ANNEXURE - IV

Land Acquisition Due Diligence Report

ERM Impact Assessment and Planning

Land Acquisition Due Diligence Report For Barauni Thermal Power Plant

Kyushu Electric Power Co.

Kyushu Electric Power Co.

December 2015

www.erm.com

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ABBREVIATIONS

ARR	: Acquisition, Rehabilitation and Resettlement, 2014
BSEB	: Bihar State Electricity Board
BSPGCL	: Bihar State Power Grid Cooperation Limited
BTPS	: Bihar Thermal Power Station
CSR	: Corporate Social Responsibility
DDR	: Due Diligence Report
DPR	: Detailed Project Report
ESC	: Economic and Social Considerations
HC	: High Court
JICA GL	: JICA Guideline
JICA	: Japan International Cooperation Agency
PAF	: Project Affected Families
PAP	: Project Affected Persons
RAP	: Resettlement Action Plan
RFCT LARR	: The Right to Fair Compensation and Transparency in Land
ROW	: Right of Way
SC	: Supreme Court
ToR	: Terms of Reference
WB	: World Bank

1 INTRODUCTION

1.1 OVERVIEW

ERM India Private Limited has been commissioned by Kyushu Electric Power Company. (hereafter referred to as '*Kyushu*') to undertake a Land Due Diligence Study for the proposed expansion of Barauni Thermal Power Station (BTPS) – 660 MW, a public entity owned by the Bihar State Power Grid Company Limited (BSPGCL).

The land due diligence study is aimed to capture the land procurement procedure followed by BSPGCL and analyze the same with reference to the applicable frameworks described subsequently. The DD study was envisaged to inform and guide the resettlement action plan.

1.2 APPLICABLE REFERENCE FRAMEWORK

The due diligence assessment was undertaken with reference to the following national laws and international policy guidelines.

1.2.1 International Guidelines

Following international guidelines are referred to for the purpose of land due diligence:

- The Resettlement Plan under Annex A of the World Bank's (WB) safe guard policy OP4.12 - Involuntary Resettlement Source Book Planning and Implementation in Development Projects
- JICA's Environmental and Social Considerations Guidelines (due diligence study).

1.2.2 National and Local Laws

The key national and local laws referred to for the purpose of the DD are as follows:

- The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (RFCT LARR) Act, 2014
- Bihar Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2014

It is however to be noted that, the land identified as per the DPR at present does not trigger any of the laws. The DPR also does not mention extra land required for the ash dyke area previously, for which land acquisition is already completed as per the Land Acquisition Act, 1894 (no longer applicable presently).

Box 1.1 Legal status of the 290 acres land proposed for Ash Dyke area

- The Supreme Court of India dismissed the Special leave petition No. 37969/ 2013 filed by *Brinda Devi and others* (Arising out of impugned final judgment and order dated 18/04/2013 in LPA No. 1778/2012 passed by the High Court of Patna) in its judgement dated 13-01-2016.
- However, it upheld the decision of the High court which stated that the petitioners should prove the title over land and petitioner should must take recourse of law by filing a civil suit in the matter. It effectively meant that the petitioners (land claimants) in this case were free to move to file title suit in Trial Court at District level in Civil court.
- Earlier, the Supreme Court of India in its order dated 8-10-2014 has asked for Status quo as regards to the possession to be maintained; however in its judgement dated 13-01-2016, it ordered that such status quo will operate further only for a period of 3 weeks from the date of the Supreme Court Judgement dated 13-01-2016. So, BSPGCL will be free to take control of the land after a period of 3 weeks from the judgement date.
- Things may change if civil suit is filed by the petitioners (land claimants) and depending upon the judgement of the Civil court the land ownership status will be decided in future.

Source: Supreme Court Judgement dated 13-01-2016 in Special leave petition No. 37969/ 2013 filed by *Brinda Devi and others Vs The State of Bihar & others.*

Depending upon the next civil suit outcomes the applicability of the above mentioned regulations in context to the land proposed for the ash dyke presently (reference: DPR) will be decided

1.3 OBJECTIVE AND SCOPE OF WORK

The objective of the due diligence study is to document the land procurement process and the resettlement process (if any) followed by BSPGCL. The due diligence study was carried out to document and capture the land acquisition (transfer) process and to confirm how resettlement process, including consultation with the affected people and compensation has been implemented and whether the process complies with JICA's ESC Guidelines (due diligence study) and other applicable reference framework, as highlighted. The due diligence report (DDR) has used the existing information with BSPGCL and BTPS representatives and the local land administration officials on the land acquisition process. The ToR for the DDR includes the following:

1. Identification (listing) of the Project Affected Persons (PAP) and Project Affected Plots involved in case of land acquisition of all project components and confirm from the project proponent that there is no additional land is required;
2. Confirm the status of all other project affected persons dependent on the acquired land for livelihoods with formal as well as informal rights;
3. Review of the laws and regulations applied to the land acquisition and

resettlement;

4. Comment on the eligibility of entitled persons (as identified through Government enumeration/listing of entitled persons) for compensation against the loss of property and livelihood;
5. Comment on the Entitlement Matrix for the land acquisition and resettlement;
6. Information on the household – asset profile, land owner details, total land holding size etc. of private landowners of the area acquired – gathered from the project proponent or relevant Government authority;
7. Record of stakeholder consultation points raised during the past acquisition and commitment of the project proponent on the same along with action plan.
8. Record on compensation against the loss of property and livelihood – (However, it should be noted that the compensation has not been accepted by majority of the PAFs and the reason behind the same will be confirmed);
9. Record on resettlement assistance and livelihood restoration provided, if any. (Check whether assisting program was sufficient to improve or at least recover to the level of living standard prior to the resettlement implemented, based on the result of survey on the needs of livelihood restoration);
10. Record on assistance provided to the vulnerable people in the project affected area in the past (low income households, female, indigenous people, people with disabilities, and minority groups.);
11. Information about laws and regulations on CSR (Corporate Social Responsibility) and application of CSR to the livelihood improvement in India;
12. Information about active NGOs, policies on economic development, vocational training, unemployment rate and other development plans in the region;
13. Grievance mechanism and status of the implementation;
14. Identification of responsible organization (central government, local government, consultant, NGO, etc.) for the resettlement and their responsibilities;
15. Implementation schedule (regarding to payment of compensation on properties lost and physical relocation.);
16. Budget and resource of budget;
17. Organization responsible for monitoring and record of the implementation;
18. The result of consultation/stakeholder meeting which was conducted at the stages of initial design and of consideration of alternatives for the livelihood restoration program.

1.4 APPROACH & METHODOLOGY

For the purpose of undertaking the land due diligence study, mainly secondary sources were referred to and primary consultations undertaken with the company representatives and land related authorities to understand and review the land procurement process undertaken and the present status pertaining to the same. The following sub section provides the methodology adopted for undertaking the due diligence study.

1.4.1 *Kick-off meeting with the BTPS Representatives*

ERM team carried out a kick off meeting with the BTPS representatives during a site visit from 24th to 27th March, 2015 to gauge the land requirements, the status of land acquisition and land transfer, and the process followed thereby, the documents available with regard to the same. Further, the discussions also revealed the community sensitivities surrounding the land transfer and/or acquisition process.

1.4.2 *Stakeholder Consultations*

Discussions with Local Administration

The team undertook a subsequent site visit between 9th and 13th June, 2015 to undertake meetings with government representatives, particularly land officials at the district level and block level – land acquisition officers, circle officer/inspector etc. Information and documents/records pertaining to the private land acquired and the government land transfer in case of ash dyke area and also the records of litigation on the ash dyke land were collected. The detailed consultation records have been shared in the annexures.

Discussions with BPIC

BSPGCL had hired Bharat Power Infrastructure Company Pvt. Ltd. (BPIC), a joint venture of govt. of Bihar/BSP (H) CL& ILFS Group, as its consultant for all the pre-development project activities – including land liasoning process for the units 8 & 9. BPIC closely coordinates with the Revenue and Land Reforms Team for tracking the status of the land acquisition process pertaining to all the project components and the legal process involved thereof.

The discussions with BPIC representative were undertaken to understand the existing land related issues and litigations; the process that BSPGCL had undertaken previously to identify alternative land parcels for the ash pond area, among others.

1.4.3 Documentation Review

The study also involved reviewing several documents pertaining to the previous land acquisition undertaken and the ongoing land transfer process, including the existing litigation on the ash pond area.

Table 1.1 Documents Reviewed

SN	List of Documents
1.	Section 4 Notification (Adhisuchana) declared by Bhu Arjan Nirdeshalay, Revenue and Land Reforms Department, Bihar dated as on 10th October, 2011
2.	Section 6 Notification (Adhighoshana) declared by Bhu Arjan Nirdeshalay, Revenue and Land Reforms Department, Bihar dated as on 11th October, 2011
3.	Section 7 and 17 (1) Notification by Revenue and Land Reforms Department, Bihar dated October, 2012
4.	Notification and Public Notice Dates – Land Acquisition Dept. Patna dated 16th May, 2012
5.	Transfer of Possession Certificate (Form 17) (for 129.6225 acres of land) dated January, 2013
6.	List of 202 landowners along with Khasra no., area acquired etc. for 206 acres of land
7.	Deposition of cheque for acquiring land in Mauja Kasaha (Maranchi Diara urf KASAHA) Thana No. 10 for Area 490.48 Acres
8.	Civil Court Petition filed by an Advocate
9.	Special Leave Petition filed in the Supreme Court by 11 petitioners of Diara Maranchi dated as on March, 2014
10.	High Court Case – Counter Affidavit on behalf of respondents and supplementary affidavit by appellants
11.	Order Passed by DCLR Barh dated January 2012
12.	Compensation rate fixation document, Land Acquisition Department – Patna
13.	Regarding demarcation of land for water pipeline and 33 kV transmission line along the railway guide bundh for Ganga water supply project, BTPS
14.	Memorandum by Divisional Railway Manager granting permission for way leave facility for water pipeline dated as on 22nd September, 2014.
	Clearance for crossing the IOCL pipelines for the execution of pipelines for supply of Ganga River to BTPS dated as on 8th October, 2010

SN	List of Documents
15.	Land Acquisition Patna Dist. recalling 76 acres – to consider as government land (which was previously mistaken as private land) dated October, 2011
16.	Land Rate for Mokamah – village Maranchi Diyara urf Kasaha as on 2011-12

1.5 *LIMITATIONS*

The due diligence study was undertaken based on consultations with the BTPS and BSPGCL representatives and with the local land and revenue administration. While this assessment has endeavoured to provide a comprehensive review against the requirements of the applicable reference framework, however, there remain certain limitations to the assessment that should be considered:

- Primary consultations with the land owners could not be undertaken for the due diligence study, as permission for the same was not provided by BSPGCL;
- Limited information was shared by the relevant land related authorities at District and Tehsil level as there is litigation ongoing on the said parcel (at discussion for the expansion unit);
- Limited cooperation was extended by BSPGCL management with regard to providing information on the land acquisition process undertaken, sharing stakeholder meeting records and other land related documentation etc.
- The land transfer process is still underway during the site visit (and litigation is ongoing); hence there are several information gaps and conclusive evidence could not be derived. This study should be treated as suggestive and indicative only.
- Information provided in this report cannot be construed as legal advice;

Professional judgements expressed herein are based on facts and information provided to ERM. Wherever ERM has not been able to make a judgement or assess any process, it has highlighted that as an information gap.

1.5.1 *Uses of the Report*

ERM would also like to mention that the review was based on readily available information/ documentation, visual reconnaissance, and management interviews.

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1.6 LAYOUT OF THE REPORT

Chapter 1:	*Introduction*
Chapter 2:	*Project Background*
Chapter 3:	*Findings of the Previous Land Acquisition*
Chapter 4:	*Findings for Expansion Unit*
Annexure A:	*Consultation Records*

2 PROJECT BACKGROUND

2.1 PROJECT DESCRIPTION

Bihar State Power Generation Company Limited (BSPGCL) is planning to develop 1X660 MW (Unit 10) Super Critical Thermal Power Plant close to its under construction units (Unit No. 8 and 9). The proposed expansion project lies in the eastern India state of Bihar and involves Patna District (Mokameh Block) and Begusarai District (Barauni and Matihani Block) and on the north bank of Ganga River, about 110 kms away from the east of Patna and at a close distance from NH-31.

2.1.1 *Existing Project*

Barauni Thermal Power Station (BTPS) has been operating since 1960s as a coal fired thermal power plant under BSPGCL. A brief history of the timeline of the various units under BTPS has been provided in the table below.

Table 2.1 Overview of Barauni TPS

Unit	Equipment Specification	Rated Output (MW)	Commencement of Commercial Operation	Present Situation	Manufacturer
No.1	Coal-fired Sub-critical type unit	15	Jan. 26, 1966	Abolished	L&C Steinmüller
No.2		15	Jan. 16, 1963		
No.3		15	Oct. 20, 1963		
No.4		50	Nov. 9, 1969	Shutdown due to an environmental pollution problem on Apr. 24, 1996	Polish
No.5		50	Dec. 1, 1971	Shutdown due to an environmental pollution problem on Mar. 15, 1995	
No.6		110	Dec. 1, 1984	R&M/LE*1 ongoing	BHEL made
No.7		110	Mar. 31, 1985	R&M/LE*1 ongoing	
No.8		250	December, 2016 (Tentative)	Currently under construction	
No.9		250	December, 2016 (Tentative)	Currently under construction	
No. 10	Super-critical type unit	660	-	Expansion Unit	

*1: R&M/LE, Renovation & Modernization and Life Extension
Source: Detailed Project Report

Units 1 to 5 have been operational since 60s/70s and Unit 6&7 were further added in the decade of 80s. The manufacturer and design for the thermal power plant was based on L&C Steinmüller model for Units 1 to 3 and based on Polish model for Units 4 and 5. For Units 6 to 9, BHEL has been the manufacturer and is handling the design, construction of the main plant and

other project components (including ash dyke area). Units 8 & 9 are presently under construction and Unit 10 is the expansion unit which is being discussed in the present due diligence report. It is to be noted that some of the facilities will be shared by Units 8, 9 and 10; the same has been discussed further.

2.2 *KEY PROJECT COMPONENTS*

The project consists of the following components:

2.2.1 *Plant area (Proposed)*

The plant area proposed includes the following:

- **Main power plant area with one (1) unit of power station** (660 MW);
- **Coal source and Railway Track**: The domestic coal will be used as main fuel and light diesel oil will be the secondary fuel. The coal will be transported from the allocated coal mine to the power station via an existing rail network at the west of BTPS, and onward transportation via railway branch track from station to the inside of BTPS;
- **Coal unloading facilities and coal storage area**: ERM understands that the coal linkage for the proposed plant is yet to be established. It was reported that the existing coal storage area is not adequate for the additional capacity storage required for the expansion project; therefore the coal silo storage will be adapted for this solution. There will be a requirement for additional conveyor belt separate from Units 8 & 9 for transporting the coal from railway siding area to the coal storage area and has been provisioned for in DPR.
- **Switchyard area:** It was reported that the switchyard area being developed for Units 8 & 9 may be adequate for Unit 10. However, this was not confirmed and two options of power evacuation route picked by JICA study team were also mentioned. The total length of transmission line for power evacuation which is recommended by JICA team is around 60 km approximately.

2.2.2 *Ash Dyke Area*

The ash dyke area proposed for Units 8 & 9 was 290 acres of land (approximately). It was reported that this area will be adequate for Units 8 to 10. The 290 acres of govt. land has been transferred to BSPGCL. The present legal status pertaining to land based on review of the Supreme Court Judgement is captured in ***Box 1.1***.

BSPGCL has sub-contracted the construction works for ash dyke, ash pipeline corridor to BHEL. Presently, the layout design and planning for these project facilities is ongoing and no construction has begun.

2.2.3 Water Pipeline

The river water will be drawn from the nearby Ganga River which is at a distance of approximately 3.5 km from the BTPS site. It is reported by BSPGCL that there is an issue pertaining to the water intake point, which supposedly is a part of railway land and permission for the same needs to be obtained. Further details on this are not available at present.

