its origin. Natural occurring radioactive materials (NORM) are primordial in origin consisting uranium, thorium along with their series radionuclides and single radioactive elements like potassium. Artificial radioactivity arises due to various anthropogenic activities. Release of low levels of natural and artificial radionuclides can occur to the environment during the normal operations of nuclear facilities like ore processing, enrichment, fuel fabrication, power reactors, particle accelerators and the production and application of radioisotopes in the fields of nuclear medicine, industry, research and agriculture (UNSCEAR, 2000). The amount of release depends upon the type of facility, engineering control measures, safety standards adopted and waste management system associated with it. Similarly many other industries which do not involve direct handling of radioactive material yet may have potential to enhance or alter the natural radioactive levels in the environment. Coal fired thermal power plant is one among such industries where coal is used to produce energy and in the process fly ash is generated. Due to the reduction in volume from coal to fly ash, buildup of natural radioactivity occurs in fly ash.

Exposure, due to natural radiation, is of particular importance because it accounts for the largest contribution to the total collective radiation dose to the world population (UNSCEAR, 2000).Exposures from natural sources are due to (a) external source of extra-terrestrial origin (cosmic rays), (b) source of terrestrial origin (radioactive nuclides present in the Earth's crust, in atmosphere and in building materials), (c) internal exposure from radionuclides taken into the body through ingestion of food materials etc., and (d) indoor & outdoor inhalation exposures due to radon (^{222}Rn), thoron (^{220}Rn) and their daughters. Some of these exposures are relatively constant and uniform for all individuals throughout the world; while others vary depending on the geography and geology of the location and due to elevated levels of naturally occurring radioactive substances like uranium (^{238}U) and thorium (^{232}Th) in specific localized areas. All exposures, except those from the direct cosmic radiation, are produced by the radioactivity of the natural radionuclides present in the environment. Extent of exposure to natural sources depends on occupation, type of dwelling and construction material used, location of habitation, ventilation rate, life style and food habit, etc.

3.1. Cosmic Radiation

A major contribution to external exposure comes from cosmic rays. Cosmic rays consist of protons (85%), alpha particles (14%) and about 1% from nuclei of atomic number between 4 and 26. These particles are highly penetrating and have high energy. Cosmic radiation varies from 0.03$\mu Sv.h^{-1}$ at sea level to 0.1 $\mu Sv.h^{-1}$ at Bangalore City at an altitude of about 1 km. This becomes 1 $\mu Sv.h^{-1}$ at an altitude of 6.7 km (at the Himalayan peaks) increasing to 5 $\mu Sv.h^{-1}$ at an altitude of 10 km (aircraft cruising altitude) and 10 $\mu Sv.h^{-1}$ at the supersonic jet flying

altitude of 15 km (IAEA, 1996). The annual effective dose from cosmic rays ranges between 260 $\mu Sv.y^{-1}$ at sea level to ~ 1070 $\mu Sv.y^{-1}$ at an altitude of 3.4 km (UNSCEAR, 2000). In general, the individual annual effective dose from cosmic rays around the world ranges between 0.26 to 2.00 $mSv.y^{-1}$ with a mean value of 0.380 $mSv.y^{-1}$. Average effective dose from cosmic radiation in India is estimated to be about 0.355$mSv.y^{-1}$ (Mishra et al., 1971).

3.2. Terrestrial Radiation

Naturally occurring primordial radionuclides are present in the earth, since its origin. These are mostly isotopes of heavy elements and their decay products. These are of two types, viz. "single" and "series". "Single" isotopes are those, which are naturally occurring and have stable decay products e.g. ^{40}K, ^{87}Rb, ^{147}Sm, ^{115}Ln, ^{138}La, ^{176}Lu, etc.. Most of them are beta or beta-gamma emitters. "Series" isotopes are members of a series of radioactive parent and daughters, which finally decay into a stable daughter product. There are three natural "series", viz. the Uranium-235, Uranium-238 and Thorium-232 series. After successive alpha and beta emissions, along with the associated gamma rays, they end up as a stable isotope of lead. The members of the series include the isotopes of the inert gas, Radon (Rn-219, Rn-222 and Rn-220). The Radon gas diffuses through the soil and emanates into the atmosphere. The decay products of Radon being solids, they condense on the atmospheric dust particles of sub-micron sizes and form radioactive aerosols. The radionuclides of the Uranium and Thorium decay series are present at varying concentration levels in all compartments of the environment. The variations in their concentrations in different soils are related to the type of rock from which the soils originate. Higher levels are associated with igneous rocks such as granite and lower levels with sedimentary rocks. Some shale and Phosphate rocks have relatively higher radionuclide concentrations (IAEA, 1978). In view of the different physical, chemical and radiological properties of the members of a decay chain, all of them may not be in equilibrium in the soil. These radionuclides in soil give rise to external radiation exposures. As building materials are derived from rocks and soils, they too contain radionuclides, sometimes at relatively higher concentrations.

The varying quantities of radioactivity in rocks and soils result in the variation of natural radiation levels. The natural radiation exposure levels in different parts of India from terrestrial and cosmic radiation vary from the lowest value of 0.3$mSv.y^{-1}$ in Lakshadweep to the highest level of1.4$mSv.y^{-1}$ in Kerala (Nambi et al., 1986). The average radiation exposure levels in different states of India are shown in Figure 1. The national and global averages are also given in the figure.

3.3. Inhalation Exposure Due to Radon, Thoron and their Progeny

Major contribution of natural radiation dose arises from the inhalation of ^{222}Rn, ^{220}Rn and their short lived progeny. ^{222}Rn and ^{220}Rn are ubiquitous, and are produced in the course of decay of ^{238}U and ^{232}Th series. Being inert gases, they escape through the pores of the soil and diffuse into the atmosphere depending up on the radioactive content in the soil, type of the soil, the prevailing atmospheric conditions, etc. They arealso emanated from building materials.

Typical worldwide outdoor levels of ^{222}Rn and ^{220}Rn are about 10 $Bq.m^{-3}$; while that of indoor radon and thoron are estimated to be 40 and 10 $Bq.m^{-3}$,respectively (UNSCEAR, 2000).

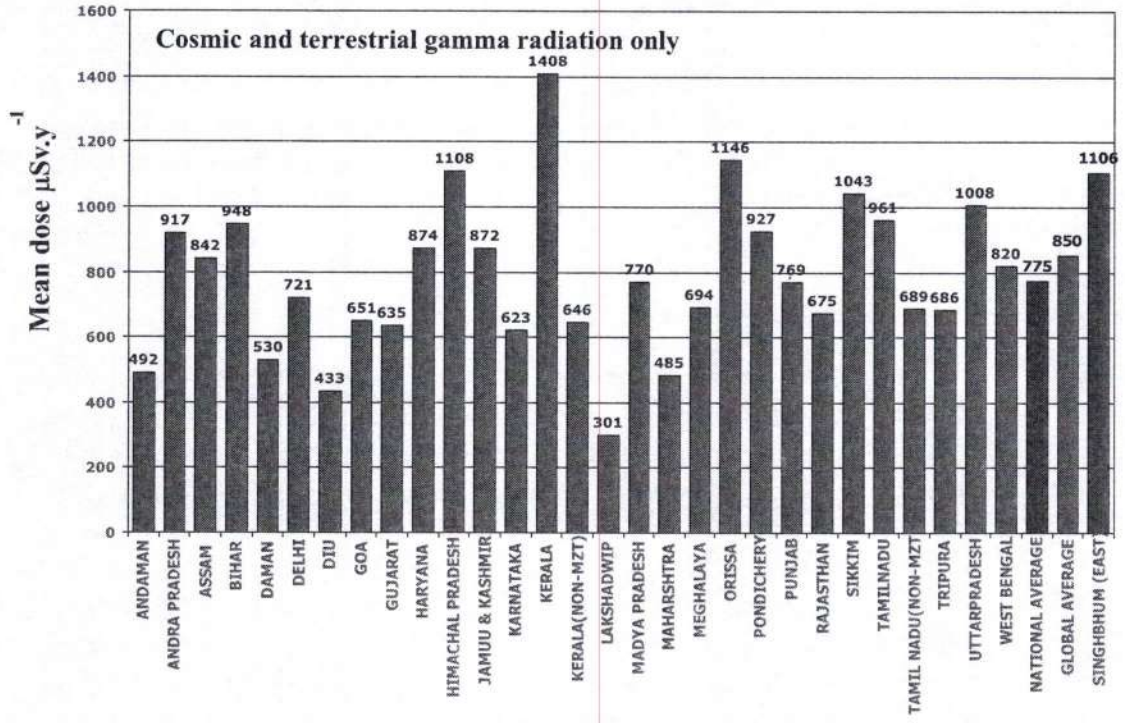

Fig.1: Average radiation exposure levels in different states of India

In India, a countrywide survey of indoor ^{222}Rn and ^{220}Rn, covering more than 2000 houses and more than 4000 quarterly measurements has yielded a national average value for the inhalation dose due to ^{222}Rn, ^{220}Rn and their progenies equal to 1.235 mSv/y (Ramachandran et al., 2003; Ramachandran et al., 2003a). This extensive survey included houses made out of different types of construction materials spreading over 130 locations at different parts of the country. Solid state nuclear track detector (SSNTD) based twin chamber ^{222}Rn-^{220}Rn dosimeters were employed for measurements in this survey conducted for a period of three years. This estimate is based on the assumption that a person spends about two third of the day indoors and the remaining period outdoors. Contribution due to ^{220}Rn and its progeny works out to be nearly 15% of the total inhalation dose. This dose rate is comparable with the global value of 1.275mSv/y (Puranik et al., 2005).

3.4. Internal Exposure due to Ingestion

Internal exposure is due to the ingestion of ^{238}U, ^{232}Th and the radionuclides produced by the decay of these as well as ^{40}K, through dietary intake. It is estimated that on a global average the ingestion dose due to intake of food containing ^{238}U and ^{232}Th series nuclide works out to be 0.140mSv.y^{-1} and that due to ^{40}K is 0.170mSv.y^{-1}. Total dose received through ingestion pathway of dietary intake of long-lived radionuclides of the^{238}U and ^{232}Th series as well as ^{40}K works out to be 0.310 mSv.y^{-1} globally (Puranik et al., 2005) and for India it estimated to be 0.315 mSv.y^{-1}.Total annual effective doses from natural sources to members of the Indian public works out to be 2.3 mSv.y^{-1} (Table-1); which can be compared with the global value of 2.4 mSv.y^{-1} (Table-2).

3.5. Radiation Exposure and Dose Limits

The radiation dose limits to workers and the members of the public from anthropogenic activities are recommended by the International Commission on Radiological Protection (ICRP), a non-governmental international organization comprising of eminent professionals. The International Atomic Energy Agency (IAEA) adopts these limits after a detailed review. The dose limits are published in the International Atomic Energy Agency Basic Safety Standards (BSS, 1996). The Atomic Energy Regulatory Board (AERB) of India, the national nuclear regulatory authority which regulates all operations involving exposure to ionizing radiation, has stipulated dose limits to occupational workers and the public, based on these recommendations. It should also be noted that in some respects the limits stipulated by the AERB are even more stringent as compared to the limits specified by the ICRP (ICRP, 2007). The annual dose limit for occupational workers is 20 mSv whereas for members of the public, the limit is 1 mSv over and above natural background radiation.

Table 1: Radiation Exposures to Indian population from Different Natural Sources and its Comparison with Reported Global value (UNSCEAR, 2008)

Radiation Sources	India		World	
	Annual Effective dose (mSv/y)	Percent contribution	Annual Effective dose (mSv/y)	Percent contribution
External:				
Cosmic radiation	0.355	15.44	0.380	16.14
Terrestrial	0.379	16.48	0.480	19.55
Internal:				
Cosmogenic nuclide	0.015	0.65	0.010	0.41
(inhalation)	1.235	53.72	1.275	51.94
^{222}Rn and ^{220}Rn (inhalation)	0.315	13.70	0.310	12.63
Terrestrial				
Total (ROUNDED OFF)	2.30	100.0	2.45	100.0

Table 2: Global mean radiation exposure to members of the public (UNSCEAR, 2008)

Sl. No.	Source of exposure		Annual effective dose (mSv)	
			Average	Typical range
1	Cosmic radiation	Cosmic and cosmogenic radionuclides	0.39	0.3 – 1.0[a]
2	External terrestrial radiation	Outdoors	0.07	
		Indoors	0.41	
		Total external terrestrial radiation	0.48	0.3 – 1.0[b]
3	Inhalation	Uranium and thorium series	0.006	
		Radon (^{222}Rn)	1.15	
		Thoron (^{220}Rn)	0.1	
		Total inhalation exposure	1.26	0.2 – 10[c]
4	Ingestion	^{40}K	0.17	
		Uranium and thorium series	0.12	
		Total ingestion exposure	0.29	0.2 – 1.0[d]
		Total	2.4	1.0 – 13

a Range from sea level to high ground elevation.
b Depending on radionuclide composition of soil and building material.
c Depending on indoor accumulation of radon gas.
d Depending on radionuclide composition of foods and drinking water.