The Project is located in Begusarai and Mokama Tehsil in Patna District of Bihar state. The layout of the project component is shown in ***Figure 2.1***.

Figure 2.1 Main Plant Area and Project Components

Source: Detailed Project Report

2.3 *LAND REQUIREMENT*

The land requirements of the existing project and the expansion project have been indicated below.

2.3.1 *Existing & Proposed Project*

It was reported that the land for main plant area (which includes power plant for Units 1 to 7) was acquired in stages across various years. The initial 38 acres was acquired in the 1960s, whereas additional 298 acres was acquired in the 1980s. Further, parcels of land for power house, greenbelt and residential colony were acquired during the years from 1958 to 1970.

As mentioned, the proposed project will involve setting up an additional unit of 660 MW. The key project components for the proposed thermal plant are:

- Main power plant area with 1 unit of power station;
- Coal unloading area and storage area;
- Switchyard area;
- Railway sliding;
- Ash dyke area and ash pipeline;
- Water pipeline;
- Green belt area;
- Miscellaneous.

The land requirement for the expansion unit (Unit 10) has been presented in the table below.

Table 2.2 Land Requirement for the Expansion Unit

Sl. No.	Description	Area (in acres)
A.	Main Plant Area	370
A.1	Proposed 1 × 660 MW plant area	
	Main Power plant including transformer yard	15
	Coal Silos & Handling systems	25
	Water system and related equipment	19
	Cooling Tower Area	10
	Switchyard (400 kV)	5
	Miscellaneous plant facilities	5
	Road & Drains	5
	Total for A.1	84
A.2	Existing 2 × 250 MW plant area	
	Total for A.2	166
A.3	Outside Plant	
	Green area and laydown area	104
	Rail track area	16
	Total for A.3	120
B	Ash pond and slurry pipeline	290
C	Water Intake Facility	20
	River water sedimentation/Setting Basin	
	River Intake pipeline	
	Grand Total, A+B+C (rounded)	680

Source: Detailed Project Report

The available land in the existing power plant already meets the requirement for majority of the project components of the expansion project as well. In this context it is important to summarize the context of the land requirement.

As this is an expansion project, even though some of the project components are developed independently, some of the components and facilities are shared with the previous units. The ash dyke area, ash pipeline, water pipeline, and railway siding will be shared among units 8, 9 and 10.

For the expansion project, it has been informed by BSPGCL that additional land will be required for ash pond, ash pipeline and water pipeline which will be shared facilities with Units 8 & 9. The DD study is taking into consideration the land procurement process for approximately 290 acres required for ash dyke area (reference: DPR).

- The expansion project will not involve additional land for the main plant area and the ash dyke area.
- Land for ash dyke area will be shared by Units 8, 9 and 10 (for legal status of land refer to ***Box 1.1***.
- Land is being acquired for the ash pipeline area which will also be shared among the units.
- ROW permission is being obtained for water pipeline from the railway authorities.

2.3.2 Coal Linkage and Land for Coal Storage/Transportation

For the expansion project, the coal linkage is yet to be established. It is being planned that the coal for Units 8 and 9 and will be purchased from Badam Coal Block, located in North Karanpura District in Jharkhand. The total reserves in this mine are 144.63 MT and this will be transported via railway route over a distance of 422 km.

The land requirement will be 25 acres for coal silos and handling systems. It was reported that the coal storage area is not adequate for the additional capacity storage required for the expansion project; therefore the coal silo storage will be adapted for this solution.

2.3.3 Land for Transmission Line

For transmission line, additional land may or may not be required (not confirmed yet). It is reported that the right of way will be acquired for power evacuation – 400 kV which may be connected with the grid at Gaighat (new) s/s (this has not been finalized yet).

With grid finalization, the total area requirement for transmission line will be known.

2.3.4 Land for Water Pipeline

For water pipeline, the layout has not been completely finalized. As reported by BTPS, the water pipeline length is reported to be 3 km approx. This involves laying of 4 underground pipelines of 650 mm and 600 mm diameter for 2 each crossing through guide bund and also laying of 33 kV underground electrical cables crossing near Railway land near Rajendra Pul Railway Station. **While the permission to lay a pipeline has been obtained, however the permission to access the intake point is pending at present from the Railway authorities.**

The right of way (RoW) permission was granted by the Divisional Railway Manager as on 1st September, 2014. A Memorandum stating the same has been reviewed. An amount of INR 6 crores 60 lakhs towards the same has been deposited with the Divisional Railway Manager of East Central Railway. This is applicable only for a period of 10 years.

As per site observations, this land is being cultivated by the famers from Simariya village and others in the nearby areas. The section near to the intake point also gets inundated with water during monsoons – the period when the Fisheries Department allows fishing to take place on auction basis. The railway land remained unused for a long time – allowed the Fisheries Department to use the land for fishing purposes during the specific season. However, the ownership rights of the said parcel vests with the Railway.

At one place near Simariya *ghat* (1), it will cross above ground and perpendicular to Indian Oil Corporation limited (IOCL) line. A section of about 600m - 800m will cross through the *ghat* area and will also require temporary removal of about 4-5 shops and perhaps more structures depending upon the final layout of the pipeline. It was also reported by BTPS that one of the huts was displaced while laying the water pipeline. A widow was the resident of the house and a new replacement house has been provided at a nearby location. The documentation supporting the same was not made available for review.

2.3.5 Land for Access Roads

The main plant area can be easily accessed by NH 31. The access road is required mainly for the ash dyke – for movement of labour and vehicles during the pre-construction and construction phases of the project and also for operation/maintenance of the ash pipeline corridor and the ash dyke. The existing pathway is a long dirt road through village Simariya – approx. 2.5 kms from the ash dyke area. It was reported that there might be an additional land requirement of 5 acres.

(1) The term *ghat* refers to a series of steps leading down to a body of water, particularly a holy river.

2.3.6 Land for Ash Pipeline Corridor

The ash pipeline corridor connecting the ash dyke area with the main plant area is approximately 2.5 kms long and 50m wide. This will be constructed on an elevated platform and a pathway crisscrossing the platform will be created in order to allow unrestricted access for the villagers in the areas nearby. The ash pipeline will pass through the administrative jurisdictions of both Patna District and Bihar District:

- The section of the pipeline in Patna District comprises of entirely government land and is included in the 290 acres land (area of ash pond).
- **The section of Begusarai District will involve 3.75 acres of private land for which land has been acquired as on 22nd January, 2014. The certificate of possession of land has been reviewed**;
- It was reported that the ash pipeline will also involve displacement of nearly 10 houses of village Jagatpura (revenue village Ramdiri). Further details on the same have not been made available for review.

2.3.7 Previous Land Acquisition Undertaken for Ash Dyke Area (for Expansion Unit)

During the preliminary planning stage of the expansion unit (Unit 10), it was envisaged that for ash dyke area additional land will be required, over and above the land for ash dyke for Units 8 & 9 i.e. 290 acres of land.

It was anticipated that an additional land of approximately 206 acres of land will be required for the ash dyke area (129 acres of private land and 77 acres of government land). However, this land will not be required any further. This conclusion has been made by BSPGCL.

The details on the land status for the expansion project have been presented in the table below. This includes the status on the ash dyke area.

Table 2.3 Status Update on Land Involved/Required in Unit 10

Project Component	Administrative	Total Area Required	Date of Land Acquisition/ Land Transfer	Legal Status	Current Status	Deposited money: INR
Ash Pond Area (Common for Units 8, 9 and 10)	Patna District	Government Land 290.0 acres Including 26.25 acres of ash slurry pipeline	June 12, 2013	• Govt. notification for transfer of land issued for 290 acres as on June, 2011 • Cheque Deposited by BTPS with District Magistrate, Patna as on 11th April, 2011 (Source: Documents Reviewed)	• Local community has claimed the land title on said land and this subject is raised to High court which dismissed the case. Subsequently SLP was filed in the Supreme Court which was dismissed by the Supreme Court in its judgement dated 13-01-2016. For current legal status refer to ***Box 1.1***. • There we 11 petitioners in the case.	Rs 364,891,499 ※paid on April 11, 2011 for 514.41 acres (amount of 19,111,503 was deposited for 23.93 acres on July 30, 2010)
Ash Pipeline Area	Begusarai District	Private Land – 3.75 acres	Jan 22, 2014	• Land has been acquired by BSPGCL as on 10th December, 2012 • The certificate of possession of land was received as on 22nd January, 2014 (Source: Document Reviewed) • Status regarding compensation payment can only be available with approval of BSPGCL	• Approximately 10 households need to be relocated. • Additional 0.2 acres of land is required for rehabilitation of displaced families from the pipe corridor for which acquisition has already been filed as on 23rd January, 2015. • The District LAO filed his letter as on 9th February, 2015 has requested for re-filing of acquisition furnishing additional details pertaining to the same.	Rs 16,255,288
		Private Land – 0.200 acres (Relocation Site)	-	• The Relocation site has not been identified and acquired. (Source: BSPGCL)	-	
Water Pipeline Area	Begusarai District	Water Intake, Pipeline area and tank (approx. 3 kms) – 15.5 acres;		• Permission issue pending for water intake, as reported by BSPGCL; • RoW facility provided by Railway authorities; (Source: Document Reviewed)	-	

Source: Consultations with BTPS and BSPGCL management

The findings of the study are therefore captured for the requirement of 290 acres of land and other land requirements which have already been enlisted in ***Table 2.3.*** The issues pertaining to the extra private land (129.6225 acres) earlier required for the project and the extra Government land required (Land 76.8875 acres) will be referred to wherever required. The status of land for ash pipeline and water pipeline will also be discussed wherever required.

3.1 OVERVIEW – CONTEXT SETTING

Based on the information available, it is understood that the expansion project may not involve additional land for any of the project components including ash dyke area. As mentioned, the ash dyke will comprise of 290 acres of government land which will be shared by Units 8, 9 and 10. The land however had legal claims associated with it which has already been captured in ***Box 1.1***. During site visit, it was observed that villagers are engaged in agricultural cultivation on this parcel and a few temporary huts were also observed.

In addition, the ash pipeline also constitutes of 0.2 acres of private land and as mentioned, this involves displacement of nearly 10 houses. The resettlement process has been initiated; however a new resettlement site has not been identified. BTPS has sought help from the land administration for undertaking the resettlement process.

The chronology of the government land transfer concerning the land involved for the ash dyke has been presented below:

Table 3.1 Chronology of Government Land Transfer (290 acres)

SN	Stages of Land Transfer and Further Updates	Date/Remarks
1.	Govt. notification for transfer of land issued for 290 acres	June, 2011
2.	Cheque Deposited by BTPS with District Magistrate, Patna	11th April, 2011
3.	High Court Case Filed by Petitioners	2011
4.	High Court Dismissed the case and made the judgement in favour of Government and against petitioners	18th April, 2013
5.	SLP filed by the petitioners with Supreme Court	13th November, 2014
6	Supreme Court Dismissed the Special Leave Petition mentioning the following in its order: • a deadline of 3 weeks for removing the Status Quo on land; and 3 weeks for filing any civil suit to establish ownership over the land	13th January, 2016

Source: Primary Consultations and Case Documents

3.1.1 Retrospective Review of the Alternative Land Parcels for Ash Pond

The review of the Supreme Court litigation and discussions with the BSPGCL management indicates that:

There were five land options (A, B, C, D and E) which were considered for the project or suggested at different stages during the planning phase, but eventually could not be finalized because of certain reasons. Additional areas within the vicinity of the project were surveyed and none other alternatives were found suitable for the project.

Figure 3.1 Alternative Land Parcels

Source: BSPGCL

Some of the reasons for not considering the plots have been indicated below.

Table 3.2 Plot options and issues associated

Plot Option	Issues associated and Remarks
PLOT A	Plot A was not considered by BTPS mainly because of community sensitivities involved. The then DM of Begusarai suggested to find an alternative land to BSPGCL and the BPIC officials;
PLOT C	Plot C was suggested by the Revenue Department of Muzzafarpur District and was not considered by BTPS – as the land area was insufficient as per the then project requirements.;
PLOT D	Plot D was not considered as the ADM, Begusarai informed that the identified 550 acres of land is under litigation.

Plot Option	Issues associated and Remarks
PLOT E	Plot E constitutes of land which is around 25-30 feet below the ground level and is used to store flood water through ring bund when the water level of the river Ganges goes up. The site is on the other side of railway line and also NH and require crossing of both and hence was not considered to be feasible.
PLOT B	Plot B was jointly identified by BSPGCL and BPIC representatives, which has been finally allocated to BTPS. At the time of selection, the land area was free of all encumbrances and the area reportedly did not have villages in the immediate vicinity

Source: BSPGCL

Considering all the above options, land area B was found to be suitable as alternative for the project and was considered for acquisition. BPIC supported with information on the plot numbers and the tentative area for further action to the Land Acquisition Department of Patna District. The payments towards this land were subsequently deposited with the Land Department at the District level. This is presently facing litigation in the court.

Government has maintained that Plot B, which is presently allocated to BTPS, was actually almost 490 Acres. Out of this, 200 acres of land approximately were covered under *Jambandi* (revenue records), while the rest 290 acres did not have any *Jambandi* document and it is maintained by the Government that the said land is therefore Government land.

3.2 FINDINGS BASED ON THE SITE VISIT

3.2.1 Identification (listing) & Status of the Project Affected Persons (PAPs) and Project Affected Plots

3.2.1.1 For ash pond and associated facilities

As mentioned, it was anticipated that an additional land of approximately 206 acres of land will be required for the ash dyke area (129 acres of private land and 77 acres of government land). The listing of the PAPs and project affected plots was undertaken by the local administration for these land parcels. However, as per the final ash pond strategy, this land will not be required any further.

For the 290 acres of land, the list of the PAPs and project affected plots has not been undertaken by the local land authorities as it is categorized as government land. The livelihoods of the families dependent on this land may become vulnerable in case they have to discontinue their dependence and hence listing of PAPs will be required in such a scenario.

Irrespective of the outcome of the civil petition (in case filed by the land claimants) the PAPs will need to be provided livelihood restoration support. In case the claimants win the title suit (in case filed by the land claimants),

such families will be directly affected PAPs. Also, the applicability of the local regulations will shape the identification of PAPs; this will also take into account the JICA and WB guidelines for identification of PAPs.

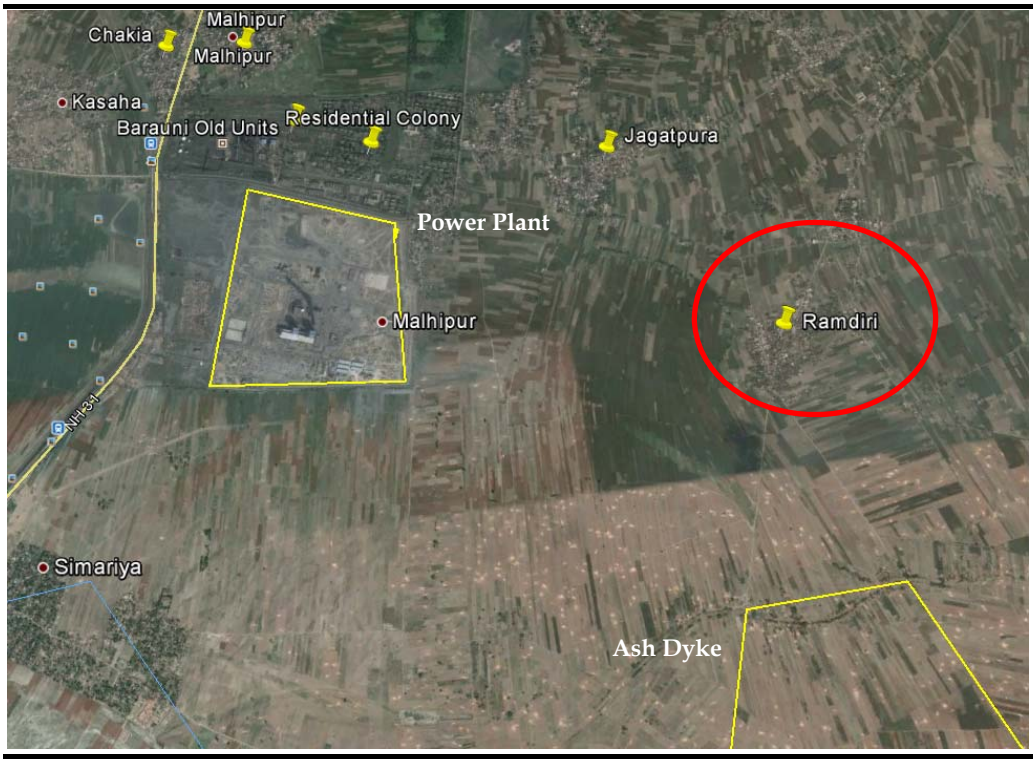
3.2.1.2 *For other project components*

The discussions with the management of BTPS and BSPGCL indicate that there will be requirement for some additional land in case of other facilities such as water pipeline etc. However, at this stage it is not resolved whether such land will be diverted from the existing land under the ownership of BSPGCL, or additional land will be transferred and/or acquired. At this stage, further information on this is not available.

3.2.2 Eligibility of entitled persons for compensation against the loss of property and livelihood

For the 290 acres of ash pond area, based on the observations on site and the discussions with the BTPS and BPIC representatives, it was gauged that there are over 100 families cultivating on the parcel of land at present and being in close proximity to the Ganga River. The land is well irrigated with high productivity and yield. Discussions with the officials at the Tehsil level indicate that majority of the people, belonging to Ramdiri village (highlighted in red in ***Figure 3.2***) and of Bhumihar caste, have been cultivating in this area for over 2-3 decades. Historically, under the Zamindari system (*land revenue system introduced under the colonial government in India*), the large landlords had sub-let smaller parcels of land to tenants for cultivation.

Figure 3.2 Location of Ramdiri Village (East to Power Plant and North to the proposed ash dyke)



Source: Google earth pro accessed on 20/12/2014

Some of the community members report that they have been cultivating ever since. It can be gauged that there is a significant dependence on the land for the potential PAPs as a livelihood source and income.

Irrespective ***of the*** legal outcome of the case (refer to the present status in ***Box 1.1***), the extent and magnitude of livelihood loss needs to be assessed and accordingly compensated. BSPGCL will be responsible for the same.

In case the petitioner (claimants) are able to establish their title claim (in case title suit is filed by land claimants), this will further lead to a situation in which the Government will either resort to land acquisition as per the right to fair compensation and transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 and related Bihar state rules or the project may prefer to go for negotiated settlement. This is however a foresight depending upon the understanding of the present practices.

If the verdict is not in favor of private claims, based on international standards/JICA guidelines, compensation will need to be provided for those identified as PAPs.

3.2.3 Entitlement Matrix for the land acquisition and resettlement

In continuation to the previous point, after having identified the PAPs for the project, the entitlement matrix needs to be shaped against the livelihood loss.

During the site visit, it was observed that villagers are engaged in agricultural cultivation on this parcel and a few temporary huts have been established near the boundary area of the ash dyke, perhaps for crop protection purpose. The physical possession of the land has not been taken by BSPGCL.

The extent of livelihood dependence on this land parcel could not be precisely gauged as primary consultations could not be undertaken with the affected persons. The broad entitlements need to be shaped based on the loss of income (permanent or temporary) and loss of assets, if any.

3.2.4 Information on the household – gathered from the Project Proponent or relevant Government authority

For the area under discussion, the information on the household – asset profile, land owner details, total land holding size of the supposed land owners – has not been collected either from the district land authorities or from the project proponent. Some of the details such as the land holding size of the supposed land owners may be available with the local Patwari (village level accountant or such local accountant); however such a document was not found readily accessible during the site visit.

As the ash pond area is considered as government land on records, the land transfer process did not involve survey of the potential PAPs.

3.2.5 *Record of stakeholder consultation points raised during the past acquisition and commitment of the project proponent on the same along with action plan*

BSPGCL and BTPS have not shared any formal records of the stakeholder meetings and consultations (concerns, perceptions and expectations) undertaken with the PAPs and other community members residing in the vicinity area. BTPS and BPIC had undertaken consultations with some of the community members in the planning phase of Units 8 & 9. While some were in favour of the project, several others expressed concerns regarding the project coming up in their area.

As informed, BTPS representatives have not undertaken any formal meeting or consultation with the potentially affected villagers or the nearby community members for the expansion Unit 10.

Public Hearing for Units 8 & 9 - in fulfilment with the EIA requirement

Additionally, in the process of obtaining environmental clearance for the project, BTPS representatives had undertaken two public hearings on 8th July, 2011 at Town Hall, Begusarai District and on 11th November, 2011 at Block office, Mokama in Patna District. In both the hearings, representatives from BSPGCL, BTPS, District authorities and also officials from the Pollution Control Board were present to address the concerns of the community members. Since the ash pond is a shared facility across Units 8, 9 & 10, the stakeholders for Unit 10 will be common as that identified for Units 8 & 9.

Some of the issues that were raised during the public hearing have been summarized as follows:

Table 3.3 Summary of Issues and Responses

Sl. No.	Issues raised	Responses by BTPS
1.	The area for ash dyke and the way in which the fly ash generated will be reused	• About 500 acres of land has been identified towards the south-east of the project. • The location has been further described to the participants. • BTPS will follow the fly ash management guidelines of MoEF and has initiated discussions with various cement/brick manufacturers/road contractors for off-take of the fly ash.
2.	Additional information on the land acquisition details for the project	• The project proponent stated that the land shall be acquired as per the Government of Bihar policy and suitable compensation shall be paid to the land losers.
3.	Water pollutants and water infected diseases	• The treated effluent will be utilized within the plant premises to the maximum extent.
4.	The pollution and hazards due to the old running units are critical and	• The project proponent informed that the old units were running below the norms of pollution control board but they have been shut since 1993 and are presently

Sl. No.	Issues raised	Responses by BTPS
	hampering agricultural cultivation	undergoing renovation and modernization work. Several initiatives are being taken to meet the pollution standards and norms.
5.	The survey no. 10 land (proposed ash dyke area) belongs to farmers, whereas it is declared as government land. The proposed land acquisition record should be properly investigated so that the farmers could get proper compensation	• The project proponent had informed that the land shall be acquired as per the Govt. of Bihar policy and suitable compensation shall be paid to the land losers. • Further, the requisite land ownership papers for survey no. 10 may be submitted to District magistrate or BSPGCL for consideration for dispersal of compensation to the land loser.
6.	Most of the land being acquired for the expansion of thermal power belongs to the village Ramdiri of Begusarai District, so why is the public hearing conducted at Mokama in Patna District?	• The project proponent explained that part of the land being acquired lies in Patna District. Hence, one public hearing each is being conducted in Begusarai and Patna District.
7.	Thermal plant expansion is required, but instead of acquiring the proposed piece of land, the land existing in between the present unit and proposed ash pond land should be acquired, which is a disputed barren land	• The project proponent has informed that the land being acquired has been identified by the technical committee considering various parameters like distance from river, power plant, availability of contiguous land in one single patch under government ownership with minimum R&R requirement, no obstruction etc.

Source: EIA Report, 2×250 MW Barauni Thermal Power

3.2.6 Record on compensation against the loss of property and livelihood

For 129 acres of private land, it should be noted that the compensation has been deposited by BSPGCL with the District Collector. But the compensation has not been accepted by majority of the Project Affected People (PAP) and the reason behind the same will be confirmed. However, as previously mentioned, this area is not being considered by BSPGCL and has not been included in the latest DPR.

In the present scenario, based on the civil suit litigation outcome, if the private claims are identified, then BSPGCL will have to compensate the PAPs through cash (replacement cost of land) and in kind (restoring livelihoods to a better status than previously). Also, BSPGCL will need to meet JICA/ WB guidelines to mitigate the impacts on PAF, even though legal claims are not established.

3.2.7 Record on resettlement assistance and livelihood restoration provided, if any.

For any of the additional land being procured, there has been no survey undertaken by the project proponent pertaining to resettlement and livelihood restoration.

Previously, since the project proponent anticipated that no private land will be acquired for the development of proposed project, no rehabilitation and resettlement aspects were envisaged and accordingly R&R action plan was not prepared for the project.

If the families dependent on 290 acres (ash pond area) for livelihood sustenance need to be displaced and/or resettled, BSPGCL shall consider if any livelihood support or to at least recover to the level of living standard will be provided

3.2.8 Record on assistance provided to the vulnerable people in the project affected area

As the listing of PAPs has not been undertaken for the additional land required, the classification of the families has not been confirmed. The extent of vulnerable families (low income households, female, people with disabilities and minority groups.) has not been identified at present. This information will be critical and it will affect the entitlement matrix.

Typically, of the potential PAPs, the vulnerable families will be identified based on certain parameters such as physically vulnerable (physically challenged, old age etc.) and/or economically vulnerable (BPL families etc.).

3.2.9 Information about laws and regulations on CSR and application of CSR to the livelihood improvement in India

Statutory Requirement

Clause 135 of the Companies Act, 2013 (the "CSR Clause") requires targeted companies to spend a prescribed formula-based amount on CSR for the applicable fiscal year, report on these activities, or explain why they failed to spend, in the annual board report. Specifically, the CSR Clause applies to any company, during any fiscal year, with:

- a net worth of rupees 500 crore (about U.S. $90 million) or more;
- a turnover of rupees 1,000 crore (about U.S. $180 million) or more; or
- a net profit of rupees 5 crore (about U.S. $900,000) or more.

The Board of the company shall ensure that the company spends, in every financial year, at least two percent of the average net profits of the company made during the three immediately preceding financial years.

It is not precisely known whether the net profits of BTPS have crossed the threshold criteria as the details have not been shared. None of the units are operational at present. While Units 6 & 7 are undergoing refurbishment, Units 8 & 9 are still in the construction stage. Units 1 to 5 may be scrapped entirely.

Voluntary CSR Initiatives

It was reported that till date, BTPS has not undertaken any community development initiatives or interventions in the vicinity area villages nor any such strategy has been chalked out.

However, as part of previous study for Units 8 & 9, the proponent has made certain commitments as part of CSR. A total of 14.64 crores were to be allocated, as indicated in the EIA report. This amount was being planned to be spent across the following themes:

- Maintenance of schools;
- Providing scholarships to poor children, distributing books, adult literacy;
- Maintenance of water supply, village roads;
- Health check-up camps, medical camps, logistics support, ambulance facility;
- Maintenance of parks, power supply, village roads, drainage;
- Developing nursery plantations.

During the site visit, the community initiatives had not begun to be implemented by BTPS. No additional details pertaining to this have been shared.

3.2.10 Information about active NGOs, policies on economic development, vocational training, unemployment rate and other development plans in the region

Based on the site visit and discussions with the project proponent, it could be gathered that there are no active NGOs in the study area. While there are a few local NGOs based in Patna District (such as Sarvangin Vikas Samiti (SVS), Daudnagar Organization for Rural Development (DORD), Sanghamitra, and Manav Chetna Vikas Sangathan) and Begusarai District (Welfare Association Club, Bharat Vikas Parishad, Lok Seva Sanstha, and Sanskritik Vidyapeeth); however they did seem to be operating in the study area. Based on secondary review, it was found that there are no national-scale civil society organizations functional in and around the study area.

There are very few higher educational institutions in the study area. The nearest facilities for arts and science degree colleges, for engineering colleges and for vocational training institute are at a distance of over 10 kms from the power plant. Most of these higher educational institutions are in Begusarai.

As part of the development plans, the state government has been implementing the rural electricity scheme - Rajiv Gandhi Vidyutikaran Yojana (RGGVY) across villages in Begusarai and Patna District. The scheme targets creating adequate electricity infrastructure and completing household electrification.

3.2.11 Grievance mechanism and status of the implementation

Both BSPGCL and BTPS do not have a formal grievance mechanism to officially register, track and redress the grievances received from the internal and external stakeholders.

For internal stakeholders, the grievances, if any, are received and addressed mainly verbally and via emails for some of the employee staff in the organization. For community stakeholders, there is no direct interface and there is no mechanism established to hear any concerns and expectations etc. BTPS has not undertaken any consultations with the local community and the potential PAPs for the proposed expansion unit.

However, consultations with the local community has been undertaken with the community members as part of the public hearing process and some of the concerns have already been raised and addressed to an extent. The BTPS representatives have undertaken consultations with smaller groups, considering the overall community sensitivities. The details of the public hearing process have been discussed in the above sections.

3.2.12 Identification of responsible organization (central government, local government, consultant, NGO, etc.) for the resettlement and their responsibilities

For the additional land required, the project proponent has not undertaken any planning for resettlement and the responsibilities associated. Hence, the strategy to undertake the resettlement and livelihood restoration process and the identification of responsible organization (central government, local government, NGO etc.) for implementation of the same has not been undertaken by the project proponent.

Further, based on the Supreme Court judgement, the responsibilities will either be shared by the project proponent and the land administration or solely by the project proponent to comply with the JICA and WB standards.

3.2.13 Implementation schedule

With regard to the additional land required, the project proponent is still at a very preliminary stage. There is no implementation schedule charted clearly and no specific target dates.

3.2.14 Budget and resource of budget

There is insufficient information at this stage.

3.2.15 Organization responsible for monitoring and record of the implementation

There is insufficient information at this stage.

3.2.16 Consultation/stakeholder meetings

As mentioned, the project proponent has not undertaken any consultations or stakeholder meetings with the affected people and the local community at large concerning the expansion Unit 10. There hasn't been any interface in the context of the expansion project as yet.

However, the project proponent has planned to undertake stakeholder meetings in the near future with select community members and groups in the villages Ramdiri, Kasaha, Chakia, Jagatpura and other adjacent villages, while considering the sensitivities pertaining to land litigation etc.

3.3 REGULATORY REVIEW

3.3.1 Gap Assessment vis-à-vis OP 4.12 World Bank

The findings and gaps identified vis-à-vis the requirements identified by the World Bank for a resettlement plan has been presented below.