4. Study Site Description

4.1. Site description

Sipat Super Thermal Power Project is located near Sipat village in Masturi Tehsil of Bilaspur District Chhattisgarh. The plant is situated about 15-Km Northeast of Bilaspur city (District Headquarter) and is accessible via Bilaspur-Baloda State Highway, which passes through Sipat.

Main Plant Area and Township of NTPC Sipat is bounded by North latitudes from 22°07'00" N to 22°08'53.40" N and by East longitudes from 82°16'43" E to 82°18'49.37" E ,where as Ash disposal area is in between 22°03'37.63" N to 22°05'16.59" N and 82°16'22.42" E to 82°17'39.18" E ,falling in the Survey of India toposheets Nos. 64 J/4 and 64 J/8. Nearest railway station is Bilaspur of South Eastern Railway, located at a distance of about 15-Km.Nearest Airport is Raipur airport which is 150 Km from NTPC Sipat.

4.2. Topography:

The topography of the study area extremely varied though, in general uneven to flat with an average elevation of 265-m above mean sea level. There are two hillocks, Sonthi Pahar (Reserved Forest) in the Northeast part and Dalha Pahar (Protected Forest) in the Southeastern part. The Dalha rises abruptly neat Akaltara and is visible from long distance. The general slope of the study area is from north-west to south-east. The major portion of the plain contains clay loam and sandy soil of lateritic origin.

4.3. Geographical Features

The Sipat STPP is located on the Chhattisgarh Basin geological formation, which is made up of sediments of calcareous, argillaceous and arenaceous facies represented by limestone, shales and sandstones of the Raipur series of the Cuddapah system. The site is mostly located on hard rock terrain, underlain of Charmuria limestone and Gunderdehi shales.

The area is drained by the Kharung, Lilagarh and Arpa rivers. The flow of these rivers is from north to south. Kharung and Lilagarh rivers are perennial but have little discharges in summer season/dry season. Kharung and Lilagarh rivers flow through quartzite, limestone, shale and dolomite rock formation and Arpa River flows through the limestone formation. These rivers form dendritic drainage pattern in the area.

The area under investigation is mostly hard rock terrain comprising like limestone, shale and sandstone of Raipur series of Cuddapah system. The northern part of the area is occupied by granites and gneisses of Archaean age. At places, capping of alluvial soil of recent age is also found.

4.4. Climate of the site

The climate of the study area is sub-tropical, semi arid, continental and monsoon type. Thus, it has hot summers, cool winters and small rainy season. The winter season starts towards the letter half of November and extends till about the middle of March followed by summer, which continues till about the middle of June when maximum temperature reaches up to 45°C and

dust cyclones are common. After it, southwest monsoon arrives. The rainy season starts around middle of the June and continues till September. The post monsoon months October and November constitute a transitional period from monsoon to winter season.

The climate is ideal for agriculture development, particularly for wheat, rice, sugarcane and cotton crops. Limited rainy season, good and healthy climate is suitable for industrial development also.

4.5. Ground Water in Study Area

The main source of ground water recharge in the study area is rain water which infiltrates into the ground through carious litho logical horizons present in the area. Secondary source of recharge is due to seepages of surface irrigation water applies to agriculture fields through the various distributaries of Kharung Left Bank Canal as well as seepage from the canal.

The movement of ground water depends upon the porosity and permeability of rock formation and local topography of the area whereas the direction of movement depends upon the hydraulic gradient. The maximum infiltration of rain water occurs in porous and permeable zone of geological formation where the topography is almost plain.

4.6. Hydrology

Introduction

Water resources in the study area can be broadly classified into two categories:

(i) **Surface Water Bodies:** Rivers, stream, canal, ponds, etc. which include Arpa, Kharung and Lilagarh rivers; Tumgarh tributary of Kharung and other small nallahs. In addition, there is also a Canal (Kharung Left Bank) and several ponds in the area.

(ii) **Ground Water Bodies:** It includes shallow aquifers as well as deep aquifers.

The only source of recharging for surface water and ground water resources is precipitation (rainfall). The study area receives maximum rainfall during monsoon months which extends from June to September.

Surface Water Hydrology

Drainage Pattern

The study area lies in the catchments area of Mahanadi River. The study area is drained by Arpa, Kharung and Lilagarh rivers, which flow in southern direction, with a gradient of about 1.00-m/Km.

The north south tending high ground of the area acts as a surface water divide between the drainage system of Kharung and Lilagarh rivers, Kharung flows west of the plant and joins Arpa. Lilagarh and Kharung rivers have relatively narrow and shallow channels. Arpa River has wide and shallow channel. The high drainage in the central high ground indicates the presence of low permeable sub-zones with sporadic vegetation in the area.

5. Sampling, Sample Processing and Analysis

The sampling locations were selected based on public habitation details and meteorological data of the site. The no. of samples collected and locations surveyed for ambient gamma radiation and atmospheric radon and thoron levels are as per the work order of NTPC, Sipat site.

5.1. Gamma radiation survey and environmental sample collection

Gamma radiation levels were measured using radiation survey meter (Make/model: Target Identifinder-N) at one meter height from the ground. At each location, 4 – 5 readings were recorded. After statistical analysis of observations range and mean of gamma radiation level is estimated.

Atmospheric outdoor radon and thoron levels were measured using Professional Radon monitor (Make/model: Genitron Alpha Guard) and Electronic Radon detector (Make/Model: Durridge RAD7). Both the instruments have been used for outdoor radon and thoron measurement as per the protocol specified in the manufacturer's manual. The Professional Radon monitor used in diffusion mode for 10 minute cycle and measurement done for a period of about 1 hour time at each location. The electronic radon detector was used for thoron monitoring in active thoron mode in 15 minute cycle.

Indoor integrated radon and thoron gas levels were measured using solid-state nuclear track detector (SSNTD) based single entry passive dosimeters. The dosimeters were deployed in the houses at each location minimum 1 meter distant from wall and one foot from roof for about 30 days. The dosimeters placed in house at location away from the door / window, in front of fan / AC, etc. Other precautions were also taken to keep it away from direct sunlight / dust exposure and not being disturbed by other factors regularly. The date and time of deployment and retrieval were registered for calculation of exposure duration. After 90 days of exposures, the radon-thoron dosimeters were retrieved by NTPC official and sent to Health Physics Division, BARC, Mumbai for further analysis of the SSNTD films.

Groundwater, surface water and drinking water samples were collected in pre-acid cleaned polythene carboys (5 liter capacity each). Before collection of the water samples, the cleaned carboys rinsed with the water to be collected and carboys were filled fully. Groundwater samples collected from bore well / hand pumps around the proposed ash dyke area and surrounding villages up to 10 km distance from the NTPC site.

The nearby surface water source is Leelagarh river from where the surface water is collected that is final recipient of storm water drain. During the sampling duration, both Lagoon 2 and 3 were in service for ash slurry discharge and decanted water of both the lagoons were collected in an overflow lagoon which is pumped back to plant through AWRS pumps.

Surface soil samples were collected from an undisturbed site (1 m x 1m) as per the procedure mentioned in IAEA TRS 259. One kg of surface soil samples collected from each location in clean polythene bags.

Number of gamma radiation survey, environmental sampling, radon - thoron monitoring in and around plant area and surrounding villages are summarized in Table-3. Location details where radon - thoron twin cup dosimeters are deployed are given in Table-4.

Table 3: No. of locations surveyed and samples collected in and around NTPC Sipat Site

Sl. No.	Description	Numbers
1a	Gamma radiation levels measured in plant premises	11
1b	Atmospheric radon and thoron levels measured in plant premises	10
2	Radon-thoron samples in houses	10
3	External gamma radiation levels in villages upto 10 km radius	16
4	Soil samples around the ash dyke area	6
5	Groundwater samples around the ash dyke area	6
6	AWRS water/ Toe drain water/ Surface water from water bodies nearby ash dyke area	3
7	Locally grown food samples (Grains/ vegetable)	6
8	Drinking water from nearby villages	7
9	Coal from yard/ coal as fired (mill)/ fly ash, bottom ash and fly ash bricks	6
10	Stack particulates	1
11	Flora from ash dyke and AWRS	4
12	Fauna from ash dyke and AWRS	2
13	Drinking water samples from plant area/ township/ Raw water	3

Table 4: Deployment of Indoor Radon – Thoron dosimeters around NTPC Sipat Site

Sl. No.	Code of dosimeter	Location / Village name	Location details
1	CG-SPT-0716-DS01	Control room stage-I	Plant Site
2	CG-SPT-0716-DS02	Administrative building	Plant Site
3	CG-SPT-0716-DS03	Fly ash brick plant	Plant Site
4	CG-SPT-0716-DS04	Sipat	Village around the plant
5	CG-SPT-0716-DS05	Karra	Village around the plant
6	CG-SPT-0716-DS06	Janji	Village around the plant
7	CG-SPT-0716-DS07	Darrabhata	Village around the plant
8	CG-SPT-0716-DS08	Ralia	Village around the plant
9	CG-SPT-0716-DS09	NTPC township, B-type quarter	NTPC Township
10	CG-SPT-0716-DS10	NTPC township, D-type quarter	NTPC Township

5.2. Sample processing

Soil, groundwater, surface water, drinking water and food matrices are processed at Radio-analytical Laboratory of Health Physics Division, BARC Hospital, Anushaktinagar, Mumbai as per the standard protocols.

5.2.1. Water sample processing

Water quality parameters such as pH, Electrical Conductivity (EC), Total dissolved solids (TDS), Salinity, Temp., Oxidation Reduction Potential (ORP) were measured in-situ, using portable sensors (Make/Model: Eutech PCS35 and ORP meter). The sensors were calibrated daily prior to use in the field. The samples were filtered and acidified with concentrated Nitric acid till pH <2 to avoid wall adsorption. The collected samples were processed as per standard protocol of BARC for analysis ^{238}U, ^{232}Th, ^{226}Ra, ^{210}Pb and ^{40}K.

5.2.2. Soil sample processing

Stones, pebbles and other unwanted items were removed from the soil samples, oven dried at a temperature of 110°C for 24 h for the removal of moisture. Further, samples were crushed into fine powder by using mortar and pestle, homogenized and sieved through 100 µm mesh size. A representative sample of 300 gram weight collected from the bulk by coning and quartering technique. Each sample was packed and sealed, completely airtight, in a cylindrical polyethylene container of 6.5 cm diameter and 7.5 cm height and stored for about one month to attain secular equilibrium between ^{226}Ra and ^{232}Th with their respective daughter products.

5.2.3. Food sample processing

The food samples were washed with ultrapure water to remove dust and adhered soil particles and then allowed to be air-dried. The fresh weight was registered and kept in muffle furnace at 300°C for a Period of one week for volume reduction. The fresh weight of about 5 kg is reduced to around 300 gram and sealed in standard geometry. These samples were kept for a period of six months to attain radioactive equilibriums. After six months, the samples were counted using p-type High Purity Germanium detector of 50% relative efficiency for gamma emitters.

5.3. Sample analysis

5.3.1. Analysis of NORM in soil and food samples using HPGe detector

Soil samples were analysed by using a high resolution gamma spectrometry system consisting of a coaxial p-type high purity germanium detector (HPGe) having 50% relative efficiency with respect to 7.6 × 7.6 cm NaI(Tl) detector for the 1332 keV gamma radiation of ^{60}Co and for a source-detectors distance of 25 cm, coupled with a 8K MCA and computer. The resolution of the detector was 1.85keV for the 1332 keV gamma radiation of ^{60}Co. The detector is housed in 10cm thick circular rings of lead shield to reduce the background contribution from the surrounding. Spectrums were acquired for 60,000 seconds for soil samples and for 100,000

seconds in case of food samples. Spectrum analysis was done by SpectraLine GP software (Baltic Scientific Instruments). IAEA Certified Reference Materials, RGU-1 and RGTh-1 were used for energy and efficiency calibration in the- identical geometry similar to the sample geometry. The gamma spectrometry system was calibrated in the energy range of 40 to 3000keV. ^{238}U, ^{232}Th, ^{226}Ra, ^{210}Pb and ^{40}K activity are measured from 1001 (^{234m}Pa), 2614 (^{204}Tl), 1764 (^{214}Bi), 46.53 (^{210}Pb) and 1460.8 keV(^{40}K) gamma energy, respectively. Necessary self-absorption corrections were carried out for density and matrix differences between the standards and samples. The quality control of the analysis was carried out by analysing the IAEA standard reference materials and the precision of the analyses was within 8 % of the certified values.