Table 3.4 OP 4.12 Resettlement Plan – World Bank

Sr. No.	Points highlighted in OP 4.12	Key Findings and Observations	Further areas of improvement
1.	Socio-economic studies - the findings of the socioeconomic studies (including census survey) to be conducted in the early stages of project preparation and with involvement of potentially displaced people.	• The socio-economic study is currently being undertaken by BSPGCL through ERM in the project planning phase; • The primary consultations and census surveys with the potentially displaced people have not been undertaken as yet; • These may be conducted based on the formal approval of the project and the permission provided by BSPGCL.	• The census survey should account for the household characteristics, the magnitude of livelihood loss, the information on vulnerable groups etc.
2.	Other studies - describing land tenure and transfer system, inventory of common property resources, public infrastructure, social networks, socio-cultural characteristics of communities etc.	• The objective of this land DD report is to capture the approach followed for the land acquisition and transfer process; • The socio-economic studies being undertaken capture the public infrastructure available (physical and social) in the study area; • Information on common property resources (CPR), livelihood sustenance, and non-title based usufruct systems, social networks and interactions, formal and informal institutions have not been captured. Primary consultations for the same need to be undertaken.	• Primary consultations need to be undertaken with the PAPs and information on the topics identified (CPR etc.) need to be captured through the socio-economic study and supporting studies, if required.
3.	Legal Framework – findings of analysis covering nature of compensation, valuation, applicable legal procedures, relevant customary and traditional laws, gaps between local resettlement policy and bank's resettlement policy etc.)	• It is assumed that the additional land is required only for ash pond and ash pipeline (as information on land for other project components has not been shared) and as mentioned this area is presently under litigation; • The findings study on land (in the legal context) are incomplete at this stage as the resolution on the land area has not been made by the SC; • It is difficult to highlight the gaps on the legal procedure followed and the gaps between local and bank's resettlement policy etc.	• The project proponent should comply with the customary/traditional laws, national land laws and world bank's resettlement policy
4.	Institutional Framework – the findings of an analysis covering – identification of agencies responsible for resettlement activities and NGOS for implementation	• As mentioned, based on the SC judgement and the final land categorization, the specific responsibilities associated with the resettlement process will be identified; • At present, there is no agency or NGO identified to undertake the implementation of resettlement and livelihood restoration;	-
5.	Eligibility – definition of displaced	• At present, for the potential PAPs, the project has not defined the	• The project proponent needs to

Sr. No.	Points highlighted in OP 4.12	Key Findings and Observations	Further areas of improvement
	persons and criteria, including cutoff dates.	criteria for determining the eligibility for compensation and resettlement assistance, including cutoff dates.	define the eligibility, after listing the PAPs of the expansion project
6.	Valuation and compensation for losses	• Based on the decision of the Supreme Court, the private claims may or may not be identified; • At present, the project proponent has not developed a methodology to be used in valuing losses to determine the replacement cost etc.	• Based on the court decision, if the private claims need to be identified – then the land valuation is to be undertaken (to achieve replacement cost) and losses to be compensated accordingly.
7.	Resettlement Measures (compensation package and other measures to assist the displaced persons)	• As mentioned, the resettlement measures will be identified after the resolution on the land area (ash pond) has been made by SC; • The resettlement for families on the land area constituting 0.2 acres (in the ash pipeline) will involve displacement of 10 families; • Additional details (compensation package etc.) had not been made available.	• The project proponent will need to develop a compensation package and additional entitlements to compensate adequately for the livelihood loss
8.	Site selection, site preparation and relocation (alternative relocation sites etc.)	• For the families to be displaced due to ash pipeline, new resettlement/relocation site had not been identified.	• The project proponent should ensure that the site selection should consider aspects indicated in OP4.12
9.	Housing, infrastructure and social services	• At this stage, there is insufficient information on this.	-
10.	Community Participation (Involvement of resettlers and host communities/ Integration with host populations	• The resettlement plan has not been formulated and the host communities have not been consulted for the same, as yet.	• The project proponents need to ensure community participation (esp. PAPs) in resettlement plan and process.
11.	Grievance procedures	• There isn't any grievance mechanism for community stakeholders or for PAPs to raise their concerns, if any	• The project proponent needs to develop a grievance mechanism and also make it accessible
12.	Organizational responsibilities (identifying agencies for implementation of resettlement measures)	• Based on the title suit claim (in case filed by the land Claimants), it will be known whether the entire responsibility of resettlement will be on BSPGCL or will be shared with the local land administration etc. • The project proponent may or may not involve any agency in the	-

Sr. No.	Points highlighted in OP 4.12	Key Findings and Observations	Further areas of improvement
		resettlement implementation process;	
13.	Implementation schedule (target dates for resettlement plan preparation and implementation)	• There is insufficient information on this at this stage.	-
14.	Costs and budget	• There is insufficient information on this at this stage.	-
15.	Monitoring and evaluation	• There is insufficient information on this at this stage.	-

3.4 WAY FORWARD

Having set the context and discussed some of the findings based on primary and secondary data pertaining to the land area required/involved for the expansion unit, the following section delves into the way forward.

This section has been further divided into three sub-sections. The Supreme Court judgement and legal status is already discussed in ***Box 1.1***. The first section delves on the outcome/implication in case of each of the scenarios. And the third section ends with a discussion on the way forward – in terms of further assessment and studies to be conducted as a follow-up, as several information gaps exist at present.

3.4.1 Scenario analysis against possible Civil Court Judgement outcome

If Petitioner (Community) wins the case:

- The private ownership over land will be recognised, and the land will need to be
  - Either acquired by the Government through land acquisition; OR
  - BTPS and BSEB will need to undertake willing buyer willing seller approach for procuring the land.

Note: *If the land acquisition is undertaken under the Right to Fair Compensation and Transparency in Land. Acquisition, Rehabilitation and Resettlement Act and the corresponding rules of Bihar Government, the complete process may take 55 months, until the Government makes specific rules which will ease the acquisition process.*

Even if BTPS decides to undertake willing buyer and willing seller, minimum time taken to complete the negotiation and buy the land will not be less than 2 years in all likelihood, especially when due process of consultation is expected to be followed.

If Petitioner (Community) loses the case:

- The land will belong to the government and hence lease to BSEB and BTPS will be valid;
- The community alleged claims over the land will not be tenable legally; however to meet JICA and WB requirements;
  - Assets and other losses will need to be compensated;
  - Livelihood losses will need to be identified and livelihood restoration options will need to be explored;
  - The entitlement matrix in this case will account for the above two points and will be shaped accordingly.

3.4.2 Way forward keeping in context the above

ERM will undertake a follow-up study, to the extent possible, to undertake primary consultations with a sample of project affected persons, if possible to gauge the extent and magnitude of livelihood loss. This will further inform the entitlement matrix and the resettlement action plan.

ANNEXURE - V

Resettlement Action Plan Framework

ERM Impact Assessment and Planning

Resettlement Action Plan Framework for Barauni Thermal Power Plant

Kyushu Electric Power Co.

Kyushu Electric Power Co.

February 2016

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CONTENTS

TABLES

FIGURES

ACRONYMS AND DEFINITIONS

LARR	Land Acquisition, Rehabilitation and Resettlement, 2013
BSEB	Bihar State Electricity Board
BSPGCL	Bihar State Power Grid Cooperation Limited
BTPS	Bihar Thermal Power Station
CSR	Corporate Social Responsibility
DDR	Due Diligence Report
DLC	District Level Committee
DPR	Detailed Project Report
ESC	Economic and Social Considerations
ESIA	Environmental and Social Impact Assessment
GRC	Grievance Redress Committee
GoB	Government of Bihar
GoI	Government of India
HC	High Court
HIV	Human immunodeficiency virus
JICA GL	JICA Guidelines for Environmental and Social Considerations （April 2010)
JICA	Japan International Cooperation Agency
NGO	Non-Government Organization
PAH	Project Affected Household
PAPs	Project affected persons
RAP	Resettlement Action Plan
RC	Resettlement Committee
ROW	Right of Way
RAPF	Resettlement Action Plan Framework
SAP	Social Action Plan
SC	Supreme Court
SEP	Stakeholder Engagement Plan
SIA	Social Impact Assessment
ToR	Terms of Reference
WB	World Bank

1 INTRODUCTION

The proposed expansion of Barauni Thermal Power Station (BTPS) – 660 MW, a public entity owned by the Bihar State Power Grid Company Limited (BSPGCL) will be developed as Unit No. 10, brown field, river water based, domestic coal fired thermal power project with Super Critical (SC) technology, at Barauni Village, in Begusarai district of Bihar. Kyushu Electric Power Company is presently responsible for providing technical support for the construction of the proposed expansion of this coal-fired Thermal Power Station (TPS) in Bihar, under the aegis of Japan International Cooperation Agency (JICA). Kyushu Electric Power Company, (*hereafter referred to as 'Kyushu'*) is a Japan based power supplier company, founded in May 1951. The company has been providing electricity to right prefectures (1) of the country.

At present, 90% of the total power installed in the State of Bihar is fossil fuel based thermal power. The power shortage in the State of Bihar is anticipated to the tune of 15.3 % in terms of energy for the year 2014 - 15 and therefore the Government of Bihar (GoB) has planned a massive capacity addition to cater for increase in demand. In order to reduce the duration for setting up of the new power station, Bihar State Power Grid Corporation Limited (BSPGCL) has planned the extension of existing Barauni Thermal Power Station (BTPS). The Government of India (GoI) then invited Japan Government to examine a possibility of constructing a 1 x 660 MW Supercritical (SC) (2) unit at this existing station.

ERM has been commissioned to undertake a Resettlement Policy Framework (RAP Framework) by Kyushu Electric Power Company (hereafter referred to as '*Kyushu*') for the proposed expansion Unit 10 Barauni Thermal Power Project, owned by the Bihar State Power Grid Corporation Ltd. (BSPGCL). The RAP Framework is therefore prepared keeping in context the land requirement identified in detailed project report and summarised in ***Table 2.4.***

1.1 PURPOSE OF THIS RAP FRAMEWORK

The purpose of this document is to provide an *overarching framework* for land acquisition, resettlement and compensation for the Barauni Project with the overall aim of ensuring fair and just compensation for lost assets, restoration of income and livelihood and improving or at least restoring the quality of life of project affected people to the pre project level. The Resettlement Policy Framework (RAP Framework) covers the whole project and establishes the principles, procedures, entitlements, eligibility criteria and broad implementation plan that will be valid for the duration of the entire Project.

(1) In certain countries, a district under the authority of a governor or a prefect, is addressed as a prefecture.
(2) The term supercritical is used for power plants with operating pressures above critical pressure. Thermodynamic cycles which operate at parameters above critical point (at 225.56 kg/cm2 and 374.15°C) are called supercritical cycles.

This document will provide guidance for the development of resettlement action plans (RAP) covering the main as well as ancillary project component requiring compensation and resettlement.

1.1.1 Applicable Standards

- National and state land and resettlement laws and regulations
- International standards and best practice guidelines such as World Bank OP 4.12 Resettlement Plan and JICA Environmental and Social Considerations

Against this background, this RAP Framework intends:

i. to confirm the policies and entitlements to be applied to land acquisition or utilization, compensation and resettlement in the context of the projects; and
ii. to confirm the procedure for preparing the RAP for the Projects, in order to guarantee that the projects are planned and implemented in accordance with the international standards.

The following text sets out:

- the institution and policy frameworks for land acquisition, expropriation, procurement or utilization, compensation and resettlement;
- principles and procedures to be applied for land acquisition or utilization, compensation and resettlement;
- procedures for information of, and consultation with, the affected people;
- procedures for redress of grievance; and
- procedures for implementation, monitoring and evaluation of the resettlement plans.

1.2 APPROACH & METHODOLOGY

This RAP Framework provides an overview of the legislative Framework and administrative framework that will guide resettlement activities in Bihar, India.

ERM has developed this report based on limited documentation review, secondary baseline data, consultations with BTPS, BSPGCL representatives and discussions with government stakeholders. Approvals/permissions were not provided by BSPGCL for undertaking community meetings and any primary consultations in villages and with the impacted stakeholders. This did not involve any field based socio-economic surveys etc.

Therefore, at this stage, various components of the policy framework have been developed and interpreted based on certain assumptions for potential entitlement categories and compensation framework. This document should be considered as an overview which will undergo further revision post

undertaking primary consultations, community opinion/feedback and completion of land and asset inventory survey.

1.3 KEY DEFINITIONS

Some of the key definitions used in the document are as follows:

Compensation	Payment in cash or replacement in kind for an asset or a resource that is acquired or adversely affected by the Project.
Cut-off Date	The date of completion of inventory of losses during the preparation of the RAP. The PAP will be informed of the cut-off-date for the sub-project component, that anyone moving into the sub-project area after that date will not be entitled to compensation and assistance under the project.
Economic Displacement	Loss of income streams or means of livelihood resulting from land acquisition and/or obstructed access to resources (land, water or forest), associated with the Project regardless of impacts on residence and associated losses.
Entitlement Framework	The entitlement Framework provides the specific entitlements for each category of Project affected persons, which will typically include a combination of monetary compensation or in kind compensation, physical resettlement, livelihood and rehabilitation support.
Female Headed Household	A household where a woman is the principal earning member of the family.
Head of the Household	The eldest member of core family in the household, for the purpose of the project.
Lost income opportunities	Lost income opportunities will be assessed and compensated on the basis of the losses caused by the project. If a household or family has several adult members who will lose their incomes, all will be compensated.
Livelihood Restoration	The commitment to provide economically and physically displaced communities and persons compensation for loss of assets at full replacement cost and other assistance and support to restore, and preferably improve their livelihoods and standards of living.
Non-land based impacts	Non-land based project-impacts could include one or more of these
Physical Displacement	Loss of shelter resulting from the acquisition of land and/or project impacts (noise, air quality, safety, loss of access etc.) associated with the Project that requires the Project Affected Person(s) to be moved to another location.
Private property owners	Persons who have legal title to structures, land or other assets and are accordingly entitled to compensation under the Land Act. In the case of a joint title deed, the replacement land or cash compensation will be given to the joint holders who will be treated as a unit.

Project-Affected Household (PAH)	All members of a household, whether related or not, operating as a single economic unit, who are affected by the Project. It may also include other dependents living in the same dwelling or set of dwellings, like close relatives (e.g. parents, grandchildren).
Project-Affected Person (PAP)	Any person who, as a result of the implementation of the Project, loses the right to own, use, or otherwise benefit from a built structure, land (residential, agricultural, pasture or undeveloped/unused land), annual or perennial crops and trees, access to natural resources or any other fixed or moveable asset, either in full or in part, permanently or temporarily. • Physically Displaced People i.e. people subject to Physical Displacement as defined hereunder; • Economically Displaced People i.e. people subject to Economic Displacement as defined hereunder. • Restriction of access to resources i.e. people subject to denial of access to resources that were available prior to advent of project.
Project - Affected Community	A community that is affected by the project.
Resettlement Policy Framework	This overarching guidance document that the project commits to; it establishes the project's policies, procedures, entitlements, and implementation strategy in the event of economic or physical displacement throughout the life of the project.
Resettlement Support and Assistance	A range of support provided to PAPs during the resettlement process, which may include, for example transportation, and social or other services, shifting allowance to bear the cost of moving, transition allowance to compensate for the interim loss of livelihood and lost work days etc.
Replacement Cost	The amount of cash compensation sufficient to replace lost assets and cover transaction costs taxes, registration fees, cost of transport associated with registration of new land and land transfer, new dwellings and businesses), without taking into account depreciation or salvage value.
Resettlement Action Plan (RAP)	Documented procedures and the actions a project proponent will take to mitigate adverse effects, compensate losses, and provide development benefits to persons and communities affected by a project.
Vulnerable Groups	People who by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantage, or social status may be more adversely affected by resettlement than others and who may be limited in their ability to claim or take advantage of resettlement assistance and related development benefits.

1.4 LIMITATIONS

The document does not contain any feedback or opinion of the impacted groups as permissions to undertake primary consultations in villages was not provided by the project proponent.

The report is based on the laws, regulations and standards effective as of the date of completion. ERM shall not be obliged to anticipate or report any regulatory changes after the date of this report; however reasonable diligence will be ensured so that upcoming changes, if any, based on the consultations are captured to the extent possible in the document.

- Primary consultations with the land owners could not be undertaken as the permission for the same was not provided by BSPGCL;
- Limited information was shared by the relevant land related authorities at District and Tehsil level as there are potential land claimants on the leased land for ash dyke area (at discussion for the expansion unit);
- Limited cooperation was extended by BSPGCL management with regard to providing information on the land acquisition process undertaken, sharing stakeholder meeting records and other land related documentation etc.
- The land transfer process is still underway during the site visit (and litigation is ongoing); hence there are several information gaps and conclusive evidence could not be derived. This study should be treated as suggestive and indicative only.
- Information provided in this report cannot be construed as legal advice;

Professional judgements expressed herein are based on facts and information provided to ERM. Wherever ERM has not been able to make a judgement or assess any process, it has highlighted that as an information gap.

The information and statements provided in this report are not to be construed as legal advice.

1.5 STRUCTURE OF THE REPORT

The remainder of the RAP Framework report is structured as follows:

Section 2 outlines the project and various components of it;

Section 3 discusses the approach and structure of the RAP Framework

Section 4 details of socio-economic profile of the project region and potentially affected people;

Section 5 lays out the regulatory and administrative framework for

resettlement planning;

Section 6 describes the projects impacts and eligibility criteria for the project;

Section 7 lays out the entitlement criteria of various categories of affected people, valuation process and process of compensation payment;

Section 8 defines the institutional arrangements, including roles and responsibilities, for resettlement;

Section 9 outlines participation and consultation arrangements;

Section 10 describes the grievance redress arrangement in the project including the structure of committees and generating awareness about it;

Section 11 describes implementation schedule and budget for the RAP; and

Section 12 presents monitoring and evaluation requirements.