5.3.2. Analysis of ^{238}U and ^{232}Th in water samples using Alpha Spectrometer

Aliquots of water samples were radiochemically processed for uranium and thorium and electroplated. Known amount of radioactive tracers of uranium and thorium (^{232}U and ^{229}Th) were used for the estimation of elemental recovery for the respective analyses. Samples were analysed for ^{238}U (4.197 MeV) and ^{232}Th (4.013 MeV) alpha activity using a passivated ion-implanted planar silicon (PIPS) detector based eight chamber alpha spectrometer.

5.3.3. Analysis of ^{226}Ra in water samples using Emanometric technique

About 2 liter of sample was pre-concentrated by thermal heating over hot plate to about 50 ml and the concentrated sample was loaded in glass bubblers of emanometric technique. After loading, samples were purged to remove dissolved radon gas, if any and then the sample is allowed to remain in sealed condition of about 20 - 30 days. After delay period, the built up radon gas in the glass bubbler, due to decay of ^{226}Ra in the sample, was collected in pre-evacuated background counted scintillation cells. After equilibrium period of 180 min, the scintillation cells were counted for alpha activity using PMT and digital counter. From the alpha counts, background counts, efficiency, delay period, counting time, the ^{226}Ra activity is estimated.

5.3.4. Analysis of ^{210}Pb in water samples using Liquid Scintillation Analyser

An aliquot of water sample was processed radiochemically for separation of lead from other decay products of ^{238}U. The lead sulphate precipitate dissolved and mixed with 12 ml scintillation cocktail (Ultima Gold) and counted in triple to dual coincidence ratio (TDCR) based liquid scintillation analyser (Make / Model: Hidex 300 SL) for 500 minutes. The analyser was calibrated with ^{210}Pb standards (NPL, UK) and the quality of the analysis is ensured by replicate analysis and spike recovery analysis. The minimum detectable level activity in this method is 35 mBq/l. The precision of the analyses was within ±8 %.

5.3.5. Analysis of ^{40}K in water samples using Atomic Absorption Spectrophotometer

An aliquot of water sample was digested using concentration nitric acid and perchloric acid for analysis of total potassium using double beam atomic absorption spectrophotometer (Make/Model : GBC Avanta). The analytical wavelength of 769.9 nm was used for K estimation and ionization effect is suppressed with addition of excess cesium. From the total

potassium concentration, the ^{40}K activity concentration was estimated using the isotopic composition of ^{40}K in potassium and specific activity of ^{40}K. By theoretical calculation, 1 ppm of Potassium (K) in water is equal to 29.75 mBq/l of ^{40}K in the water sample is used for conversion.

5.3.6. Analysis of SSNTD films for indoor radon and thoron levels

After retrieval of the dosimeter, the SSNTD films were chemically etched in 6.0N NaOH solution for 90 minutes followed by counting for number of tracks using spark counter. Also few chemically etched films were counted in optical microscope to corroborate the counts observed in spark counter. Using the standardized calibration factor, the indoor, radon and thoron levels were estimated.

6. Quality assurance and quality control

The accuracy and reliability of the method is verified by cross method analysis, replicate analysis and spike recovery study. All laboratory glasswares used for sample processing were soaked in 10% nitric acid for 15 days and then rinsed thoroughly twice with ultra pure water (resistivity 18.1 MΩ, Thermo nano pure diamond TII water purification system) before use. Various precautions were taken in order to avoid cross contamination.

7. Results and discussion

The results obtained in the present radiological study are presented in this section. The data obtained under this study are comparable and in the same order, therefore, arithmetic means and standard deviations are preferred.

7.1. Results of radiological survey around the SSTPP site, NTPC Ltd., Sipat

The ambient gamma radiation levels inside the plant premises and the surrounding villages up to 10 km radius of the plant site are summarized in Table 5 and Table 6, respectively. The ambient gamma radiation dose rates in the plant premises and the surrounding villages up to 10 km radius of the plant site varied from 50 to 140 nSv/h with arithmetic mean value of 88 ± 28 nSv/h at 95% confidence interval and 60-160 nSv/hr, with an average value of 97 ± 18 nSv/hr at 95% confidence interval respectivily. Gamma radiation dose rate levels were measured along the MGR track of SIPAT site and the results were tabulated in Table 7 (range of 60 – 100 nSv/h with a mean of 79 ± 9). The observed range of gamma radiation levels were comparable with the range reported for the country 60-150 nSv/h and global range of 68-228 nSv/h. The average gamma radiation dose rate levels were found to be very close to national average value of 88 nSv/h (Nambi et al., 1987) and below to the global average value of 103 nSv/h (UNSCEAR, 2008). The levels observed in villages are comparable to other parts of the country.

The radon (^{222}Rn) and thoron (^{220}Rn) gas levels at different locations inside the plant varied from 5-19 Bq/m^3 and <10 Bq/m^3, respectively (Table 8). The average radon activity concentration observed in the plant premises (12.4 ± 6.5 Bq/m^3) is below the average value (AM: 23 Bq/m^3) reported for India (Ramachandran et al., 2003) and global average value of

40 Bq/m^3 (UNSCEAR, 2000). The IAEA BSS has recommended an action level of 200 Bq/m^3 for indoor ^{222}Rn concentration in dwellings. The thoron (^{220}Rn) activity concentration in 10 locations was found to be less than method detection level and also lower than global average value of 10 Bq/m^3(UNSCEAR, 2000).

The integrated indoor radon and thoron levels were measured at 10 locations using SSNTD based single entry pinhole, twin cup dosimeter; the data is presented in Table 9. The indoor radon levels was found to vary from 45 – 61 Bq/m^3 at three locations in plant premises, about 70 – 80 Bq/m^3 in NTPC township quarters and 54 – 60 Bq/m^3 in the dwellings in five selected villages around the site. The indoor radon concentrations were much less than the action level of 200 Bq/m^3 prescribed by Basic Safety Standards of IAEA (IAEA BSS 115, 1996). The thoron concentration varied from 12 - 28 Bq/m^3 with an average value of 19 ± 5 (at 95% confidence interval).

Table 10 presents the activity concentration of naturally occurring radionuclides in soil samples collected from the study area. The ^{238}U, ^{226}Ra and ^{232}Th activity concentration varied from 45.5 – 105.6 Bq/kg (Mean: 70.3 ± 18.9); 43.5-74.6 Bq/kg (Mean: 55.4 ± 5.6) and 69.8 – 184.9 Bq/kg (Mean: 97.6 ± 8.7) respectively. ^{40}K activity in soil samples was found to be in the range of 291.8 – 652.6 Bq/kg with an arithmetic mean of 443.5 ± 17.6 Bq/kg. The average activity concentration of 70.3 ± 18.9 Bq/kg of ^{238}U in soil samples observed around the NTPC Sipat site is higher than the national average value of 29 Bq/kg (UNSCEAR, 2008) and the global average value of 33 Bq/kg (UNSCEAR, 2008). The average ^{226}Ra activity concentration of 55.4 ± 5.6 Bq/kg found in the soil samples collected around the study site was found to be higher than the National (29 Bq/kg) and global average value (30 Bq/kg) (UNSCEAR, 2008).

The activity concentration of ^{238}U, ^{226}Ra, ^{232}Th and ^{40}K levels in the coal samples were observed in the range of 46.4 – 53.7 Bq/kg (Mean: 49.2±4.8); 49.3 – 59.0 Bq/kg (Mean: 54.5±3.8); 60.4 – 70.1 Bq/kg (Mean: 61.5±5.3) and 130.3 – 186.5 Bq/kg (Mean: 149.5±8.6) respectively. The activity concentration of ^{238}U, ^{226}Ra, ^{232}Th and ^{40}K levels in the fly ash samples were observed in the range of 73.6 – 89.2 Bq/kg (Mean: 83.2±9.5); 72.8 – 85.9 Bq/kg (Mean: 80.0±4.0); 101.4 – 1318.8 Bq/kg (Mean: 114.9±6.3) and 339.0 – 400.3 Bq/kg (Mean: 374.9±10.4) respectively (Table 11).

Six locally grown food samples were analysed for naturally occurring radionuclides. The naturally occurring radionuclides such as ^{238}U, ^{232}Th, ^{226}Ra and ^{210}Pb were found to be less than method detection level of high resolution gamma spectrometer system as shown in Table 12. The global reference concentration of ^{238}U, ^{232}Th, ^{226}Ra and ^{210}Pb in grain products is 0.02, 0.003, 0.08 and 0.05 Bq/kg, respectively. Only ^{40}K was detected in the cereal, pulses and vegetable samples and the activity concentration of ^{40}K was observed in the range of 11 to 210 Bq/kg of fresh weight. Generally, ^{40}K concentration in the samples is correlated with total potassium in the food matrix as radio-potassium (^{40}K) has a natural abundance of 0.012% of total potassium. Pulses have a higher percentage of minerals and potassium that reflects in ^{40}K activity concentration. The activity concentration of ^{40}K was found to be higher in pulses than cereals and vegetable samples collected around the site.

The activity concentration of ^{238}U, ^{226}Ra, ^{232}Th and ^{210}Pb in flora and fauna samples (Table 13 & 14) collected around the site were observed less than the minimum detection levels of the analytical technique. ^{40}K concentrations in vegetation samples were observed in the range of 50.7 to 113.9 Bq/kg of fresh weight basis.

Twenty five water samples comprising of 6 groundwater samples (Table 15) around ash dyke area; 3 water samples (Table 16) from Toe drain/AWRS/surface water from Leelaghar River; 3 drinking water samples (Table 17) collected from Plant and Guest house; 8 drinking water samples (Table 18) from villages around the plant; 5 drinking water samples (Table 19) beyond five km distance from the NTPC site/Ash Dyke area as control samples to assess the natural radioactivity levels. The activity concentrations of ^{238}U, ^{226}Ra, ^{232}Th, ^{210}Pb and ^{40}K in groundwater, surface water and drinking water are given in Table 15, 16 and 17, respectively. The activity concentrations of ^{232}Th and ^{210}Pb in the water samples collected around the site were found to be less than the method detection level of the analysis technique. The activity concentration (in mBq/l) of ^{238}U, ^{226}Ra, ^{232}Th and ^{210}Pb in all the water samples is found to be less than World Health Organization (WHO) guideline level of 10 Bq/l (radiological toxicity), 1 Bq/l, 1 Bq/l and 0.1 Bq/l, respectively. ^{238}U activity concentrations in drinking water samples were in the range of 2.5 – 70 mBq/l which is well below the WHO guideline level of 10000 mBq/l. The ^{226}Ra activity concentration were found to be in the range of <4.5 – 57 mBq/l which is well within the WHO guideline value of 1000 mBq/l/. The ^{40}K activity concentration in groundwater around ash dyke area, surface water and drinking waters were found to be in the range of 2.3 – 38.6; 6.4 – 36.4 and 5.6 –7.9 mBq/l respectively.

Table 5: Ambient gamma radiation levels in NTPC Sipat Plant areas

Sl. No.	Plant location	GPS	Gamma radiation level (nSv/h)
1	Administrative building	N 22° 08.135' E 82° 17.974'	80-120 (100)
2	Auxiliary Pump House area	N 22° 07.758' E 82° 17.538'	80-130 (105)
3	ESP area, Unit-I	N 22° 07.831' E 82° 17.607'	50-80 (65)
4	CHP control room	N 22° 07.194' E 82° 17.329'	100-120 (110)
5	Coal yard (Between TP-15 & 17)	N 22° 07.311' E 82° 17.370'	50-90 (70)
6	Control room stage-I	N 22° 07.982' E 82° 17.667'	100-140 (120)
7	Control room stage-II	N 22° 07.972' E 82° 17.442'	80-100 (90)
8	Switchyard control room	N 22° 08.174' E 82° 17.289'	60-80 (70)
9	Janji gate	N 22° 07.283' E 82° 16.740'	60-90 (75)
10	Fly ash brick plant	N 22° 08.010' E 82° 17.018'	60-110 (85)
11	Main gate security	N 22° 08.062' E 82° 18.072'	60-110 (85)
Average gamma radiation levels			89 ± 18
National average levels reported (Except NHBRA)			**60-150**
Global average levels reported (Except NHBRA)			**68 - 228**
Prescribed Regulatory limit			**No National and International limits**

Table 6: Ambient gamma radiation levels in villages around NTPC Sipat Plant site

Sl. No.	Village name	GPS	Elevation (m)	Gamma radiation level (nSv/h)
1	Sipat	N 22° 09.193' E 82° 17.103'	252	140-160
2	Janji	N 22° 07.861' E 82° 16.708'	289	70-90
3	Darrabhata	N 22° 07.539' E 82° 19.424'	251	90-100
4	Ralia	N 22° 03.980' E 82° 17.668'	271	100-110
5	Kanda	N 22° 09.156' E 82° 20.619'	268	60-120
6	Dahina	N 22° 09.045' E 82° 21.220'	269	70-90
7	Nargora	N 22° 10.579' E 82° 18.113'	283	100-120
8	Karra	N 22° 08.575' E 82° 19.044'	274	80-90
9	Baruhdih	N 22° 11.720' E 82° 19.643'	288	60-100
10	Bhilai	N 22° 03.139' E 82° 17.010	268	70-100
11	Gautara	N 22° 04.314' E 82° 15.217'	275	90-130
12	Mopka	N 22° 05.273' E 82° 12.262'	278	90-120
13	Khaira	N 22° 05.141' E 82° 14.072'	262	80-120
14	Lagara	N 22° 06.305' E 82° 13.999'	280	80-100
15	Nagoi	N 22° 08.624' E 82° 11.620'	275	70-90
16	Pipra	N 22° 1..754' E 82° 13.223'	279	90-120
17	Sankar	N 22° 06.165' E 82° 21.347'	276	90-120
Average gamma radiation levels				97 ± 18
Prescribed Regulatory limit				**No National and International limits**

Table 7: Radiation Survey of MGR Track at Sipat (Merry Go Round)

Sl. No.	Plant location	Gamma radiation level (nSv/h) Range (mean)
1	MGR Workshop	85 – 95 (90)
2	NTPC Exit Gate	75 – 85 (80)
3	Towards Dipka mine – 1 km away	95 – 100 (97.5)
4	Towards Dipka mine – 2 km away	90 – 100 (95)
5	Towards Dipka mine – 3 km away	65 – 75 (70)
6	Towards Dipka mine – 4 km away	65 – 75 (70)
7	Towards Dipka mine – 5 km away	65 – 75 (70)
8	Towards Dipka mine – 6 km away	60 – 70 (65)
9	Towards Dipka mine – 7 km away	70 – 80 (75)
10	Towards Dipka mine – 8 km away	75 – 85 (80)
11	Towards Dipka mine – 9 km away	70 – 80 (75)
12	Towards Dipka mine – 10 km away	75 – 85 (80)
13	Wagon Loading area, Near Dipka mine	70 – 90 (80)
14	Around Coal Loaded Wagon	70 – 90 (80)
15	Wagon Tippler area	70 – 90 (80)
Average gamma radiation levels		79.2 ± 9.2
National average levels reported (Except NHBRA)		**60-150**
Global average levels reported (Except NHBRA)		**68 - 228**
Prescribed Regulatory limit		**No National and International limits**

Table 8: Ambient Radon-Thoron levels in NTPC Sipat Plant premises

Sl. No.	Plant location	GPS	Radon level (Bq/m^3)	Thoron level (Bq/m^3)	RH (%)	Temp (°C)	P (mbar)
1	Administrative building	N 22° 08.135' E 82° 17.974'	19 ± 8	< 10	65	25	972
2	Auxiliary Pump House area	N 22° 07.758' E 82° 17.538'	10 ± 6	< 10	59	26	971
3	ESP area, Unit-I	N 22° 07.831' E 82° 17.607'	5 ± 4	< 10	86	30	971
4	CHP control room	N 22° 07.194' E 82° 17.329'	18 ± 8	< 10	79	28	971
5	Coal yard (Between TP-15 & 17)	N 22° 07.311' E 82° 17.370'	8 ± 5	< 10	84	30	972
6	Control room stage-I	N 22° 07.982' E 82° 17.667'	10 ± 6	< 10	72	26	973
7	Control room stage-II	N 22° 07.972' E 82° 17.442'	10 ± 6	< 10	62	24	973
8	Switchyard control room	N 22° 08.174' E 82° 17.289'	17 ± 8	< 10	73	39	974
9	Janji gate	N 22° 07.283' E 82° 16.740'	10 ± 6	< 10	66	35	974
10	Fly ash brick plant	N 22° 08.010' E 82° 17.018'	17 ± 8	< 10	77	30	972
Average			12.4 ± 6.5				
Indoor action level (BSS 115)			**200**	-	-	-	-
National average value (GM)			**23**	**12.2**	-	-	-
Global average value (AM)			**40**	**10**	-	-	-

Table 9: Indoor Radon-Thoron levels in plant and villages around SSTPP Plant site

Sl. No.	Code of dosimeter	Location / Village name	Radon level (Bq/m^3)	Thoron level (Bq/m^3)
Plant area				
1	CG-SPT-SO1	Control room stage-I	52 ± 5	15 ± 3
2	CG-SPT-SO2	Administrative building	45 ± 4	26 ± 5
3	CG-SPT-SO3	Fly ash brick plant	61 ± 5	28 ± 4
NTPC Township				
4	CG-SPT-SO9	B-type quarter	80 ± 6	23 ± 4
5	CG-SPT-SO10	D-type quarter	70 ± 5	15 ± 4
Villages around the plant				
6	CG-SPT-SO4	Sipat	56 ± 9	12 ± 3
7	CG-SPT-SO5	Karra	58 ± 5	20 ± 4
8	CG-SPT-SO6	Janji	57 ± 5	17 ± 5
9	CG-SPT-SO7	Darrabhata	54 ± 7	16 ± 3
10	CG-SPT-SO8	Ralia	60 ± 5	17 ± 4
		Range	**45 - 80**	**12 - 28**
		Average	**59 ± 10**	**19 ± 5**
		National average (GM)	**23**	**12.2**
		Global average	**40**	**10**

Table 10: Natural radioactivity levels in soil samples around ash dyke area

Sl. No.	Sample code	Villages	Activity levels (Bq/kg)			
			^{238}U	^{226}Ra	^{232}Th	^{40}K
1	CG-SPT-0716-S01	Rankh	71.4 ± 7.4	54.9 ± 1.7	84.6 ± 2.6	460.9 ± 5.8
2	CG-SPT-0716-S02	Koriya	52.5 ± 2.8	48.5 ± 1.8	91.9 ± 2.9	652.6 ± 7.3
3	CG-SPT-0716-S03	Sukripalli	45.5 ± 2.5	49.7 ± 1.8	78.5 ± 2.6	397.1 ± 5.8
4	CG-SPT-0716-S04	Hardadih	105.6 ± 8.7	55.9 ± 1.7	92.0 ± 2.6	341.1 ± 5.1
5	CG-SPT-0716-S05	Ralia	70.0 ± 7.6	65.3 ± 1.9	93.5 ± 2.7	407.8 ± 5.5
6	CG-SPT-0716-S06	Bharwadih	72.0 ± 6.6	43.5 ± 1.6	69.8 ± 2.4	348.1 ± 5.2
7	CG-SPT-0716-S07	Gataura	63.0 ± 3.1	53.4 ± 1.8	106.5 ± 3.0	563.4 ± 6.7
8	CG-SPT-0716-S08	Mopka	66.2 ± 6.1	45.5 ± 1.5	79.2 ± 2.4	438.1 ± 5.5
9	CG-SPT-0716-S09	Daganya	93.3 ± 7.5	74.6 ± 1.9	184.9 ± 3.4	534.6 ± 5.7
10	CG-SPT-0716-S10	Sankar	63.4 ± 2.8	62.6 ± 1.9	95.0 ± 2.7	291.8 ± 4.8
		Range	45.5 – 105.6	43.5 – 74.6	69.8–184.9	291.8 – 652.6
		Average	70.3 ± 18.9	55.4 ± 5.6	97.6 ± 8.7	443.55±17.65
		Global average value (UNSCEAR, 2008)	**7 – 81 (29)**	**7 – 81 (29)**	**14 – 160 (64)**	**38 – 760 (400)**

Table 11: Natural radioactivity levels in coal and fly ash samples

Sl. No.	Sample code	Sample Location	Activity levels (Bq/kg)			
			^{238}U	^{226}Ra	^{232}Th	^{40}K
1	CG-SPT-0716-C01 (Coal)	Stockyard stage-I	53.7 ± 2.7	55.3 ± 2.2	60.4 ± 3.1	130.3 ± 5.0
2	CG-SPT-0716-C02 (Coal)	Stockpile stage-II	46.4 ± 2.5	49.3 ± 2.1	54.0 ± 2.9	131.6 ± 4.8
3	CG-SPT-0716- C 03 (Coal)	Feeder coal Unit-I	47.5 ± 3.1	59.0 ± 2.2	70.1 ± 3.2	186.5 ± 5.1
4	CG-SPT-0716- C 04 (Fly ash)	Bottom ash Unit-I	86.9 ± 3.9	85.9 ± 2.5	131.8 ± 4.1	400.3 ± 6.6
5	CG-SPT-0716- C 05 (Fly ash)	Fly ash stage-II	73.6 ± 3.3	72.8 ± 2.2	111.6 ± 3.5	339.0 ± 5.6
6	CG-SPT-0716- C 06 (Fly ash)	Fly ash brick	89.2 ± 8.0	81.4 ± 2.2	101.4 ± 3.3	385.3 ± 5.7
	Global average value (UNSCEAR, 2008)		**7 – 81 (29)**	**7 – 81 (29)**	**14 – 160 (64)**	**38 – 760 (400)**

Table 12: Natural radioactivity levels in locally grown food samples

Sl. No.	Sample ID	Sample details	Activity Concentration (Bq/kg of fresh wt)				
			^{238}U	^{226}Ra	^{232}Th	^{40}K	^{210}Pb
1	CG-SPT-0716-F01	Rice	<0.07	<0.03	<0.03	12.64 ± 0.41	<0.5
2	CG-SPT-0716-F02	Rice	<0.07	<0.03	<0.03	11.19 ± 0.34	<0.5
3	CG-SPT-0716-F03	Poi Sag	<0.07	<0.03	<0.03	93.73 ± 0.64	<0.5
4	CG-SPT-0716-F04	Brinjal	<0.07	<0.03	<0.03	80.07 ± 0.48	<0.5
5	CG-SPT-0716-F05	Ladies Finger	<0.07	<0.03	<0.03	95.33 ± 0.63	<0.5
6	CG-SPT-0716-F06	Pulses	<0.07	<0.03	<0.03	210.00 ± 1.58	<0.5

*MDAs for food samples are calculated for a sample size of 5 kg and for a time of 1 lac seconds and for 250 ml standard geometry.

Table 13: Natural radioactivity levels in flora samples around the site

Sl. No.	Sample ID	Sample details	Activity Concentration (Bq/kg of fresh wt)				
			^{238}U	^{226}Ra	^{232}Th	^{40}K	^{210}Pb
1	CG-SPT-0716-FL01	Elephant grass from drain of Dyke	<0.07	<0.03	<0.03	103.38 ± 0.70	<0.5
2	CG-SPT-0716-FL02	Amori from drain of Dyke-2	<0.07	<0.03	<0.03	50.69 ± 0.49	<0.5
3	CG-SPT-0716-FL03	Elephant grass inside dyke	<0.07	<0.03	<0.03	113.98 ± 0.78	<0.5
4	CG-SPT-0716-FL04	Amori from inside dyke	<0.07	<0.03	<0.03	111.57 ± 0.73	<0.5

*MDAs for flora samples are calculated for a sample size of 5 kg and for a time of 1 lac seconds and for 250 ml standard geometry.

Table 14: Natural radioactivity levels in fauna samples around the site

Sl. No.	Sample ID	Sample details	Activity Concentration (Bq/kg of fresh wt)				
			^{238}U	^{226}Ra	^{232}Th	^{40}K	^{210}Pb
1	CG-SPT-0716-FN01	Chicken sample from weekly market	<0.07	<0.03	<0.03	107.09 ± 0.84	<0.5
2	CG-SPT-0716-FN02	Fish sample from weekly market	<0.07	<0.03	<0.03	75.47 ± 0.67	<0.5

*MDAs for fauna samples are calculated for a sample size of 5 kg and for a time of 1 lac seconds and for 250 ml standard geometry.