2 PROJECT DESCRIPTION

Bihar State Power Generation Company Limited (BSPGCL) is planning to develop 1X660 MW (Unit 10) Super Critical Thermal Power Plant close to its under construction units (Unit No. 8 and 9). The proposed expansion project lies in the eastern India state of Bihar and involves Patna District (Mokameh Block) and Begusarai District (Barauni and Matihani Block) and on the north bank of Ganga River, about 110 km away from the east of Patna and at a close distance from NH-31.

2.1 EXISTING PROJECT

Barauni Thermal Power Station (BTPS) has been operating since 1960s as a coal fired thermal power plant under BSPGCL. A brief history of the timeline of the various units under BTPS has been provided in the table below.

Table 2.1 Overview of Barauni TPS

Unit	Equipment Specification	Rated Output (MW)	Commencement of Commercial Operation	Present Situation	Manufacturer
No.1	Coal-fired Sub-critical type unit	15	Jan. 26, 1966	Abolished	L&C Steinmüller
No.2		15	Jan. 16, 1963		
No.3		15	Oct. 20, 1963		
No.4		50	Nov. 9, 1969	Shutdown due to an environmental pollution problem on Apr. 24, 1996	Polish
No.5		50	Dec. 1, 1971	Shutdown due to an environmental pollution problem on Mar. 15, 1995	
No.6		110	Dec. 1, 1984	R&M/LE*1 ongoing	BHEL made
No.7		110	Mar. 31, 1985	R&M/LE*1 ongoing	
No.8		250	December, 2016 (Tentative)	Currently under construction	
No.9		250	December, 2016 (Tentative)	Currently under construction	
No. 10	Super-critical type unit	660	-	Expansion Unit	

*1: R&M/LE, Renovation & Modernization and Life Extension
Source: Detailed Project Report

Units 1 to 5 have been operational since 60s/70s and Unit 6&7 were further added in the decade of 80s. The manufacturer and design for the thermal power plant was based on L&C Steinmüller model for Units 1 to 3 and based on Polish model for Units 4 and 5. For Units 6 to 9, BHEL has been the manufacturer and is handling the design, construction of the main plant and other project components (including ash dyke area). Units 8 & 9 are presently under construction and Unit 10 is the expansion unit which is being discussed

in the present due diligence report. It is to be noted that some of the facilities will be shared by Units 8, 9 and 10; the same has been discussed further.

2.2 *PROPOSED THERMAL POWER - KEY PROJECT COMPONENTS*

Some of the key features of the project components have been summarised below in ***Table 2.2***

Table 2.2 Key Features of Project Components

Components	Aspects	Description
Fuel Source & Transportation	Type of Fuel	100% domestic coal. Class/Grade "G14" domestic coal.
	Fuel Source	The coal will be sourced either from the coal blocks or the coal linkage which will be allocated by the GoI.
	Requirement	The estimated annual coal requirement has been assessed as 2.8 MTPA
	Transportation	Domestic coal would be transported by the India Railway System in bottom opening coal wagons.
Power Evacuation	Substation	Gaighat substation (400kV) is chosen as connection point, located at Baktiyarpur, southern side of the Ganga River.
	Transmission Line Length	The line length is assumed to be approximately 60-70 km from BTPS.
Water	Source	River water will be drawn from nearby Ganga River, which is at a distance of 3.5 km from the power plant area.
Ash Disposal	Disposal area	The ash disposal area of capacity approximately 10 million m^3 common for Units 6 to 10 has been planned in a land area of 290 acres situated at a distance of 2.7 km south east from the main plant area.

Source: DPR

The following section provides additional details on some of the project components on the basis of the information collected from BTPS and BSPGCL representatives.

2.2.1 *Main Plant area (Proposed)*

The plant area proposed includes the following:

- **Main power plant area with one (1) unit of power station** (660 MW);
- **Coal source and Railway Track**: The domestic coal will be used as main fuel and light diesel oil will be the secondary fuel. The coal will be transported from the allocated coal mine to the power station via an existing rail network at the west of BTPS, and onward transportation via railway branch track from station to the inside of BTPS;
- **Coal unloading facilities and coal storage area**: ERM understands that the coal linkage for the proposed plant is yet to be established. It was reported that the existing coal storage area is not adequate for the additional capacity storage required for the expansion project; therefore the coal silo

storage will be adapted for this solution. There will be a requirement for additional conveyor belt separate from Units 8 & 9 for transporting the coal from railway siding area to the coal storage area and has been provisioned for in DPR.

- **Switchyard area:** It was reported that the switchyard area being developed for Units 8 & 9 may be adequate for Unit 10. However, this was not confirmed and two options of power evacuation route picked by JICA study team were also mentioned. The total length of transmission line for power evacuation which is recommended by JICA team is around 60 km approximately.

2.2.2 Ash Dyke Area

The ash dyke area proposed for Units 8 & 9 was 290 acres of land (approximately). It was reported that this area will be adequate for Units 8 to 10. The 290 acres of govt. land has been transferred to BSPGCL. The present legal status pertaining to land based on review of the Supreme Court Judgement is captured in ***Box 2.1***.

BSPGCL has sub-contracted the construction works for ash dyke, ash pipeline corridor to BHEL. Presently, the layout design and planning for these project facilities is ongoing and no construction has begun;

2.2.3 Water Pipeline

The river water will be drawn from the nearby Ganga River which is at a distance of approximately 3.5 km from the BTPS site. It is reported by BSPGCL that there is an issue pertaining to the water intake point, which supposedly is a part of railway land and permission for the same needs to be obtained. Further details on this are not available at present.

2.2.4 Roads

The roads of the existing units will be mostly used for connectivity. However, any modification or new construction of the roads will be done as per the requirement. The major roads connecting main plant area and internal roads in main plant will be double lane roads with raised footpaths on both sides of the road. The type of road construction will be either flexible pavement type or rigid pavement type. All access roads to all buildings/facilities/structures will be single lane roads. The roads will be mostly of flexible bitumen road and they will be designed and constructed as per the latest IRC codes of recommendation.

Figure 2.1 Main Plant Area and Project Components

Source: Detailed Project Report

2.3 *LAND REQUIREMENT*

The land requirement for the proposed Unit 10 has been summarized as follows:

2.3.1 *Existing & Proposed Project*

It was reported that the land for main plant area (which includes power plant for Units 1 to 7) was acquired in stages across various years. The initial 38 acres was acquired in the 1960s, whereas additional 298 acres was acquired in the 1980s. Further, parcels of land for power house, greenbelt and residential colony were acquired during the years from 1958 to 1970. As mentioned, the proposed project will involve setting up an additional unit of 660 MW. The land requirement for the expansion unit (Unit 10) has been presented in the table below.

Table 2.3 Land Requirement for the Expansion Unit

Sl. No.	Description	Area (in acres)
A.	Main Plant Area	370
A.1	Proposed 1 × 660 MW plant area	
	Main Power plant including transformer yard	15
	Coal Silos & Handling systems	25
	Water system and related equipment	19
	Cooling Tower Area	10
	Switchyard (400 kV)	5
	Miscellaneous plant facilities	5
	Road & Drains	5
	Total for A.1	84
A.2	Existing 2 × 250 MW plant area	
	Total for A.2	166
A.3	Outside Plant	
	Green area and laydown area	104
	Rail track area	16
	Total for A.3	120
B	Ash pond and slurry pipeline	290
C	Water Intake Facility	20
	River water sedimentation/Setting Basin	
	River Intake pipeline	
	Grand Total, A+B+C (rounded)	680

Source: Detailed Project Report

The available land in the existing power plant already meets the requirement for majority of the project components of the expansion project as well. In this context it is important to summarize the context of the land requirement. As this is an expansion project, even though some of the project components are developed independently, some of the components and facilities are shared with the previous units.

- The expansion project will not involve additional land for the main plant area and the ash dyke area.

- Land for ash dyke area will be shared by Units 8, 9 and 10 (for legal status of land refer to ***Box 2.1***.
- Land is being acquired for the ash pipeline area which will also be shared among the units.
- ROW permission is being obtained for water pipeline from the railway authorities.

2.3.2 Coal Linkage and Land for Coal Storage/Transportation

For the expansion project, the coal linkage is yet to be established. It is being planned that the coal for Units 8 and 9 and will be purchased from Badam Coal Block, located in North Karanpura District in Jharkhand. The total reserves in this mine are 144.63 MT and this will be transported via railway route over a distance of 422 km.

The land requirement will be 25 acres for coal silos and handling systems. It was reported that the coal storage area is not adequate for the additional capacity storage required for the expansion project; therefore the coal silo storage will be adapted for this solution.

2.3.3 Land for Transmission Line

For transmission line, additional land may or may not be required (not confirmed yet). It is reported that the right of way will be acquired for power evacuation – 400 kV which may be connected with the grid at Gaighat (new) s/s (this has not been finalized yet). With grid finalization, the total area requirement for transmission line will be known.

2.3.4 Land for Water Pipeline

For water pipeline, the layout has not been completely finalized. As reported by BTPS, the water pipeline length is reported to be 3.5 km approx. This involves laying of 4 underground pipelines of 650 mm and 600 mm diameter for 2 each crossing through guide bund and also laying of 33 kV underground electrical cables crossing near Railway land near Rajendra Pul Railway Station. **While the permission to lay a pipeline has been obtained, however the permission to access the intake point is pending at present from the Railway authorities.**

The right of way (RoW) permission was granted by the Divisional Railway Manager as on 1st September, 2014. A Memorandum stating the same has been reviewed. An amount of INR 6 crores 60 lakhs towards the same has been deposited with the Divisional Railway Manager of East Central Railway. This is applicable only for a period of 10 years.

As per site observations, this land is being cultivated by the famers from Simariya village and others in the nearby areas. The section near to the intake point also gets inundated with water during monsoons – the period when the Fisheries Department allows fishing to take place on auction basis. The

railway land remained unused for a long time – allowed the Fisheries Department to use the land for fishing purposes during the specific season. However, the ownership rights of the said parcel vests with the Railway.

At one place near Simariya *ghat* (1), it will cross above ground and perpendicular to Indian Oil Corporation limited (IOCL) line. A section of about 600m - 800m will cross through the *ghat* area and will also require temporary removal of about 4-5 shops and perhaps more structures depending upon the final layout of the pipeline. It was also reported by BTPS that one of the huts was displaced while laying the water pipeline. A widow was the resident of the house and a new replacement house has been provided at a nearby location. The documentation supporting the same was not made available for review.

2.3.5 Land for Access Roads

The main plant area can be easily accessed by NH 31. The access road is required mainly for the ash dyke – for movement of labour and vehicles during the pre-construction and construction phases of the project and also for operation/maintenance of the ash pipeline corridor and the ash dyke. The existing pathway is a long dirt road through village Simariya – approx. 2.5 kms from the ash dyke area. It was reported that there might be an additional land requirement of 5 acres.

2.3.6 Land for Ash Pipeline Corridor

The ash pipeline corridor connecting the ash dyke area with the main plant area is approximately 2.5 kms long and 50m wide. This will be constructed on an elevated platform and a pathway crisscrossing the platform will be created in order to allow unrestricted access for the villagers in the areas nearby. The ash pipeline will pass through the administrative jurisdictions of both Patna District and Bihar District:

- The section of the pipeline in Patna District comprises of entirely government land and is included in the 290 acres land (area of ash pond).
- **The section of Begusarai District will involve 3.75 acres of private land for which land has been acquired as on 22nd January, 2014. The certificate of possession of land has been reviewed**;
- It was reported that the ash pipeline will also involve displacement of nearly 10 houses of village Jagatpura (revenue village Ramdiri). Further details on the same have not been made available for review.

2.3.7 Ash Dyke Area (for Expansion Unit)

During the preliminary planning stage of the expansion unit (Unit 10), it was envisaged that for ash dyke area additional land will be required, over and above the land for ash dyke for Units 8 & 9 i.e. 290 acres of land.

(1) The term *ghat* refers to a series of steps leading down to a body of water, particularly a holy river.

It was anticipated that an additional land of approximately 206 acres of land will be required for the ash dyke area (129 acres of private land and 77 acres of government land). However, this land will not be required any further. This conclusion has been made by BSPGCL. DPR also does not mention extra land required for the ash dyke area previously, for which land acquisition is already completed as per the Land Acquisition Act, 1894 (no longer applicable presently).

2.3.8 Summary of land requirement for expansion project and current status (Jan 2016)

The details on the land status for the expansion project have been presented in the table below. This includes the status on the ash dyke area.

Table 2.4 Land Requirement & Status for Unit 10

Project Component	Total Area Required	Legal Status	Current Status
Ash Pond Area (Common for Units 8, 9 and 10) Patna District	Government Land 290.0 acres Including 26.25 acres of ash slurry pipeline	• Govt. notification for transfer of land issued for 290 acres as on June, 2011 • Cheque Deposited by BTPS with District Magistrate, Patna as on 11th April, 2011	• Local community has claimed the land title on said land and this subject is raised to High court which dismissed the case. • The judgement passed by Supreme Court (Special Leave Petition (C) No. 37969 of 2013) supports the High Court judgement. • The petitioners may file the case in the Civil Court.
Ash Pipeline Area Begusarai District	Private Land – 3.75 acres	• Land has been acquired by BSPGCL as on 10th December, 2012 • The certificate of possession of land was received as on 22nd January, 2014 • Status regarding compensation payment is not known.	• Approximately 10 households need to be relocated. • Additional 0.2 acres of land is required for rehabilitation of displaced families from the pipe corridor for which acquisition has already been filed as on 23rd January, 2015. • The District LAO filed his letter as on 9th February, 2015 has requested for re-filing of acquisition furnishing additional details pertaining to the same.
	Private Land – 0.200 acres (Relocation Site)	• The Relocation site has not been identified and acquired	-
Water Pipeline Area Begusarai District	Water Intake, Pipeline area and tank (approx. 3 kms) – 15.5 acres;	• Permission issue pending for water intake, as reported by BSPGCL; • RoW facility provided by Railway authorities;	-

The present legal status of the 290 acres of land for ash dyke area is mentioned in ***Box 2.1.***

Box 2.1 Legal status of the 290 acres land proposed for Ash Dyke area

- *The Supreme Court of India dismissed the Special leave petition No. 37969/ 2013 filed by Brinda Devi and others (Arising out of impugned final judgment and order dated 18/04/2013 in LPA No. 1778/2012 passed by the High Court of Patna) in its judgement dated 13-01-2016.*
- *However, it upheld the decision of the High court which stated that the petitioners should prove the title over land and petitioner should must take recourse of law by filing a civil suit in the matter. It effectively meant that the petitioners (land claimants) in this case were free to move to file title suit in Trial Court at District level in Civil court.*
- *Earlier, the Supreme Court of India in its order dated 8-10-2014 has asked for Status quo as regards to the possession to be maintained; however in its judgement dated 13-01-2016, it ordered that such status quo will operate further only for a period of 3 weeks from the date of the Supreme Court Judgement dated 13-01-2016. So, BSPGCL will be free to take control of the land after a period of 3 weeks from the judgement date.*
- *Things may change if civil suit is filed by the petitioners (land claimants) and depending upon the judgement of the Civil court the land ownership status will be decided in future.*

Source: Supreme Court Judgement dated 13-01-2016 in Special leave petition No. 37969/ 2013 filed by *Brinda Devi and others Vs The State of Bihar & others.*

Depending upon the next civil suit outcomes the applicability of the above mentioned regulations in context to the land proposed for the ash dyke presently (reference: DPR) will be decided

3 APPROACH & STRUCTURE OF THE RAP FRAMEWORK

3.1 APPROACH AND METHODOLOGY FOR RAP FRAMEWORK

This RAP Framework has been developed based on the socio economic baseline data collection for the ESIA study and the stakeholder consultations carried out in the field with a range of stakeholders including the representatives from the various government departments, which have possible stakes in the issues related to the compensation, resettlement and rehabilitation.

The team undertook a site visit in March followed by June visit in, 2015 and has been continuously carried on to inform the development of the RAP Framework and to assess the potential application of this framework to the different project components, in their regional context. The consultations especially focused on meetings with government representatives, particularly land officials at the district level and block level – land acquisition officers, circle officer/inspector etc. Information and documents/records pertaining to the private land acquired and the government land transfer in case of ash dyke area and also the records of litigation on the ash dyke land were collected.

The summary of site visit and the consultations undertaken by the ERM team during the March and June visit have been presented in the following table.

Table 3.1 Site visit schedule and meetings undertaken

Date	Activity Brief	Discussion Topics
24th March-2015	• General meeting with the Barauni TPS GM, AGM etc. • Discussions with ESE (Extension Project) and ESE (Ganga Water Supply Project + Rly Sliding) and SE (Civil);	• Understanding the layout of facilities for the proposed project; • New land required/acquired for the proposed project;
25th March 2015	• Visit to the boundary points of the ash pond area; • Visit to the Ganga River water intake point, sedimentation tank, water pipeline area;	• Site observations – land-use area; • Discussion regarding the status of land acquired;
26th March 2015	• Visit to the main plant area for extension project; • Visit to the residential colony area, overlooking the Ramdiri village adjacent to the east side of the plant boundary;	• Site observations – land-use area;
27th March 2015	• Discussion with Executive Engineer Department of Planning & Design of BSPGCL; • Gathered topo sheets from Survey of India; • Discussion with BPIC Consultant in	• Clarifications on land required/acquired, litigations etc. if any; • Clarification on project layout and design elements; • Validating information for Form – I;

Date	Activity Brief	Discussion Topics
	charge for land liasoning for the new land acquisition of the BTPS extension project;	
9th June, 2015	• BSPGCL Senior Management Team Executive Engineer – Planning and Design – P&D Dept., Chief Engineer P&D Dept, Electrical Executive Engineer	• Discussion on various points and aspects of pre- feasibility report; • Understanding land requirement for various project components;
	• Director for Land Acquisition, Bihar • Subordinate to Section Officer	• ERM seeking cooperating for sharing land acquisition related information and associated documents etc. for Patna District and Begusarai District; • Discussion regarding the current status on the land acquisition in this project context;
10th June, 2015	• Director, Land Acquisition Officer for Patna District. • Assistant Dir. Land Acquisition Officer Patna District	• ERM seeking cooperation for sharing land acquisition related information and associated documents etc. for Patna District;
11th June, 2015	• Assistant Director Land Acquisition Officer Patna District	• Discussion to understand the current status of compensation payments regarding acquired land – 129 acres private land; • Understand the land acquisition process followed in Bihar and in the case of BTPS; • Status update on any proceedings regarding identifying raiyati claims over khas mahal land (government land) (1).
	• Other staff members of LA office relevant to BTPS project	• Documentation Support
	• Discussion with Executive Engineer – Planning and Design – P&D Dept. and Project Manager, Proposed Unit 10	• Sharing the concept note and discussion on the feasibility of conducting stakeholder meeting;
12th June, 2015	• Meeting with General Manager of BTPS and ESE Extension Project at in the Administrative Building	• Introduced ERM as the agency authorized to undertake EIA/ESIA study; • Shared the concept note for stakeholder meeting with GM; • Mutually agreed on some of the points concerning stakeholder meeting;
	• Meeting with Circle Officer (CO) and Circle Inspector (CI) in Mokama	• Documentation Support; • Discussion regarding the SLP Supreme Court Case on 290 acres of government land (transferred legally to BTPS, however physical possession has not been taken); • Understanding the role of CO/CI in the land acquisition process;

(1) These are referred to the private claims of individuals over government land (ash pond area in this project context) who supposedly have been cultivating on the land and have been dependent for several decades.

The stakeholder consultations were focussed on understanding the land requirement, existing status of acquisition, community sensitivities, understanding the layout and design aspects of the project components. The stakeholder consultations were undertaken with government departments, project representatives supplemented with reconnaissance visit of the area, detailed review of erstwhile land procurements, official communication, court judgements, petition filed by potential land claimants (in the ash dyke area), challenges associated with land procurement, land tenure issues, understanding of alternate land options explored by the project etc.

The land and other livelihood opportunities, access to services, etc. were also confirmed as a part of the secondary review and reconnaissance visit of the area, as consultations were not encouraged presently. This was done to be able to develop the entitlement framework and an implementation strategy that can guide the resettlement activities on the ground.

The discussions focused on issues that are pivotal to the entitlement matrix in this Framework document. The findings from the field including the perceptions and the expectations of the community were later discussed and validated in the context of the local regulatory and legislative paradigm with the land department officials at various levels. The consultations primarily revolved around the following issues:

- the proposed Project;
- potential Project impacts on land;
- the nature of land and asset ownerships;
- community structures and decision making;
- management and control of government lands and privately held lands;
- status of land records and nature of land ownership/ claims related issues;
- suggestions on the process of land take for the project as well as potential replacement land; and
- overall perception of the project and key concerns.

This helped understand the land use profile of the location and distances of the settlements and the potential range of resettlement issues that the RAP Framework would be required to cover.

These consultations and site visits enabled the team to scope the potential land and resettlement issues for the full project footprint, though not to the extent of complete RAP, as it is based on stakeholder consultations and reconnaissance visit of the project area.

3.2 ORGANISATION OF THE RAP FRAMEWORK

This RAP Framework provides an overview of the legislative Framework and administrative framework that will guide resettlement activities related to

land procurement for the project, a broad entitlement Framework that will guide the determination of the compensation package for different category of impacts, an implementation strategy that will drive the process to be followed on ground for the project, and overarching commitments on the processes to be followed on stakeholder engagement, grievance redressal, and monitoring and evaluation consistent with the requirements of local regulations, JICA and WB guidelines.

Given that ash dyke proposed area has land claims and ownership issues may need time to sort out, RAP Framework will also be applicable for any such option which could be finally selected by BSPGCL/BTPS.

A detailed land and asset, household, village and community level survey and extensive consultations will be undertaken to determine the impacts of the Project, land users and owners will be identified and a compensation package for these impacts at the household level will be developed. The principles and methodology to be followed to conduct the surveys and prepare the entitlement matrix will be guided by this RAP Framework

3.2.1 RAP for the Project Components

The RAP will provide the actual household and village level baseline and impacts based on the surveys and consultations, and will include an entitlement matrix that will define the specific numbers of impacted families, land and assets, entitlement options and costs. Specifically, RAP will cover:

- detailed socio-economic profile;
- land ownership pattern;
- livelihood profile;
- stakeholder mapping;
- Impact assessment;
- key issues for RAP (including a summary of consultation and issues raised);
- detailed entitlement matrix for the project component;
- household and community level compensation package;
- A broad strategy for livelihood restoration;
- Implementation strategy; and
- RAP Budget.

On aspects of monitoring, reporting, organisational responsibilities etc, the RAP reports will fall back on the Framework which already commits to these processes which would also be agreed with the GoB and jointly agreed upon by the resettlement committee.

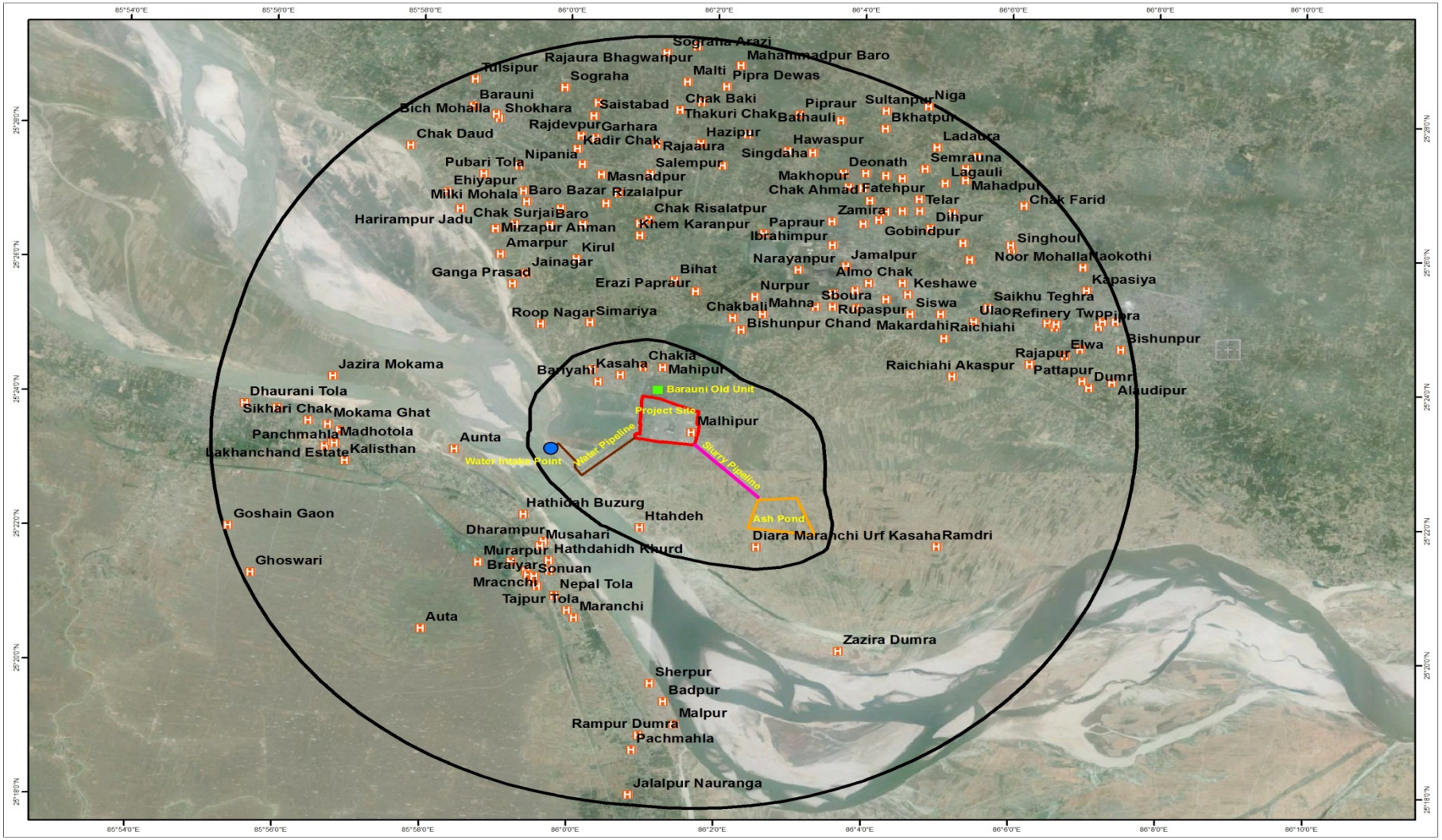
A detailed methodology on how the surveys for the RAP will be conducted and how RAP report will be developed has been described in Section 7.

The socio economic baseline of the project area is covered in detail in the ESIA report, though it is primarily based on secondary review and visual observation. Specific socio economic baseline for PAPs will be developed as part of the RAP. The entire project area includes all the project components – main plant area, ash dyke and ash pipeline, water intake point and water pipeline, railway siding, coal storage area, switchyard and residential colony. Broad understanding of the villages wherein the project and its associated facilities fall is captured in ***Table 4.1.***

Table 4.1 Project Components and Associated Affected Villages

Sr. No.	Project Components	Villages in the vicinity area
1.	Main Power Plant for Unit 10, Railway Siding, and Coal Storage Area	• The power plant is located on the existing land owned by BTPS. No additional land is being acquired for the same. • The villages **Chakia** and **Malhipur**, located to the North and North West portion of the power plant located at a distance of 1 – 2 km and village **Ramdiri** is located adjacent to the Eastern boundary of the power plant area.
2.	Ash Dyke Area	• The ash dyke area is proposed on 290 acres of government land – South East of the main power plant area. • The village **Diara Maranchi urf Kasaha** is located adjacent to the South West boundary of the ash dyke area. • It is reported that farmers from Village **Ramdiri** are undertaking cultivation on this land parcel. Village Ramdiri is located within 1 km of the ash dyke area towards the Northern side.
3.	Ash Pipeline Area	• There are 2 **Ramdiri** villages in the vicinity area. The ash pipeline will also displace nearly 10 households in Ramdiri village (located in the eastern side of the power plant and residential colony).
4.	Water Intake and Water Pipeline	• The water intake is from River Ganga and the water pipeline will pass through **Simariya Ghat** village.
5.	Residential Colony	• Village **Ramdiri** is located adjacent to the residential colony.

Figure 4.1 *Study Area Map indicating core and buffer zone and the villages*



Source: Google earth pro accessed on 15th November, 2015

The location of the villages in the project area is shown in ***Figure 4.2***.

Figure 4.2 Location of the Villages in the Project Area

Source: Google Earth pro accessed on 14th January, 2016

5 LEGAL AND ADMINISTRATIVE FRAMEWORK

The proposed RAP Framework for Barauni Thermal Power Project will be developed to conform to the following local and national laws and regulations and also international guidelines.

5.1 NATIONAL AND INTERNATIONAL GUIDELINES

5.1.1 National and state level Laws and Regulations

5.1.1.1 *The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement (RFCT LARR) Act, 2013 and ordinances thereunder*

The Act came in force on January 1, 2014 and the Draft rules pertaining to the effective LARR implementation have been notified on December 31, 2013. The new act addresses the lack of an integrated and comprehensive resettlement and rehabilitation (R&R) law along with compensation for loss of land/livelihoods. The new Act for the first time has looked at the issue of food security and discourages acquisition of multi-cropped irrigated lands except for linear projects. The Act also for the first time accords much-needed focus on Rehabilitation and Resettlement (R&R) - compensation for land has been significantly enhanced in both urban areas and rural areas.

In this project context, this act may only get triggered in case of ash pipeline area if BSPGCL does not opt for willing buyer willing seller mode of purchase. In case of ash dyke area, this law will not get triggered as it is government land; however may get triggered in case the potential land claimants are able to establish right over the land, and Government need to undertake land acquisition.

In case it get triggered based on future developments, the following aspects of compensation will need to be essentially looked into as covered in ***Table 5.1.***

Table 5.1 LARR Act 2013 Compensation and R&R provisions

Aspects to be covered in case of land Acqusition
Market value of the land to be acquired to be paid to the land owner (whose land has been acquired) by including all assets attached to the land. • the market value of the **building and other immovable property or assets** attached to the land or building which are to be acquired • the **market value of trees and plants** attached to the land acquired • the market value of the standing crops damaged during-the process of land acquisition
In determining the amount of compensation to be awarded for land acquired under this Act. the following shall be taken into consideration- • Firstly**, the market value** as determined under section 26 and the award amount in accordance with the First and Second Schedules (of LARR Act, 2013): *First Schedule: Factor by which the market value is to be multiplied in the case of rural areas - 1.00 (one) to 2.00 (two) based on the distance of project from urban area, as may be notified by the appropriate government;* • secondly, the damage sustained by the person interested, by reason of the taking of any standing crops and trees which may be on the land at the time of taking possession

Aspects to be covered in case of land Acqusition
thereof; • thirdly, the damage (if any) sustained by the person interested, at the time of the taking possession of the land, by reason of severing such land from his other land: • Fourthly, the damage (if any) sustained by the person interested at the time of the taking possession of the land by reason of the acquisition injuriously affecting his other property., movable or immovable in any other manner, or his earnings; • Fifthly; in consequence of the acquisition of the land, if the person interested is compelled to change his residence or place of business, the reasonable expenses (if any) incidental to such change; • Sixthly the damage (if any) bonafide resulting from diminution of the profits of the land between the time of the publication of the declaration under section l9 and the time of the Collector's taking possession of the land. • Seventhly, any other ground which may be in the interest of equity, justice and beneficial to the affected families.
Under Section (30), The Collector having determined the total compensation to be paid, shall, to arrive at the final award, impose a 'Solatium,' amount equivalent to one hundred per cent of the compensation amount. ***Explanation.-Solatium amount shall be in addition to the compensation payable to any person whose land has been acquired.***
Under Section 30 (3), In addition to the market value of the land provided under section 26, the Collector shall, in every case. award an amount calculated at the **rate of twelve per cent per annum on such market value** for the period commencing on and from the date of the publication of the notification of the Social Impact Assessment study under sub-section (2) of section 4, in respect of such land, till the date of the award of the Collector or the date of taking possession of the land, whichever is earlier.
Provided further that the appropriate government may, by notification increase the rate of rehabilitation and resettlement amount payable to the affected families, taking into account the rise in the price index.
The Rehabilitation and Resettlement Award shall include all of the following, namely: (a) rehabilitation and resettlement amount payable to the family; (b) bank account number of the person to which the rehabilitation and resettlement award amount is to be transferred: (c) particulars of house site and house to be allotted, in case of displaced families; (d; particulars of land allotted to the displaced families; (e) particulars of one time subsistence allowance and transportation allowance in case of displaced families; (f) particulars of payment for cattle shed and petty shops: (g) particulars of one-time amount to artisans and small traders; (h) derails of mandatory employment to be provided to the members of the affected families (i) particulars of any fishing rights that may be involved; f) particulars of annuity and other entitlements to be provided (*) particulars of special provisions for the Scheduled Castes and the Scheduled Tribes to be provided:
Resettlement Site: ln every resettlement area as defined under this Act, the Collector shall ensure the rural provision all infrastructural facilities and basic minimum amenities specified in the Third Schedule.