Table 15: Natural radioactivity levels in 6 groundwater samples around ash dyke area

Sl. No.	Samples code	Village name	Activity levels (mBq/L)				
			^{238}U	^{226}Ra	^{232}Th	^{210}Pb	^{40}K
1	CG-SPT-07-W03	Rank	6.3	<4.5	< 6	< 20	2.3
2	CG-SPT-07-W04	Kaudia	8.8	26	< 6	< 20	38.6
3	CG-SPT-07-W05	Hardadih	11.3	<4.5	< 6	< 20	5.8
4	CG-SPT-07-W06	Sukhirpali	6.3	<4.5	< 6	< 20	17.8
5	CG-SPT-07-W07	Relia	3.8	<4.5	< 6	< 20	22.6
6	CG-SPT-07-W19	Gautara	20.0	7	< 6	< 20	35
World Health Organization Guideline Level (2011) *** Radiological toxicity #Chemical toxicity**			**10,000* 375#**	**1000**	**1000**	**100**	**No guideline value**

Table 16: Natural radioactivity levels in three water samples from drain / AWRS / surface water (Leelaghar River)

Sl. No.	Sample code	Village/ Location name	Activity levels (mBq/l)				
			^{238}U	^{226}Ra	^{232}Th	^{210}Pb	^{40}K
1	CG-SPT-07-W01	TOE Drain Overflow Lagoon-2	10.0	<4.5	< 6	< 20	6.4
2	CG-SPT-07-W02	DYKE-02 Overflows	60.0	5	< 6	< 20	36.4
3	CG-SPT-07-W08	Leelagar River	21.3	19	< 6	< 20	9.5
World Health Organization Guideline Level (2011) *** Radiological toxicity #Chemical toxicity**			**10,000* 375#**	**1000**	**1000**	**100**	**No guideline value**

Table 17: Natural radioactivity levels in three drinking water samples collected from Plant area and Guest house

Sl. No.	Sample code	Village/Location name	Activity levels (mBq/l)				
			^{238}U	^{226}Ra	^{232}Th	^{210}Pb	^{40}K
1	CG-SPT-07-W10	NTPC Guest House Tap Water	5.0	<4.5	< 6	< 20	7.1
2	CG-SPT-07-W11	Drinking Water from Plant Area	7.5	<4.5	< 6	< 20	5.6
3	CG-SPT-07-W12	RAW Water from Plant Area	2.5	<4.5	< 6	< 20	7.9
World Health Organization Guideline Level (2011)			**10,000***	**1000**	**1000**	**100**	**No guideline value**
*** Radiological toxicity #Chemical toxicity**			**375#**				

Table 18: Natural radioactivity levels in 8 drinking waters from villages around the plant

Sl. No.	Sample code	Village name	Activity levels (mBq/l)				
			^{238}U	^{226}Ra	^{232}Th	^{210}Pb	^{40}K
1	CG-SPT-07-W09	Darrabhata	5.0	<4.5	< 6	< 20	1.0
2	CG-SPT-07-W14	Nargora	12.5	21	< 6	< 20	14.2
3	CG-SPT-07-W15	Gudi	10.0	34	< 6	< 20	13.7
4	CG-SPT-07-W16	Dahina	2.5	57	< 6	< 20	10.5
5	CG-SPT-07-W17	Kanda	7.5	<4.5	< 6	< 20	6.5
6	CG-SPT-07-W18	Karra	22.5	35	< 6	< 20	34
7	CG-SPT-07-W20	Mopka	25.0	12	< 6	< 20	11.6
8	CG-SPT-07-W21	Lagara	52.5	25	< 6	< 20	9
World Health Organization Guideline Level (2011)			**10,000***	**1000**	**1000**	**100**	**No guideline value**
*** Radiological toxicity #Chemical toxicity**			**375#**				

Table 19: Natural radioactivity levels in 5 drinking water samples beyond five km from NTPC site / ash dyke area as control samples

Sl. No.	Samples collected	Location Name	Activity levels (mBq/l)				
			^{238}U	^{226}Ra	^{232}Th	^{210}Pb	^{40}K
1	CG-SPT-07-W13	Baruhdih	7.5	7	< 6	< 20	7.1
2	CG-SPT-07-W22	Nagoi	70.0	18	< 6	< 20	34
3	CG-SPT-07-W23	Daganya	28.8	32	< 6	< 20	11.4
4	CG-SPT-07-W24	Tikripara	12.5	11	< 6	< 20	5.0
5	CG-SPT-07-W25	Aamlipali	23.8	8	< 6	< 20	6.1
World Health Organization Guideline Level (2011) *** Radiological toxicity #Chemical toxicity**			**10,000* 375#**	**1000**	**1000**	**100**	**No guideline value**

7.2.1. Radium equivalent activity and radiological hazard indices

Assessment of various radiation health hazard indices were carried out to arrive at a safe conclusion on the health status of exposed human population or environment. To represent the activity levels of ^{226}Ra, ^{232}Th and ^{40}K by a single quantity, which takes into account the radiation hazards associated with each component, a common radiological index has been introduced [40] which is termed as radium equivalent (Ra_{eq}) activity. Ra_{eq} activity is mathematically defined as [2, 41] follows:

$$Ra_{eq} \text{ activity } (Bqkg^{-1}) = (1.43 \times A_{Th}) + A_{Ra} + (A_K \times 0.077) \quad (1)$$

Where, A_{Ra}, A_{Th} and A_K are the activity concentrations of ^{226}Ra, ^{232}Th and ^{40}K in soil, respectively. Ra_{eq} activity has been used for assessment of radiological hazards of natural radioactivity in the environment. In the above relation, it has been assumed that 10 Bq/kg of ^{226}Ra, 7 Bq/kg of ^{232}Th and 130 Bq/kg of ^{40}K, produce equal amount of gamma radiation dose. Ra_{eq} activity in soils was calculated by using Eq. (1) and it varied from 170.1 to 249.1 Bq/kg with a mean value of 212.3 ± 12.6 Bq/kg, which is well below than 370 Bq/kg, the recommended maximum level of Ra_{eq} activity in soils. Thus, from the results it can be stated that the soils are suitable for use as building materials and for other purposes without any significant radiological hazards to the population residing in the study region.

7.2.2. Indoor inhalation dose due to radon, thoron and their daughter products

In the present study, radon and thoron activity concentration is measured during one quarter during July – Sep, 2016. The indoor radon and thoron concentration has diurnal and seasonal variation. The annual effective dose due to radon and thoron and their daughter products is

estimated in the present study from the measured activity concentration, with the assumption that the activity concentration is similar over the year. For the estimation of dose due to radon and its progenies equilibrium factor and occupancy factor are needed. UNSCEAR, 2000 has suggested an occupancy factor of 7000 h/y for indoors and 1760 h/y for outdoor. The indoor radiation dose to members of the public due to radon, thoron and their progenies is found to be in the range of 0.80 – 1.42 mSv/y, average dose is 1.05 ± 0.18 mSv/y, which is slightly lower than the global and Indian average value.

$$D(mSvy^{-1}) = \frac{C_{Rn} \times F_{Rn} \times O.F \times DCF}{3700 \times 170}$$

Where,

C_{Rn} is the radon/thoron concentration in Bqm^{-3}

F_{Rn} is the equilibrium factor (0.4 for ^{222}Rn and 0.002 for ^{220}Rn)

O.F is the occupancy factor

DCF is the dose conversion factor

4 mSv/WLM for public for radon daughters

1.67 mSv/WLM for workers and public for thoron daughters

8. Conclusions

The ambient gamma radiation levels in the plant premises is observed to be in the range of 50-140 nSv/hr, with an average value of 88.6 ± 26 nSv/h at 95% confidence interval. The atmospheric radon and thoron gas levels in found to be in the range of 5 – 19 Bq/m^3 and < 10 Bq/m^3, respectively. The ambient gamma radiation levels in the surrounding seventeen villages upto 10 km radius of the plant site is found to vary from 60 to 160 nSv/h with an average value of 97 ± 23 nSv/h (at 95% confidence interval).

The indoor radon and thoron levels in the surrounding villages are observed to be in the range of 45- 80 Bq/m^3 and 12 - 28 Bq/m^3, respectively.

The naturally occurring radioactive material (NORM) like ^{238}U, ^{226}Ra, ^{232}Th and ^{40}K levels in the soil samples is observed in the range of 45.5 – 105.6 Bq/kg (Mean : 70.3 ± 18.9); 43.5-74.6 Bq/kg (Mean : 55.4 ± 5.6) and 69.8 – 184.9 Bq/kg (Mean : 97.6 ± 8.7) and 291.8 – 652.6 Bq/kg (A. Mean: 443.55 ± 17.65 Bq/kg), respectively.

From the present study, it is concluded that the radiation levels in and around the Sipat Super Thermal Power Station of NTPC Ltd., is comparable with the National average values. The naturally occurring radionuclide levels in groundwater / surface water / drinking water samples is observed well below the Atomic Energy Regulatory Board (AERB) and World Health Organization (WHO) prescribed limit / guideline values. The activity concentration of naturally occurring radionuclides in soil, food matrices, flora and fauna is comparable to the national background levels.

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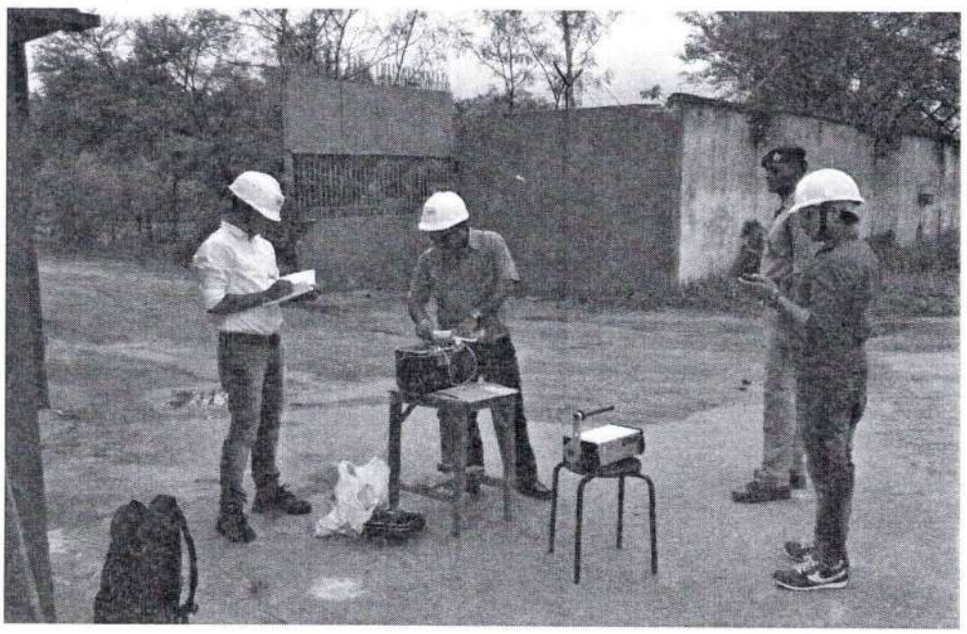
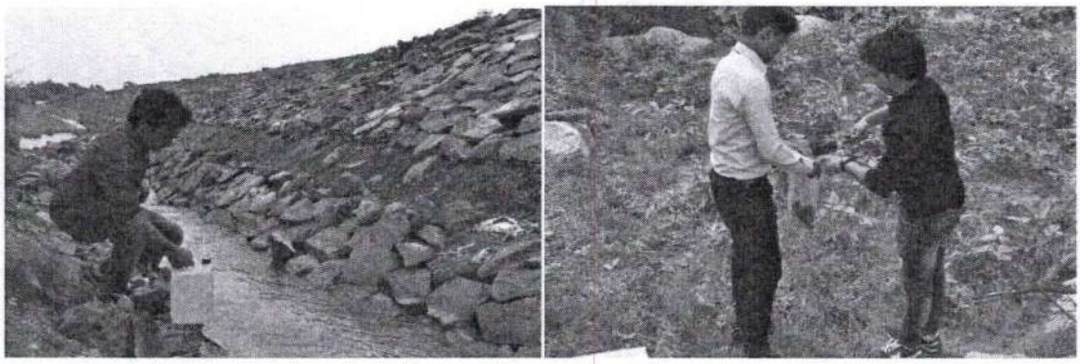
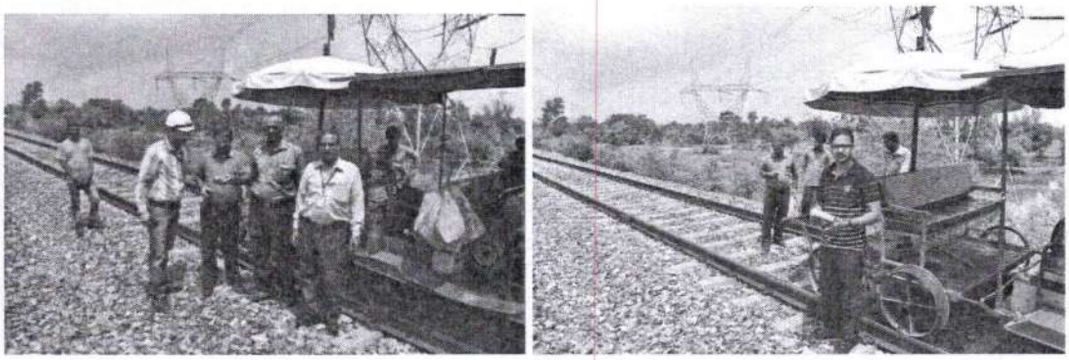
Few photographs during sampling program around KuSTPP, NTPC Ltd., Sipat



Sampling team members at Janji gate of site

Radiation survey at Ash Dyke Area





Water and Soil Sample collection and in-situ monitoring of Radiation levels.

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Annexure-6

BY SPEED POST

ANNEXURE-11

ANNEXURE-06

INDIAN INSTITUTE OF CHEMICAL TECHNOLOGY

(Council of Scientific & Industrial Research)
HYDERABAD- 500007

CSIR-IICT

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Ref: ACMS/NTPC/2017

Date: 29-05-2017

To:
Mr.Pankaj Sharma,
Dy .General Manager (EMG),
Sipat Super Thermal Power Station,
Ujjawal Nagar(P.O),
SIPAT,
Bilaspur Distt,
Chhattisgarh-495 555.

06.06.17 - manager (EMG)

Dear Sir,

This is with your reference no :Sipat/Envt./2017/1352 and letter dated 07-02-2017 regarding the analysis of Coal, Fly ash and Bottom ash samples and the report for the same is given below.

Analysis Report

S.No	Parameters	Coal Fried Unit#1	Coal Fried Unit#4	Fly Ash	Fly Ash Silo Stage Unit #4	Bottom Ash Unit#1	Bottom Ash Unit#4
1	Al (% by mass)	2.35	1.52	3.38	9.78	6.34	6.55
2	As (µg/g)	13.89	7.26	25.60	30.33	26.70	18.92
3	Cd(µg/g)	0.27	0.14	0.79	0.53	0.21	0.19
4	Co(µg/g)	10.59	13.79	19.62.	20.83	10.97	11.11
5	Cr(µg/g)	64.87	45.87	96.03	101.25	69.40	73.21
6	Cu(µg/g)	15.85	148.88	58.35	62.31	33.15	29.11
7	Fe (% by mass)	1.24	1.72	1.89	1.75	0.83	2.54
8	Mn(µg/g)	70.60	308.36	67.21	139.54	158.58	148.83
9	Hg(µg/g)	1.11	0.48	0.64	0.85	B.D	B.D
10	Ni(µg/g)	28.14	26.25	27.88	31.78	16.30	17.32
11	Pb(µg/g)	15.46	15.62	20.11	36.05	7.98	11.86
12	Zn(µg/g)	57.25	18.10	38.40	41.38	31.75	19.32

B.D: Below Detection Limit

Analyzed by

Scientist-in-Charge

for Director

1. This Certificate refers to sample(s) examined only.
2. These Results should not be used for commercial purpose (Advertisement).

A9(1/1)

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Annexure 7

ANNEXURE-13

ANNEXURE-07

छत्तीसगढ़ शासन
जल संसाधन विभाग
मंत्रालय,
महानदी भवन, केपिटल कॉम्पलेक्स,
नया रायपुर (छ.ग.)

क्र. 6236/29/4/96/म/31/औजप्र/डी–4, नया रायपुर, दिनांक 11/12/2017

प्रति,

मुख्य अभियंता,
मिनीमाता (हसदेव) बांगो परियोजना,
जल संसाधन विभाग,
बिलासपुर (छ.ग.)

विषय :– एन.टी.पी.सी.लिमिटेड द्वारा बिलासपुर जिले में स्थापित 2980 मेगावाट सीपत सुपर थर्मल पॉवर प्रोजेक्ट हेतु हसदेव बांगो परियोजना की दांयी मुख्य नहर से स्वीकृत 120.00 मि.घ.मी. वार्षिक जल आबंटन को कम कर 93.00 मि.घ.मी. वार्षिक करने की स्वीकृति।

संदर्भ:– 1. शासन का पत्र क्रमांक–6493–6494/29/4/96/म/31/औजप्र/डी–4, दिनांक 31.10.2009.
2. प्रमुख अभियंता का पत्र क्र.–3451141/औजप्र/छ.ग./017/4040–4041, दिनांक 20.03.2017.
4. शासन का पत्र क्रमांक–5359–5360/7/ज.सं./तशा/औजप्र/01/डी–4, दिनांक 18.10.2017.

––00––

उपरोक्त विषय के संदर्भ में, राज्य जल संसाधन उपयोग समिति, छत्तीसगढ़ की 41वीं बैठक, दिनांक 11.10.2017 में लिये गये निर्णयानुसार, एन.टी.पी.सी. लिमिटेड, सीपत, बिलासपुर (संस्थान) द्वारा जिला–बिलासपुर में स्थापित 2980 मेगावाट सीपत सुपर थर्मल पॉवर प्रोजेक्ट हेतु, हसदेव बांगो परियोजना की दांयी मुख्य नहर से स्वीकृत 120.00 मि.घ.मी. वार्षिक जल आवंटन की मात्रा को, संस्थान के अनुरोध पर कम कर 93.00 मि.घ.मी. वार्षिक करने की स्वीकृति निम्नलिखित शर्तों के साथ प्रदान की जाती है :–

1. संस्थान के 2980 मे.वा. सीपत सुपर थर्मल पॉवर प्रोजेक्ट हेतु जल आबंटन को कम करने बाबत् शासन द्वारा जारी किये जाने वाला आदेश, संस्थान द्वारा दि. 25.11.2009 को विभाग से किये गये अनुबंध का भाग होगा एवं प्रकरण में पुनरीक्षित 93.00 मि.घ.मी. वार्षिक जल आबंटन, संस्थान द्वारा प्रकरण में समस्त बकाया राशि (यदि कोई होगी तो) जमा करने के दिनांक से लागू होगा।
2. संस्थान को आवंटित पुनरीक्षित 93.00 मि.घ.मी. वार्षिक जल उपयोग के एवज में शासन द्वारा समय–समय पर शासकीय स्त्रोत से जल प्रदाय हेतु निर्धारित जलदर पर देय योग्य जलकर का नियमानुसार भुगतान करने की संस्थान को बाध्यता होगी।
3. प्रकरण में जल प्रदाय की शेष शर्तें, शासन के मूल स्वीकृति पत्र क्रमांक–6493–6494/29/4/31/96/म/औजप्र/डी–4, दिनांक 31.10.2009 के अनुसार यथावत रहेगी।

सहपत्र :–शून्य।

(याकुब खेस्स) 11/12/17
संयुक्त सचिव
जल संसाधन विभाग

कार्यपालन अभियंता
हसदेव वर्रोज जल प्रबंध संभाग
रामपुर/कोरबा (छ.ग.)

31/3/18

पृ. क्र. 6237/29/4/96/म/31/औजप्र/डी–4, नया रायपुर, दिनांक 11/12/2017

प्रतिलिपि :–

1. प्रमुख अभियंता, जल संसाधन विभाग, सिंहावा भवन, रायपुर को संदर्भित पत्रों के परिप्रेक्ष्य में सूचनार्थ अग्रेषित।
2. अधीक्षण अभियंता, हसदेव परियोजना मंडल, रामपुर/कोरबा एवं
3. कार्यपालन अभियंता, हसदेव बैराज जल प्रबंध संभाग, रामपुर/कोरबा को सूचनार्थ एवं शीघ्र आवश्यक कार्यवाही हेतु अग्रेषित।
4. विशेष सचिव, छ.ग. शासन, ऊर्जा विभाग, मंत्रालय, नया रायपुर को सूचनार्थ अग्रेषित।
5. महाप्रबंधक, एन.टी.पी.सी. लिमिटेड, सीपत सुपर थर्मल पॉवर स्टेशन, पोस्ट–उज्जवल नगर–सीपत–495555, जिला–बिलासपुर (छ.ग.), को उनके पत्र क्र.–Sipat/HOS/18/2016/1458, दिनांक 30.03.2016 के संदर्भ में सूचनार्थ एवं आवश्यक कार्यवाही हेतु अग्रेषित।
6. विशेष सहायक, माननीय मंत्रीजी, छत्तीसगढ़ शासन, जल संसाधन, आयाकट, कृषि, पशुपालन, मछलीपालन, धार्मिक न्यास एवं धर्मस्व विभाग, मंत्रालय, नया रायपुर को उनके नोटशीट क्र.–17/ofr/मंत्री/ज.सं./आ./कृ.प.म./धा., दिनांक 28.01.2014 के परिप्रेक्ष्य में सूचनार्थ अग्रेषित।

सहपत्र :– शून्य।

संयुक्त सचिव
जल संसाधन विभाग
मंत्रालय, नया रायपुर

रा.–1/रा.–2/रा.–3/बजट/स्था.रा.–1
स्था.रा.–2/स्था.रा.–3/स्था.मु.–1/स्था.मु.–2
स्टेनो/पी.एम.ई./कार्य/यु.नि./मु.लि./वि.प्र./ज.सू./आवास

ले.अधि. यां.प्र.अधि. अधि.अभि.

कार्यपालन अभियंता
हसदेव बैराज जल प्रबंध संभाग,
रामपुर/कोरबा (छ.ग.)

Annexure-8

ANNEXURE-08

Year	Major CSR Activities	Total fund spent
2020-21	Financial assistance for ration	730000.00
	Sporsoring 1 PAP for general nursing course	60000.00
	Providing PPE kits to medical frontline workers	607000.00
	Providing cloth masks to prevent spread of COVID-19	714000.00
	Support for Sanitizers, Soaps etc.	720000.00
	Support for establishing COVID-19 hospital	2900000.00
	Providing grocery support	900000.00
	Financial Support to local administration	2020000.00
2021-22	RURAL SPORTS - States level sports tournament	4,61,000.00
	Support to District Adminstration- Support for covid	40,00,000.00
	Promoting rural art and culture - tribal mohatsav, URS arrangement support	22,65,000.00
	Support to students of Baiga Tribe	1000000.00
	Additional room at State Mental Hospital	33,75,000.00
	Finan assistance for procuring ambulances at weekly haat bazzar	17,60,000.00
	financial assistance for construction toilet/dw	14,16,000.00
	Promotion of State level football training	5,17,000.00
	support for expedition of mt.kilimanjaro	200000.00
	Dari for Anganwadi centres	700000.00
	Renovation of existing toilets and construction of Urinal blocks in schools under Swachh Bharat Swachh Vidyalaya Abhiyan	1200000.00
	Setting up of Smart Class - Community computer in Govt. Schools	2731800.00
	financial assistance for setting COVID care center in Masturi	500000.00

Annexure -9

ANNEXURE-09

ANNEXURE-15

एनटीपीसी NTPC
A Maharatna Company

NTPC Limited

(A Government of India Enterprise)
Sipat Super Thermal Power Project
PO Ujwal Nagar
District Bilaspur
Chhattisgarh- 495555, India
Telephone No. : 07752-246552 Fax No. : 07752-246507

Service Purchase Order

CIN No. : L40101DL1975GOI007966

Purchase Order No. : 4000206020-185-1019 **Date** : 29.06.2018 **(version : 0)**

To
MANAGING DIRECTOR CG RAJYA VAN VIKAS NIGAM LIMITED
Lokash Plaza, Shankar Nagar Road
Shankar Nagar
RAIPUR
Chhattisgarh
India - 492001

Vendor Code : 1035822

Subject: : Tree Plantation in NTPC Land along the MGR Track.
[LOA REF.NO.SIPAT/CS/2018-19/18062/1839128 DATED:26.06.2018]
NIT NO. : Dated
Your Offer No. :
Your Reference : 1. Your letter No.VVN/KP/Expenditure/2018/955 dated: 19.06.2018
Our Reference : LOA REF.NO.SIPAT/CS/2018-19/18062/1839128 DATED:26.06.2018

Dear Sir,

This has reference to our above mentioned NIT, Your offer and subsequent discussions. We are pleased to accept your offer opened on and confirm having awarded on you the work of Tree Plantation in NTPC Land along the MGR Track. [LOA REF.NO.SIPAT/CS/2018-19/18062/1839128 DATED:26.06.2018] of total value INR 25,258,668.76 (Rupee TWO CRORE FIFTY-TWO LAKH FIFTY-EIGHT THOUSAND SIX HUNDRED SIXTY-EIGHT POINT SEVENTY-SIX ONLY) mentioned in the scope of works, special terms & conditions, Bill of quantities etc.

The duration of the service period shall be from 27.06.2018 to 31.03.2023. Though the duration of contract shall remain same, the actual date of commencement of the contract shall be as per the direction of EIC. SHRI A.K. RAI, DGM(MGR) shall be EIC for this work.

This service purchase order along with its annexure is being issued to you in duplicate .We request you to return the duplicate copy of this service purchase order, duly signed on each page by your authorised signatory in token of your unequivocal acknowledgment of the same within 15 days from the date of this service purchase order. If no communication is received within 15 days of receipt of Purchase Order, it will be treated that order has been accepted in entirety.

We thank you for the interest shown by you in our project and the cooperation extended to us. We expect to receive your continued cooperation in future also.

Thanking You,
For & on behalf of NTPC Limited.