5.1.1.2 *Bihar Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2014*

The rules at the state level have been framed entirely in line with the central government rules. Only the relevant government authorities vary as per the state specific institutional structures and organizational mechanisms.

In this project context, this act may only get triggered in case of ash pipeline area if BSPGCL does not opt for willing buyer willing seller mode of purchase. In case of ash dyke area, the status will be same as mentioned in case of the previous act.

5.1.1.3 *National Policy for Rehabilitation and Resettlement 2007*

A National Policy on Rehabilitation and Resettlement has been formally adopted by the Government of India. The key elements of the NPRR 2007 are mentioned below:

- The policy gets invoked if the project displaces more than 200 families, *en masse*, in hilly, DDP and Tribal areas or more than 400 families in plains;
- Vulnerable persons defined as-
    - Disabled, destitute, orphans;
    - Widows, unmarried girls, abandoned women;
    - Persons above fifty years, landless, BPL;
- Social Impact Assessment (SIA) has been made mandatory and a Social Clearance, similar to Environmental Clearance including public hearing & disclosure of SIA document needs to be done;
- Consultations with gram sabha, Tribes Advisory Council on R&R and Indigenous people development plan;
- When displacing Scheduled Tribes people a Tribal Development Plan (TDP) is required;
- Land for land allotment, if available, for ST and SC families;
- 25% premium on compensation in case where Tribal community is resettled outside the district;
- Amenities and infrastructure facilities at resettlement sites to include schools, dispensaries, post offices, fair price shops among others;
- Certain part of net profits to be allocated for Peripheral Development of the resettlement area;
- Grievance redressal through project and district level R&R committees; and
- Monitoring by a national monitoring cell.

It is not clear if this policy is effective after the LARR Act, 2013.

5.1.1.1 *Circular identifying Raiyati claims over Government land, 11th November 2014*

The circular was introduced by the Revenue and Land Reform Department, Bihar in the context that across several parts of the state, farmers have been cultivating over government owned land for years in the form of encroachment and have been also claiming compensation for the same, leading to problems in land administration. The state government has taken

several resolutions for identifying private claims on the basis on certain criteria.

It was reported by the Land Acquisition Officer that this circular is applicable for those lands which have been surveyed. In this project context, as the project (and all its components) is presently located on unsurveyed land, therefore, the contents of this circular will not be applicable. However, in future, if the petitioners of the ash pond land win the case and proper survey of the entire land is undertaken, the specifications as per this circular may get triggered.

5.1.2 World Bank Guidelines

The Resettlement Plan under Annex A of the World Bank's (WB) safe guard policy OP4.12 stipulates guidelines pertaining to involuntary resettlement. In the first place, it suggests that attempts must be made to avoid or minimize such adverse impacts and the livelihood restoration and other appropriate mitigation measures for the impacted families should be carefully planned and carried out.

A RAP/ LRP will be triggered if there are:

- Physical displacement from the land parcels selected for the project;
- Economic Displacement of people using the land for economic and livelihood activities with legal permission from Government authorities; and
- Obstruction of access to natural resources/common property resources and cultural heritage sites used by the local communities.

5.1.2.1 World Bank OP 4.12

In this project context, RAP/LRP is being triggered due to all of the three above mentioned reasons applicable to various project components. The following table identifies the findings in this project context vis-à-vis the applicable best practice guidelines as specified by the World Bank Resettlement Action Plan

Table 5.2 Resettlement Plan Guidelines of World Bank

Sr. No.	Points highlighted in OP 4.12	Key Findings and Observations
1.	Socio-economic studies - the findings of the socioeconomic studies (including census survey) to be conducted in the early stages of project preparation and with involvement of potentially displaced people.	• The socio-economic study has been undertaken by BSPGCL through ERM in the project planning phase; • The primary consultations and census surveys with the potentially displaced people have not been undertaken as yet; • These may be conducted based on the formal approval of the project and the permission provided by BSPGCL.
2.	Other studies - describing land tenure and transfer system, inventory of common property resources, public infrastructure, social	• The land DD study undertaken by ERM is to capture the approach followed for the land acquisition and transfer process; • The socio-economic studies being undertaken capture the public infrastructure available (physical

Sr. No.	Points highlighted in OP 4.12	Key Findings and Observations
	networks, socio-cultural characteristics of communities etc.	and social) in the study area; • Information on common property resources (CPR), livelihood sustenance, and non-title based usufruct systems, social networks and interactions, formal and informal institutions have not been captured. Primary consultations for the same need to be undertaken.
3.	Legal Framework – findings of analysis covering nature of compensation, valuation, applicable legal procedures, relevant customary and traditional laws, gaps between local resettlement policy and bank's resettlement policy etc.)	• It is assumed that additional land is required only for ash pond and ash pipeline; • As the ash dyke area is located on government land, the land acquisition laws/rules concerning private land are not getting triggered. However, it will further details on legal ownership of land presently under contest. • For ash pipeline and for the new resettlement site for 10 households, both located on private land, BSPGCL may choose to either acquire or purchase land. • In case of acquisition, the national land and resettlement rules will be triggered.
4.	Institutional Framework – the findings of an analysis covering – identification of agencies responsible for resettlement activities and NGOS for implementation	• BSPGCL is still to take a final decision on the status of the private claims which have presently not been recognized by Supreme Court; • At present, there is no agency or NGO identified to undertake the implementation of resettlement and livelihood restoration;
5.	Eligibility – definition of displaced persons and criteria, including cutoff dates.	• At present, for the potential PAPs, BSPGCL has not defined the criteria for determining the eligibility for compensation and resettlement assistance, including cut-off dates.
6.	Valuation and compensation for losses	• At present, BSPGCL has not developed a methodology to be used in valuing losses to determine the replacement cost etc.
7.	Resettlement Measures (compensation package and other measures to assist the displaced persons)	• As mentioned, the resettlement measures will be identified after the resolution on the land area (ash pond) has been made by SC; • The resettlement for families on the land area constituting 0.2 acres (in the ash pipeline) will involve displacement of 10 families; • Additional details (compensation package etc.) had not been made available.
8.	Site selection, site preparation and relocation (alternative relocation sites etc.)	• For the families to be displaced due to ash pipeline, new resettlement/relocation site had not been identified yet by BSPGCL.
9.	Housing, infrastructure and social services	• At this stage, there is insufficient information on this.
10.	Community Participation (Involvement of resettlers and host communities/ Integration with host populations	• The resettlement plan has not been formulated and the host communities have not been consulted for the same, as yet.
11.	Grievance procedures	• There is no grievance mechanism in place at present for community stakeholders or for PAPs to raise their concerns, if any
12.	Organizational responsibilities (identifying agencies for implementation of resettlement measures)	• BSPGCL will need to undertake the planning and implementation of resettlement measures by itself or with the help of any agency in case of ash dyke area.

Sr. No.	Points highlighted in OP 4.12	Key Findings and Observations
		• For private land acquisition, the land administration along with other agencies will be involved in the implementation process.
13.	Implementation schedule (target dates for resettlement plan preparation and implementation)	• There is insufficient information on this at this stage.
14.	Costs and budget	• There is insufficient information on this at this stage.
15.	Monitoring and evaluation	• There is insufficient information on this at this stage.

5.1.3 JICA Guidelines

JICA (an implementing agency of Japanese Official Development Assistance – ODA) Guidelines for Environmental and Social Considerations were developed in 2004 and revised in 2006 to manage three forms of assistance – technical cooperation, loan aid and grant aid. JICA makes suitable considerations of environmental and social impacts and the costs when implementing projects.

The objectives of the guidelines are to encourage project proponents to have appropriate consideration for environmental and social impacts and that the evaluations of such considerations are conducted accordingly. The "environmental and social considerations" are defined as considering environmental impacts including air, water, soil, ecosystem, flora and fauna, as well as social impacts including voluntary resettlement, respect for the human rights of indigenous people, and so on.

As for land acquisition aspect, JICA GL stipulates that World Bank OP 4.12 *Involuntary Resettlement* shall be referred in case involuntary resettlement is expected.

6 PROJECT RELATED IMPACTS

6.1 IDENTIFICATION OF PROJECT IMPACT AND PROJECT AFFECTED PEOPLE

6.1.1 Project Impacts

6.1.1.1 Loss of Land

Permanent Land Transfer/Acquisition

The majority of land required by the project will be for the ash dyke (to be shared by Units 8, 9 & 10). The permanent land transfer for the project includes the following:

- Ash dyke area in Patna District covering an area of 290 acres resulting in major economic impacts on the people due to loss of cultivated land (and also irrigated land), loss of grazing land and assets;
- Ash pipeline comprising of 3.75 acres of private land in Begusarai district, resulting in physical displacement of nearly 10 houses/families (spread on 0.2 acres) and other assets (trees etc.) and also loss of some cultivable land linearly;
- Acquisition of land for developing the new resettlement colony for the displaced families (approx. 0.2 acres). This aspect is being worked out along with the land administration in Begusarai District as they will be leading in identifying the relocation site and determining the land area;
- As per the discussion with BTPS/ BSPGCL, they would prefer to get it done through the local administration, though they would provide monetary support for the same;
- Acquisition of land for other ancillary facilities for the project that is not envisaged at this point of time.

6.1.1.2 Loss of Structures and Other Assets

The ash dyke area may not involve loss of structures and the loss of assets is currently unknown and will be quantified following the land and asset survey of RAP preparation process. The ash pipeline will involve displacement of nearly 10 structures and the loss of assets is not known at present. Potential loss of structures and other assets includes:

- Houses and residential structures (e.g. mud brick and thatch or sheet metal roofing);
- Standing crops, if any; (information insufficient at present);
- Trees, wells and plantations, if any.

6.1.1.3 Loss of Income

Loss of income may result from:

- Damaged crops due to project construction or other activities (in ash dyke, ash pipeline area, water pipeline area);
- Loss of business income (temporary obstruction to some of the market stalls along the ROW for water pipeline in Simariya Ghat area);
- Loss of or restriction of access to natural resources (currently used for agriculture and grazing) which are central to the livelihood strategies of local rural communities;

6.1.2 Project Affected Peoples

Project Affected People (PAPs) are defined as persons affected by land acquisition, relocation, or loss of incomes associated with land acquisition and resettlement.

6.1.2.1 Categories of Affected People

Project affected persons will be entitled to compensation based on the status of their occupation of the affected areas as defined in *Table 6.1.*

Table 6.1 Categories of Affected People

Category of Affected People	Description
Owners with Legal Title	Those who have formal legal title to land (recognized under the Indian laws).
Traditional Land Owners	Those who do not have formal legal rights to land but have a claim to such land that is recognized under traditional or customary recognition of right to occupy.
Cultivators/ Tenants	No recognizable legal right or claim to the land or structure, tenant paying an owner (in this case government) with a periodical rental payment.
Legal business enterprise	Business enterprises recognised by law of land; (in this case market stalls in Simariya ghat)
Encroachers (using land/water or other resource)	No recognizable legal right or claim to the land/water resource, those who use the land for: • Subsistence activities (agriculture); • Activities leading to livelihood and occupation (sharecroppers, agriculture wage labour etc.).
Squatters (living on land)	No recognizable legal right or claim to the land, those who are residing in structures.
Those who arrived after the cut-off-date	Those who inhabit the area following the cut-off date.

6.1.3 Vulnerable Groups

Vulnerable groups from this project point of view are those who by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantage or social status are more adversely affected by resettlement than others; and who may have limited ability to claim or take advantage of resettlement assistance and related development benefits. For the Project these may include:

- Elderly persons, disabled persons, widows without support, orphans, and/or people suffering from serious illness; and

- Chronically food insecure households, particularly female headed households, and extreme destitute population, including the landless.

6.1.4 Identification of Project Impacts and Project Affected Persons

Project impacts will be identified through a land survey and asset inventory process, while the census will identify PAPs.

6.1.4.1 Census and Socio-Economic Survey

The census survey will cover all project affected families (PAF), not exceeding 100 families and the socio economic profile survey will at least cover 25% of all project affected peoples (PAP). The census will record the family details, identification details, location and other basic information on PAPs. The list of PAP shall also include the ones those affected by loss of employment in the form of wage labourer due to impact on the tenant.

The sample survey of PAPs will be undertaken to gather socio-economic details including livelihood dependency patterns/sources, living conditions, access to services and it will capture the family level details such as health, gender, details of movable and immovable assets ownership, livestock ownership, family expenditure pattern, access to services and it will capture the family level details such as health, gender, details of movable and immovable assets ownership, livestock ownership, family expenditure pattern, access to services etc. Based on the available information, the upper limit for the number of PAFs across the project components is decided at 100. This needs to include land based as well as livelihood based PAFs. This survey will also include needs assessment.

6.1.4.2 Land Survey and Asset Inventory

BTPS will undertake the users of land and assets on the ash dyke area, ash pipeline area and water pipeline area. The proponent may seek support will be sought from land administration in undertaking the process. The census survey will go hand in hand with the land and asset inventory survey so as to avoid duplication and delay in RAP preparation process.

The land survey and asset inventory involves:

- detailed survey of all losses (both physical assets and loss of income) that will result for each household, enterprise, or community affected by the Project;
- survey and classification by type of land acquired or affected by the Project;
- survey of all houses and associated structures affected by the project along with the photographs;
- survey of other private physical non-moveable assets such as standing crops, firewood etc.;
- survey of businesses such as shops, workshops; and

- survey of common property resources, public structures, basic infrastructure, namely water, road and electricity.

6.1.4.3 Cut-Off Date

The establishment of a cut-off date is required to prevent opportunistic in-migration to the Project Area and subsequent claims for resettlement entitlements. The census and land and asset survey carried out for the RAP will be considered as cut-off date for this project component. Those occupying the Project Area after the cut-off date will not be eligible for resettlement entitlements. The PAPs will be notified of cut-off date during the census which will also be made public in a meeting attended by PAPs and displayed in public areas, such as community notice boards.

7 RESETTLEMENT POLICY AND ENTITLEMENT FRAMEWORK

The proposed resettlement framework has been developed to broadly serve as a guideline document to mitigate the unavoidable economic impacts of the estimated land footprint. This section summarises the main project impacts/the type of losses, the entitlement principles, entitlement categories and corresponding entitlements to restore, at the least, pre-project living standards, income-earning capacities and economic production levels.