[R.K. JAIN]
SR.MANAGER(CS)

Enclosures :
BILL OF QUANTITIES, SCOPE OF WORK, TERMS AND CONDITIONS

(Bill of Quantity)

Name of Work: Tree Plantation in NTPC Land along the MGR Track.
[LOA REF.NO.SIPAT/CS/2018-19/18062/1839128
DATED:26.06.2018]

Sl No.	Code	Description	Unit	Quantity	Net Price	Amount	Long Text

Delivery/Invoicing Address:
1019 Sipat Super Thermal Power Project
PO Ujwal Nagar District Bilaspur
Chhattisgarh
495555
India
07752-246552
07752-246507
Invoicing to be done on
GST No. : 22AAACN0255D4Z5

10		Tree Plantation along MGR Track (Part-A)	AU	1.000	18,517,850.00	18,517,850.00	

Tax: NIL **Extra**

10 .10		First year plantation & its maintenance	NO	22,975	365.0000	8,385,875.00	
10 .20		Second Year Maintenance	NO	22,975	140.0000	3,216,500.00	
10 .30		Third Year Maintenance	NO	22,975	131.0000	3,009,725.00	
10 .40		Fourth Year Maintenance	NO	22,975	127.0000	2,917,825.00	
10 .50		Fifth Year Maintenance	NO	22,975	43.0000	987,925.00	

TOTAL OF BOQ PART : 00010 INR 18517850.00

Amount **18517850.00**
Other Charges 0.00

Net Amount on BOQ PART : 00010 INR 18517850.00

20		Fencing RCC Pole with Barbed Wire(Part-B	AU	1.000	6,740,818.76	6,740,818.76	

Tax: NIL **Extra**

20 .10		Fencing RCC Pole with barbed wire (3x3M	RMT	14,956	450.7100	6,740,818.76	

TOTAL OF BOQ PART : 00020 INR 6740818.76

Amount **6740818.76**
Other Charges 0.00

Net Amount on BOQ PART : 00020 INR 6740818.76

Net Total Amount INR 25,258,668.76
Less Rebate/Amount INR 0.00
Grand Total INR 25,258,668.76

INR TWO CRORE FIFTY-TWO LAKH FIFTY-EIGHT THOUSAND SIX HUNDRED SIXTY-EIGHT AND SEVENTY-SIX PAISA ONLY

[R.K. JAIN]
SR.MANAGER(CS)

एनटीपीसी NTPC
A Maharatna Company

NTPC Limited

(A Government of India Enterprise)
Sipat Super Thermal Power Project
PO Ujwal Nagar
District Bilaspur
Chhattisgarh- 495555, India
Telephone No. : 07752-246552 Fax No. : 07752-246507

Service Purchase Order

CIN No. : L40101DL1975GOI007966

Purchase Order No. : 4600057825-185-1019 **Date** : 21.09.2019 **(version : 0)**

To
MANAGING DIRECTOR CG RAJYA VAN VIKAS NIGAM LIMITED
Lokash Plaza, Shankar Nagar Road
Shankar Nagar
RAIPUR
Chhattisgarh
India - 492001

Vendor Code : 1035822

Subject:	: Tree Plantation (25000 nos), Fencing and its Maintenance for 5 Years along the MGR Track in NTPC Land on Deposit basis. [LOA REF.NO.SIPAT/CS/2019-20/19048/P-258440/1939070 DATED:19.09.2019]
NIT NO.	: 800043231 Dated
Your Offer No.	:
Your Reference	: 1. Your letter Ref. #/#####/######/####/2019/1996 ######## ###### 04.09.2019
Our Reference	: LOA REF.NO.SIPAT/CS/2019-20/19048/P-258440/1939070 DATED:19.09.2019

Dear Sir,

This has reference to our above mentioned NIT, Your offer and subsequent discussions. We are pleased to accept your offer opened on and confirm having awarded on you the work of Tree Plantation (25000 nos), Fencing and its Maintenance for 5 Years along the MGR Track in NTPC Land on Deposit basis. [LOA REF.NO.SIPAT/CS/2019-20/19048/P-258440/1939070 DATED:19.09.2019] of total value INR 42,653,263.00 (Rupee FOUR CRORE TWENTY-SIX LAKH FIFTY-THREE THOUSAND TWO HUNDRED SIXTY-THREE ONLY) mentioned in the scope of works, special terms & conditions, Bill of quantities etc.

The duration of the service period shall be from 23.09.2019 to 22.09.2024. Though the duration of contract shall remain same, the actual date of commencement of the contract shall be as per the direction of EIC. SHRI A.K. RAI, DGM(MGR) shall be EIC for this work.

This service purchase order along with its annexure is being issued to you in duplicate .We request you to return the duplicate copy of this service purchase order, duly signed on each page by your authorised signatory in token of your unequivocal acknowledgment of the same within 15 days from the date of this service purchase order. If no communication is received within 15 days of receipt of Purchase Order, it will be treated that order has been accepted in entirety.

We thank you for the interest shown by you in our project and the cooperation extended to us. We expect to receive your continued cooperation in future also.

Thanking You,
For & on behalf of NTPC Limited.

[G.P. PATLEY]
MANAGER(CS)

Enclosures :
BILL OF QUANTITIES, TERMS AND CONDITIONS

(Bill of Quantity)

Name of Work: Tree Plantation (25000 nos), Fencing and its Maintenance for 5 Years along the MGR Track in NTPC Land on Deposit basis. [LOA REF.NO.SIPAT/CS/2019-20/19048/P-258440/1939070 DATED:19.09.2019]

Sl No.	Code	Description	Unit	Quantity	Net Price	Amount	Long Text

Delivery/Invoicing Address:

1019 Sipat Super Thermal Power Project
PO Ujwal Nagar District Bilaspur
Chhattisgarh
495555
India
07752-246552
07752-246507
Invoicing to be done on
GST No. : 22AAACN0255D4Z5

10		Tree Plantation along MGR Track	AU	1.000	42,653,263.00	42,653,263.00	

Tax: NIL **Extra**

10 .10		First year plantation & its maintenance	NO	25.000	382.2500	9,556,250.00	
10 .20		Second Year Maintenance	NO	25.000	173.3800	4,334,500.00	
10 .30		Third Year Maintenance	NO	25.000	161.7900	4,044,750.00	
10 .40		Fourth Year Maintenance	NO	25.000	158.2400	3,956,000.00	
10 .50		Fifth Year Maintenance	NO	25.000	82.8700	2,071,750.00	
10 .60		fencing RCC pole with barbes wire 1st yr	RMT	38.040	491.3300	18,690,193.20	

TOTAL OF BOQ PART : 00010 INR 42653443.20
Discount (Value) 180.20-
Amount **42653263.00**
Other Charges 0.00
Net Amount on BOQ PART : 00010 INR 42653263.00

Net Total Amount INR 42,653,263.00
Less Rebate/Amount INR 0.00
Grand Total INR 42,653,263.00
INR FOUR CRORE TWENTY-SIX LAKH FIFTY-THREE THOUSAND TWO HUNDRED SIXTY-THREE ONLY

[G.P. PATLEY]
MANAGER(CS)

एनटीपीसी NTPC
A Maharatna Company

NTPC Limited

(A Government of India Enterprise)
Sipat Super Thermal Power Project
PO Ujwal Nagar
District Bilaspur
Chhattisgarh- 495555, India
Telephone No. : 07752-246552 Fax No. : 07752-246507

Service Purchase Order

CIN No. : L40101DL1975GOI007966

Purchase Order No. : 4000209233-054-1019 **Date** : 20.08.2018 **(version : 1 Date : 22.08.2018)**

To
MANAGING DIRECTOR CG RAJYA VAN VIKAS NIGAM LIMITED
Lokash Plaza, Shankar Nagar Road
Shankar Nagar
RAIPUR
Chhattisgarh
India - 492001

Vendor Code : 1035822

Subject: : Plantation, maintenance & watch and ward including fencing of 2000 Plants in ash Dyke area for five year at NTPC Sipat.
Version 1: Purchase Grp changed to 054.

NIT NO. : Dated
Your Offer No. :
Your Reference : Your offer letter Ref. No. VVN/KP/vyay/2017/909 dated 22.05.2017
Our Reference : Ref. No. SIPAT/CS//18192

Dear Sir,

This has reference to our above mentioned NIT, Your offer and subsequent discussions. We are pleased to accept your offer opened on and confirm having awarded on you the work of Plantation, maintenance & watch and ward including fencing of 2000 Plants in ash Dyke area for five year at NTPC Sipat. Version 1: Purchase Grp changed to 054. of total value INR 4,103,991.57 (Rupee FORTY-ONE LAKH THREE THOUSAND NINE HUNDRED NINETY-ONE POINT FIFTY-SEVEN ONLY) mentioned in the scope of works, special terms & conditions, Bill of quantities etc.

The duration of the service period shall be from 14.08.2018 to 13.08.2023. Though the duration of contract shall remain same, the actual date of commencement of the contract shall be as per the direction of EIC. Sh. Shahid Nasim, Sr. Manager (AHP) shall be EIC for this work.

This service purchase order along with its annexure is being issued to you in duplicate .We request you to return the duplicate copy of this service purchase order, duly signed on each page by your authorised signatory in token of your unequivocal acknowledgment of the same within 15 days from the date of this service purchase order. If no communication is received within 15 days of receipt of Purchase Order, it will be treated that order has been accepted in entirety.

We thank you for the interest shown by you in our project and the cooperation extended to us. We expect to receive your continued cooperation in future also.

Thanking You,
For & on behalf of NTPC Limited.

Rajeev Verma
DGM (CS)

Enclosures :
Payment Details, Terms and Conditions and Drawing as per Annexure-A.

(Bill of Quantity)

Name of Work: Plantation, maintenance & watch and ward including fencing of 2000 Plants in ash Dyke area for five year at NTPC Sipat. Version 1: Purchase Grp changed to 054.

Sl No.	Code	Description	Unit	Quantity	Net Price	Amount	Long Text

Delivery/Invoicing Address:

1019 Sipat Super Thermal Power Project
PO Ujwal Nagar District Bilaspur
Chhattisgarh
495555
India
07752-246552
07752-246507
Invoicing to be done on
GST No. : 22AAACN0255D4Z5

10		Plantation in Ash Dyke area	AU	1.000	4,103,991.57	4,103,991.57	

Tax: NIL **Extra**

10 .110		1st year plantation & maintenance	NO	2,000	401.0000	802,000.00	
10 .120		Fencing RCC with Chain link 1st year	RMT	4,553	450.6900	2,051,991.57	
10 .130		Second year Plantation maintenance	NO	2,000	178.0000	356,000.00	
10 .140		Third year Plantation maintenance	NO	2,000	174.0000	348,000.00	
10 .150		Fourth year PLANTATION maintenance	NO	2,000	172.0000	344,000.00	
10 .160		Fifth year plantation maintenance	NO	2,000	101.0000	202,000.00	

TOTAL OF BOQ PART : 00010 INR 4103991.57

Amount **4103991.57**
Other Charges 0.00

Net Amount on BOQ PART : 00010 INR 4103991.57

Net Total Amount INR 4,103,991.57
Less Rebate/Amount INR 0.00
Grand Total INR 4,103,991.57

INR FORTY-ONE LAKH THREE THOUSAND NINE HUNDRED NINETY-ONE AND FIFTY-SEVEN PAISA ONLY

Rajeev Verma
DGM (CS)

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NTPC Limited

(A Government of India Enterprise)
Sipat Super Thermal Power Project
PO Ujwal Nagar
District Bilaspur
Chhattisgarh- 495555, India
Telephone No. : 07752-246552 Fax No. : 07752-246507

Service Purchase Order

CIN No. : L40101DL1975GOI007966

Purchase Order No. : 4600058009-054-1019 **Date** : 05.10.2019 **(version : 0)**

To **Vendor Code** : 1035822

MANAGING DIRECTOR CG RAJYA VAN VIKAS NIGAM LIMITED
Lokash Plaza, Shankar Nagar Road
Shankar Nagar
RAIPUR
Chhattisgarh
India - 492001

Subject: : Plantation, maintenance & watch and ward including fencing of 5000 plants in Ash Dyke area for five years for the year 2019-2024.
[LOA REF.NO.SIPAT/CS/2019-20/19086/P-279066/1939077 DATED:03.10.2019]

NIT NO. : 800043350 Dated
Your Offer No. :
Your Reference : 1. Your letter Ref. #/#####/######/####/2019/4152 ######## ###### 12.02.2019
2. Your letter Ref. #/#####/######/####/2019/2235 ######## ###### 24.09.2019
3. Your letter Ref. #/#####/######/####/2019/2237 ######## ###### 24.09.2019

Our Reference : LOA REF.NO.SIPAT/CS/2019-20/19086/P-279066/1939077 DATED:03.10.2019

Dear Sir,

This has reference to our above mentioned NIT, Your offer and subsequent discussions. We are pleased to accept your offer opened on and confirm having awarded on you the work of Plantation, maintenance & watch and ward including fencing of 5000 plants in Ash Dyke area for five years for the year 2019-2024. [LOA REF.NO.SIPAT/CS/2019-20/19086/P-279066/1939077 DATED:03.10.2019] of total value INR 10,434,693.30 (Rupee ONE CRORE FOUR LAKH THIRTY-FOUR THOUSAND SIX HUNDRED NINETY-THREE POINT THIRTY ONLY) mentioned in the scope of works, special terms & conditions, Bill of quantities etc.

The duration of the service period shall be from 09.10.2019 to 08.10.2024. Though the duration of contract shall remain same, the actual date of commencement of the contract shall be as per the direction of EIC. SHRI SHAHID NASIM, SR.MANAGER (AHP) shall be EIC for this work.

This service purchase order along with its annexure is being issued to you in duplicate .We request you to return the duplicate copy of this service purchase order, duly signed on each page by your authorised signatory in token of your unequivocal acknowledgment of the same within 15 days from the date of this service purchase order. If no communication is received within 15 days of receipt of Purchase Order, it will be treated that order has been accepted in entirety.

We thank you for the interest shown by you in our project and the cooperation extended to us. We expect to receive your continued cooperation in future also.

Thanking You,
For & on behalf of NTPC Limited.

[G. P. PATLEY]
MANAGER(CS)

Enclosures :

BILL OF QUANTITIES, SCOPE OF WORK, TERMS AND CONDITIONS

(Bill of Quantity)

Name of Work: Plantation, maintenance & watch and ward including fencing of 5000 plants in Ash Dyke area for five years for the year 2019-2024.
[LOA REF.NO.SIPAT/CS/2019-20/19086/P-279066/1939077 DATED:03.10.2019]

Sl No.	Code	Description	Unit	Quantity	Net Price	Amount	Long Text

Delivery/Invoicing Address:
1019 Sipat Super Thermal Power Project
PO Ujwal Nagar District Bilaspur
Chhattisgarh
495555
India
07752-246552
07752-246507
Invoicing to be done on
GST No. : 22AAACN0255D4Z5

10		Plantation of 5000Trees in Ash Dyke area	AU	1.000	10,434,693.30	10,434,693.30	

Tax: NIL **Extra**

10 .10		1st year plantation & maintenance	NO	5,000	405.2000	2,026,000.00	
10 .20		Fencing RCC with Chain link 1st year	RMT	5,110	829.0300	4,236,343.30	
10 .30		Second year Plantation maintenance	NO	5,000	229.1800	1,145,900.00	
10 .40		Third year Plantation maintenance	NO	5,000	220.7500	1,103,750.00	
10 .50		Fourth year PLANTATION maintenance	NO	5,000	226.3700	1,131,850.00	
10 .60		Fifth year plantation maintenance	NO	5,000	158.1700	790,850.00	

TOTAL OF BOQ PART : 00010 INR 10434693.30

Amount **10434693.30**
Other Charges 0.00

Net Amount on BOQ PART : 00010 INR 10434693.30

Net Total Amount INR 10,434,693.30
Less Rebate/Amount INR 0.00
Grand Total INR 10,434,693.30

INR ONE CRORE FOUR LAKH THIRTY-FOUR THOUSAND SIX HUNDRED NINETY-THREE AND THIRTY PAISA ONLY

[G. P. PATLEY]
MANAGER(CS)

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NTPC Limited

(A Government of India Enterprise)
Sipat Super Thermal Power Project
PO Ujwal Nagar
District Bilaspur
Chhattisgarh- 495555, India
Telephone No. : 07752-246552 Fax No. : 07752-246507

Service Purchase Order

CIN No. : L40101DL1975GOI007966

Purchase Order No. : 4000168564-037-1019 **Date** : 29.06.2016 **(version : 1 Date : 20.02.2018)**

To
MANAGING DIRECTOR CG RAJYA VAN VIKAS NIGAM LIMITED
Lokash Plaza, Shankar Nagar Road
Shankar Nagar
RAIPUR
Chhattisgarh
India - 492001

Vendor Code : 1035822

Subject: : Plantation of trees in green belt area sipat

Version : 1 - Created for updation of NIL GST in India Tab as per request received from execution deptt. through IOM dated : 17.02.2018.

NIT NO. : Dated
Your Offer No. :
Your Reference : Your offer letter dated : 21.12.2015.
Our Reference : Sipat/CS/2016-17/16048/1667082

Dear Sir,

This has reference to our above mentioned NIT, Your offer and subsequent discussions. We are pleased to accept your offer opened on and confirm having awarded on you the work of Plantation of trees in green belt area sipat Version : 1 - Created for updation of NIL GST in India Tab as per request received from execution deptt. through IOM dated : 17.02.2018. of total value INR 22,314,000.00 (Rupee TWO CRORE TWENTY-THREE LAKH FOURTEEN THOUSAND ONLY) mentioned in the scope of works, special terms & conditions, Bill of quantities etc.

The duration of the service period shall be from 24.06.2016 to 23.06.2021. Though the duration of contract shall remain same, the actual date of commencement of the contract shall be as per the direction of EIC. Sh. Pankaj Kumar Sharma DGM(EMG) shall be EIC for this work.

This service purchase order along with its annexure is being issued to you in duplicate .We request you to return the duplicate copy of this service purchase order, duly signed on each page by your authorised signatory in token of your unequivocal acknowledgment of the same within 15 days from the date of this service purchase order. If no communication is received within 15 days of receipt of Purchase Order, it will be treated that order has been accepted in entirety.

We thank you for the interest shown by you in our project and the cooperation extended to us. We expect to receive your continued cooperation in future also.

Thanking You,
For & on behalf of NTPC Limited.

Sh. Rajeev Verma
DGM(CS)

Enclosures :
Payment Details , Terms and Conditions and Drawing as per Annexure-A & B.

(Bill of Quantity)

Name of Work: Plantation of trees in green belt area sipat

Version : 1 - Created for updation of NIL GST in India Tab as per request received from execution deptt. through IOM dated : 17.02.2018.

Sl No.	Code	Description	Unit	Quantity	Net Price	Amount	Long Text
Delivery/Invoicing Address: 1019 Sipat Super Thermal Power Project PO Ujwal Nagar District Bilaspur Chhattisgarh 495555 India 07752-246552 07752-246507 Invoicing to be done on **GST No. :** 22AAACN0255D4Z5							
10		Green Belt plantation	AU	1.000	22,314,000.00	22,314,000.00	
Tax: NIL **Extra**							
10 .10		Green belt plantation& maintenan1st year	NO	60,000	127.0000	7,620,000.00	
10 .20		Maintenance for 2nd year	NO	60,000	70.0000	4,200,000.00	
10 .30		Maintenance for 3rd year	NO	60,000	70.0000	4,200,000.00	
10 .40		Maintenance for 4th year	NO	60,000	53.0000	3,180,000.00	
10 .50		Maintenance for 5th year	NO	60,000	30.0000	1,800,000.00	
10 .60		fencing barbed wire (3x3 mtr.interval)	RMT	3,000	292.0000	876,000.00	
10 .70		Maintenance of fencing 2nd year	RMT	300	321.2000	96,360.00	
10 .80		Maintenance of fencing 3rd year	RMT	300	350.4000	105,120.00	
10 .90		Maintenance of fencing 4th year	RMT	300	379.6000	113,880.00	
10 .100		Maintenance of fencing 5th year	RMT	300	408.8000	122,640.00	

TOTAL OF BOQ PART : 00010 INR 22314000.00

Amount **22314000.00**

Other Charges 0.00

Net Amount on BOQ PART : 00010 INR 22314000.00

Net Total Amount INR 22,314,000.00

Less Rebate/Amount INR 0.00

Grand Total INR 22,314,000.00

INR TWO CRORE TWENTY-THREE LAKH FOURTEEN THOUSAND ONLY

Sh. Rajeev Verma
DGM(CS)

NTPC Limited

(A Government of India Enterprise)

Sipat Super Thermal Power Project
PO Ujwal Nagar
District Bilaspur
Chhattisgarh- 495555, India
Telephone No. : 07752-246552 Fax No. : 07752-246507

Service Purchase Order

CIN No. : L40101DL1975GOI007966

Purchase Order No. : 4000198487-037-1019 **Date** : 09.02.2018 **(version : 1 Date : 17.01.2019)**

To
MANAGING DIRECTOR CG RAJYA VAN VIKAS NIGAM LIMITED
Lokash Plaza, Shankar Nagar Road
Shankar Nagar
RAIPUR
Chhattisgarh
India - 492001

Vendor Code : 1035822

Subject: : Plantation of trees in green belt area of Sipat.
[LOA Ref. No. SIPAT/CS/2017-18/17173/1737151 DATED:09.09.2017]

Note:- Version:1 PO created to incorporate a new line item 20 for watering of 15000 Plants (which is Off season plantation) in Green Belt area for the period from Dec.2018 to Feb.2019 as per approval of C/A in Pradeep at NP-22.

NIT NO. : Dated
Your Offer No. :
Your Reference : Your offer letter Ref. No. VVN/KP/vyay/2017/909 dated 22.05.2017
Our Reference : LOA Ref. No. SIPAT/CS/2017-18/17173/1737151 DATED:09.09.2017

Dear Sir,

This has reference to our above mentioned NIT, Your offer and subsequent discussions. We are pleased to accept your offer opened on and confirm having awarded on you the work of Plantation of trees in green belt area of Sipat. [LOA Ref. No. SIPAT/CS/2017-18/17173/1737151 DATED:09.09.2017] Note:- Version:1 PO created to incorporate a new line item 20 for watering of 15000 Plants (which is Off season plantation) in Green Belt area for the period from Dec.2018 to Feb.2019 as per approval of C/A in Pradeep at NP-22. of total value INR 25,043,350.00 (Rupee TWO CRORE FIFTY LAKH FORTY-THREE THOUSAND THREE HUNDRED FIFTY ONLY) mentioned in the scope of works, special terms & conditions, Bill of quantities etc.

The duration of the service period shall be from 01.02.2018 to 31.01.2023. Though the duration of contract shall remain same, the actual date of commencement of the contract shall be as per the direction of EIC. Shri L.K. Kaushik, Sr. Manager (EMG) shall be EIC for this work.

This service purchase order along with its annexure is being issued to you in duplicate .We request you to return the duplicate copy of this service purchase order, duly signed on each page by your authorised signatory in token of your unequivocal acknowledgment of the same within 15 days from the date of this service purchase order. If no communication is received within 15 days of receipt of Purchase Order, it will be treated that order has been accepted in entirety.

We thank you for the interest shown by you in our project and the cooperation extended to us. We expect to receive your continued cooperation in future also.

Thanking You,
For & on behalf of NTPC Limited.

(R K Jain)
Sr.Manager(CS)

(Bill of Quantity)

Name of Work: Plantation of trees in green belt area of Sipat.
[LOA Ref. No. SIPAT/CS/2017-18/17173/1737151 DATED:09.09.2017]

Note:- Version:1 PO created to incorporate a new line item 20 for watering of 15000 Plants (which is Off season plantation) in Green Belt area for the period from Dec.2018 to Feb.2019 as per approval of C/A in Pradeep at NP-22.

Sl No.	Code	Description	Unit	Quantity	Net Price	Amount	Long Text

Delivery/Invoicing Address:
1019 Sipat Super Thermal Power Project
PO Ujwal Nagar District Bilaspur
Chhattisgarh
495555
India
07752-246552
07752-246507
Invoicing to be done on
GST No. : 22AAACN0255D4Z5

10		Plantation in over burdan area	AU	1.000	24,293,350.00	24,293,350.00	

Tax: NIL **Extra**

10 .10		1st year plantation & maintenance	NO	42,500	199.9200	8,496,600.00	
10 .20		Second year Plantation maintenance	NO	42,500	108.6900	4,619,325.00	
10 .30		Third year Plantation maintenance	NO	42,500	97.5900	4,147,575.00	
10 .40		Fourth year PLANTATION maintenance	NO	42,500	93.6800	3,981,400.00	
10 .50		Fifth year plantation maintenance	NO	42,500	62.1000	2,639,250.00	
10 .60		1st yearFencing RCC barbed wire 3x3 mtr	RMT	880	310.0000	272,800.00	
10 .70		2nd year maintenance(10% of total lenth)	RMT	88	341.0000	30,008.00	
10 .80		3rd year maintenance(10% of total lenth)	RMT	88	372.0000	32,736.00	
10 .90		4th year maintenance(10% of total lenth)	RMT	88	403.0000	35,464.00	
10 .100		5th year maintenance(10% of total lenth)	RMT	88	434.0000	38,192.00	

TOTAL OF BOQ PART : 00010 INR 24293350.00

Amount **24293350.00**
Other Charges 0.00

Net Amount on BOQ PART : 00010 INR 24293350.00

20		Watering of 15000 Plants from Dec-18 to	AU	1.000	750,000.00	750,000.00	

Tax: NIL **Extra**

20 .10		Watering of 15000 Plants from Dec18 to F	EA	15,000	50.0000	750,000.00	

TOTAL OF BOQ PART : 00020 INR 750000.00

Amount **750000.00**
Other Charges 0.00

(R K Jain)
Sr.Manager(CS)

Net Amount on BOQ PART : 00020	INR 750000.00

Net Total Amount	INR 25,043,350.00
Less Rebate/Amount	INR 0.00
Grand Total	INR 25,043,350.00

INR TWO CRORE FIFTY LAKH FORTY-THREE THOUSAND THREE HUNDRED FIFTY ONLY

(R K Jain)
Sr.Manager(CS)

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