7.1 KEY ENTITLEMENT PRINCIPLES

The proposed expansion project will be implemented in accordance with the following principles:

- The Project will ensure compliance with JICA standards/world bank standards for resettlement action plan and guidelines
- Negative/ adverse impacts of the Project will be avoided or minimized, to the extent practicable, and the ones which cannot be minimised either will be mitigated and compensated for
- Both physical and economic impacts of land acquisition will be accounted for by the project and provisions made in RAP for compensation at full replacement value (i.e. the market value of assets plus transaction costs)
- Affected livelihoods will be restored as a minimum, or preferably improved, and living conditions of affected households will be improved;
- All components of the entitlements will include the integration of gender equity to ensure practical benefits for women such as necessary safeguards, increased income opportunities and greater financial security;
- The project will consider all forms of user rights (cultivators, agricultural labourers, grazers etc.) that are established prior to the survey completion;
- Adverse impacts on access (severance or disruption) where unavoidable to be mitigated through the provision of alternative access;
- The project shall assist the affected families with alternative options for livelihood and income generation, particularly if such families do not have any other alternative land parcel and if their livelihood source will completely change due to the proposed project;
- The project shall assist the affected families who have land titles elsewhere by exploring possibilities for improving agricultural productivity or with crop diversification and intensification;
- Transparency in disclosing information related to the project impacts and entitlements and people's participation across the project lifecycle;
- All project-related information dissemination, engagement and disclosure will be through consultations;
- A timely, effective and accessible grievance redressal mechanism will be established to cover all stages;
- The implementation of the land acquisition, resettlement, compensation and livelihood restoration will be monitored in terms of its impacts,

process and outcomes as per agreed and approved indicators and timelines that will be documented by BSPGCL in an Implementation Plan.
- Documentation of the land transaction process and the compensation, resettlement process will be carried out.

7.2 ELIGIBILITY AND ENTITLEMENT

7.2.1 Entitlement Categories

Based on the assessed impacts and the principles shaped, the main entitlement categories are as follows:

- general community/villagers;
- individual or a nuclear family unit;
- a household which may be composed of several families;
- share croppers and/or tenants;
- agriculture wage labourers;
- grazers;
- vulnerable families;
- shop owners.

7.2.2 Kind of Entitlement

7.2.2.1 Compensation

- Monetary compensation for loss of directly dependent land by cultivators, sharecroppers and agricultural labourers;
- Monetary compensation for assets (standing crops, trees, other immovable property) on the impacted land;
- Monetary compensation for loss of grazing land;
- Monetary compensation for physical structures, if any
- One-time/lump sum disruption allowance for economic impacts;
- Monetary compensation for loss of directly owned private land (in case of ash pipeline area);
- One-time compensation for any loss to physical structures/shops etc. (in case of water pipeline);

7.2.2.2 Livelihood Restoration Assistance

- Provision of alternate means of livelihood in the form of:
    - Improvement and enhancement of production capacity of other land;
- Basket of income-generation options to compensate for loss of income/ livelihoods impact;
- Special assistance to vulnerable social groups such as preference in project and contractor employment and procurement.

The following types of entities will be eligible for compensation and other entitlements:

Table 7.1 Type of entities

Entitlement Category	Project Component	Approximate Numbers (*)	Description
Compensation			
Cultivators, sharecroppers - within the economically displaced households	Ash dyke area, ash pipeline area	At least 100 cultivators (based on discussions with BTPS)	Economically displaced persons cultivating on the private land for allegedly over 6-7 decades and assets that are impacted. This is assessed based on anecdotal evidence from discussions with BTPS representatives. Permissions for primary consultations with the community were not provided.
Indirectly dependent – agriculture wage labourers	Ash dyke area	Insufficient information at present	This category includes the agriculture wage labourers who are engaged in the cultivation (during sowing or harvesting season) process. They are not directly dependent on the land and do not pay any rent/tax towards the same, but are indirectly dependent on land for sustenance and/or income.
Dependent for grazing land	Ash dyke area	Insufficient information at present	This category includes the grazers and households dependent on livestock rearing for livelihood/income are impacted.
Non-dependent households	Ash dyke area	Insufficient information at present	Non-dependent households include absentee landlords with limited to no economic dependence on the impacted land for their livelihoods.
Stall owners, Shop owners, etc.	Water pipeline area	At least 4-5 shops	This category includes the shop owners who are impacted for a temporary time period during the laying of water pipeline.
Rehabilitation Benefit			
Physically displaced households	Ash Pipeline area	Approximately 10 households (as reported by BTPS)	A household that is compelled to change their permanent residence due to the project.
Livelihood Restoration Assistance			
Transition Allowance	Ash dyke, Ash pipeline	At least 110 households (the number could be a little more but cannot be confirmed)	These entities will be provided with a one-time transitional allowance
Dependent Households	Ash dyke area and ash pipeline area	At least 110 households	Families with economic and physical displacement –with significant dependence on land for livelihood and/or income purpose.
Vulnerable Households	Ash dyke area and ash pipeline area	Insufficient information at present	This category will be identified based on the survey of the project impacted households. This will be a subset of the PAFs, requiring additional safeguards due to their inherent social/economic vulnerability at the time of project development.

The entitlement matrix is presently developed covering broad entitlements to be provided to the PAPs. This will however be refined during RAP preparation keeping in perspective the actual impacts on ground and also considering the gaps in the Government led resettlement process, if any.

Table 7.2 Proposed Entitlement Matrix

Type of Impact and Category	Eligible Categories	Compensation	Rehabilitation Benefits	Livelihood Restoration
Loss of agricultural land in ash pond and ash pipeline area Category: Cultivators and wage labourers, vulnerable groups	Over 100 families dependent (fully or partially) on ash dyke land for livelihood in the form of cultivation, grazing as cultivators, sharecroppers, agriculture wage labourers, grazers etc. The definition of household has considered families as per the Land Acquisition Act, 1977 in order to bifurcate an extended family on the same homestead into multiple households	• Compensation for the loss of agricultural land in cash and/or in-kind. • Cash compensation (at replacement cost for the area of land occupied) could be made in INR based on the extent of dependence and vulnerability associated • In-kind compensation could be in the form of additional support towards livelihood i.e. seedlings, agricultural inputs and financial credit for agriculture equipment etc.	-	• Eligibility for each household to a transition allowance depending upon the type of income that has been impacted within the economically impacted categories; • Eligibility of all members of the household for and livelihood restoration programs. Support in finding suitable employment opportunities in the project and livelihood continuity • For vulnerable groups, lump sum economic rehabilitation grant as seed money to start self-employment
Loss of homestead land and assets (residential structures etc.) due to physical displacement in ash pipeline area Category: Owners of Legal Title to Land, vulnerable groups	Nearly 10 households to be physically displaced as identified by BTPS The definition of household has considered families as per the Land Acquisition Act, 1977 in order to bifurcate an extended family on the same homestead into multiple households	• Provision of developed land in resettlement colony or cash compensation at full replacement value. • Cash compensation for structures at full replacement value (not depreciated) • Allowed to salvage of material from dismantled structure	• Shifting allowance in case of resettlement housing to compensate for inconvenience in shifting out of the house. • Food security allowance for vulnerable households for at least a defined period of 3 months; • For those opting for resettlement house, the resettlement housing will be completed before people are asked to move out of their current residence. • In exceptional circumstances (which will need to be defined) or	• Eligibility for each household to a transition allowance depending upon the type of income that has been impacted within the economically impacted categories; • Eligibility of all members of the household for and livelihood restoration programs • Support in finding suitable employment opportunities in the project and livelihood continuity

Type of Impact and Category	Eligible Categories	Compensation	Rehabilitation Benefits	Livelihood Restoration
			in case replacement housing is not ready at the time of proposed relocation, temporary rental allowance will be offered between the loss of access to residential houses and moving into the chosen resettlement site.	• For vulnerable families, assistance with relocation, construction (building, providing materials, workforce for building houses) and healthcare, etc.
Temporary Impacts on shops/stalls located on the proposed water pipeline route Category: Shop owners	About 4-5 shops located on private land near Simariya ghat.	• Allowance for temporary inconvenience • One-time cash compensation for any losses incurred by the stakeholder during the temporary period	-	-
Loss of other Assets (standing crops, trees, wells etc.) Category: Owners of legal title on land and cultivators on land	Economically and physically displaced households and users of lands and the associated assets thereon for livelihood/income	• Replacement cost for standing crops based on the loss incurred, the average yield etc. • Replacement cost for fruit trees based on average yield, price of harvested products, the number of years it would take to bring a new tree etc.	-	-
Unanticipated impacts		• Impacts that are not anticipated will be treated as per the entitlement matrix		

7.3 RESETTLEMENT OPTIONS

All PAPs, irrespective of their status or whether they have formal title to occupy land, are eligible for some kind of assistance if they occupied the land prior to the cut-off date, as determined by this RAP Framework. Individuals who encroach upon the area after the cut-off date are not entitled to compensation or any other form of resettlement assistance.

PAPs are typically provided with three types of resettlement options: cash, in-kind and assistance, as defined in ***Table 7.3***. The types of compensation and method of valuation will be clearly explained to PAPs.

Table 7.3 Resettlement Options

Resettlement Option	Description
Cash payments	Compensation will be calculated in INR and provided in cash or cheque form.
Payment-in-kind	Compensation may include items such as land, houses, other buildings, building materials, seedlings, agricultural inputs and financial credit for equipment
Assistance	Assistance may include moving allowance, transportation assistance and labor.

7.4 COMPENSATION FRAMEWORK

Physical and economic displacement will be managed in compliance with the

- World Bank Resettlement Policy OP 4.12
- JICA Guidelines – Environmental and Social Considerations

7.4.1 Loss of Land

Cultivators on Land

Cultivators on land with some supporting documentation in the form of tax receipts and other legally recognizable documents, as verified by the land administration and other relevant government agencies, establishes their history of dependence on the land. Since it is not legally mandated, it may be difficult for the proponent to identify replacement land of equivalent area and quality in the vicinity of the affected area. The individuals are to be provided with resettlement assistance *in lieu* of compensation for the land they occupy, and other assistance, as necessary.

Wage Labourers

Families/individuals indirectly dependent on the land through working as agricultural wage labourers during different seasons and crops, based on requirement. The loss of land may yield of loss of an important income source for them, which maybe primary income for some and secondary income

source for others. Compensation for this may be provided in-kind in the form of support on better farming/yield on their existing land or support in the form of skill-based trainings for employment generation etc.

7.4.2 Physical Displacement

The Project will compensate all the individuals who will be physically displaced as a result of land acquisition and other Project related impacts that may entail displacement. The compensation will be at full replacement cost for land and other assets lost. Resettlement assistance will be provided to all eligible people. Assistance shall be in the form of shifting allowance, transitional allowance, rental allowance, disturbance allowance, training for skill improvement and economic rehabilitation grant; applicable to PAPs as per their category and type of impact and in line with the legal requirements in India.

(a) Relocation Options

Relocation options will be prepared in consultation with directly affected individuals/communities, taking account of factors such as the existing economic base and livelihoods of displaced persons and their preferred forms of livelihood restoration. Relevant information will be provided ahead of time so that people can participate in an informed manner.

The preferred form of resettlement will be relocation to sites identified by affected households within their community, in consultation with community members and the relevant authorities. Preference will be given to relocation options that cover relatively short distances to areas that are known by displaced people, and that keep communities intact. Requests for self-relocation by individual households will also be considered only if the affected families want to migrate out of their present county.

(b) Site Selection

The process of site selection will involve the government at tehsil and district, as well as the affected and host communities. Relocation sites will be selected from private-owned agricultural land. The selection of resettlement site will be based on engagement with the affected communities, and will amongst others include the following criteria:

- suitability for development of residential areas and community infrastructure, including access to water (for drinking water supply and livestock);
- suitability for allocation of replacement land of similar size and similar agricultural potential, and other locational criteria as appropriate (e.g. access to natural resources , services, employment opportunities); and
- socially and culturally acceptable, and formally accepted by government and affected and host communities.

Preparation of relocation sites will be undertaken once the location and layout are finalised. Site preparation will be scheduled to allow for the construction of replacement housing and other required infrastructure sufficiently in advance of actual relocation.

Many of those to be resettled may wish to move to the lands of lineage kin and this could be encouraged as an alternative to resettlement site. The lineage based resettlement process would require the making of open and transparent agreements.

7.4.3 Resettlement Assistance

(a) Shifting Allowance

All displaced households will be provided with an allowance for moving their belongings and settling in at their new sites. These allowances will be paid at an appropriate time prior to physical relocation dates. Where necessary the Project will provide evacuation assistance to assist vulnerable people such as the aged and infirm. Tenants occupying rented accommodation that has to be vacated will also receive shifting allowance.

(b) Transitional Allowance

Families affected by the project would receive a transition allowance to cover the loss of income between the relocation from old setup to new place and initiations of economic activity at new location. This include initiation of production on replacement land, restarting of business at new location and developing customer base, resettling family at new place and starting of economic activity.

Transitional allowance will be calculated separately for loss of agriculture land and for other losses:

- For loss of agriculture land, the transitional allowances will be calculated based on harvests per hectare of land for a period of one year
- For others losses, the transitional allowance will be based on loss of income by any disruption of income earning activity for a period of six month,

The payment of allowance may be through food security support or in cash or a combination of both. This takes into consideration that good practice in resettlement planning is to maximise people's ability to continue cultivating their lands and such allowances is only intended to assist with the transition period.

(c) Skill improvement training

Commercial and subsistence farming is the primary source of income for the people in the country and this is no exception for the people living in the project impacted area. Although the project is emphasising on continuity of occupation base of the PAPs by providing land for land as compensation; improvement in socio-economic condition of the people is possible when there are opportunities available beyond the traditional means of economic activity. As a best practice, one member from each eligible family would be entitled to receive skill improvement training of his or her choice from the traits available. Skill improvement training would enable the affected families to take advantage of the development and benefit from it.

(d) Support for employment

The project would need people of different skill for the operation of project. In order to give benefit to the people affected by the project, the project would provide support in finding suitable job according to the skill and education level of the PAP.

7.4.4 Standing Crops

Annual and perennial crops will be compensated at full replacement value to the cultivators, including sharecroppers, based on the market value of the crops in the area. The assessed rates will be discussed with the impacted community members.

7.4.5 Assistance to Vulnerable Groups

As per the applicable reference framework, the project should provide additional resettlement assistance for vulnerable groups affected by the project. Assistance may take the following form depending upon the needs of the vulnerable groups:

- Assistance in moving, (e.g. by providing vehicles) during resettlement;
- Other assistance in the form of food, temporary accommodation, medical subsidy, employment referrals or priority employment in project activities.
- Training for skill improvement.
- Lump sum economic rehabilitation grant as seed money to start self-employment

8 INSTITUTIONAL ARRANGEMENTS

The section describes the approach that will be taken to design, plan, and implement resettlement and compensation based on the RAP Framework. It explains the sharing of responsibilities for RAP implementation and also outlines key activities, the different steps that will be taken, and processes followed for the management and operation of RAP implementation. BTPS will develop an institutional structure and an implementation plan to operationalise the project's resettlement policy.

8.1 RAP FRAMEWORK IMPLEMENTATION: PLANNING AND PREPARATION

The pre-planning and preparatory phase is envisaged as the key step for the successful implementation of the resettlement and livelihood restoration programme. It is during this stage that the planning and development of a road map, resource allocation, follow up, monitoring and reporting systems etc. will be developed. However, these will be modified and updated based on field conditions, triggering of LARR act 2013, or non-recognition of the land claims (especially in the ash dyke area of 290 acres) across the project-impacted areas and based on community consultation.

The issues of displacement are varied along the ash pond area, ash pipeline and water pipeline area. For the linear components like ash pipeline, it is proposed to be handled in an institutional arrangement where the land administration leads the process, with BTPS complying with supporting role in managing the displacement related impacts. In case of ash pond area, BTPS will lead the process with support from the local administration.

8.2 ORGANIZATIONAL SET-UP

A schematic flowchart of the project resettlement planning and implementation procedures is represented in the following section. The resettlement process starts with the establishment of resettlement team of the project proponent, which would work in coordination with various government stakeholders and PAPs.

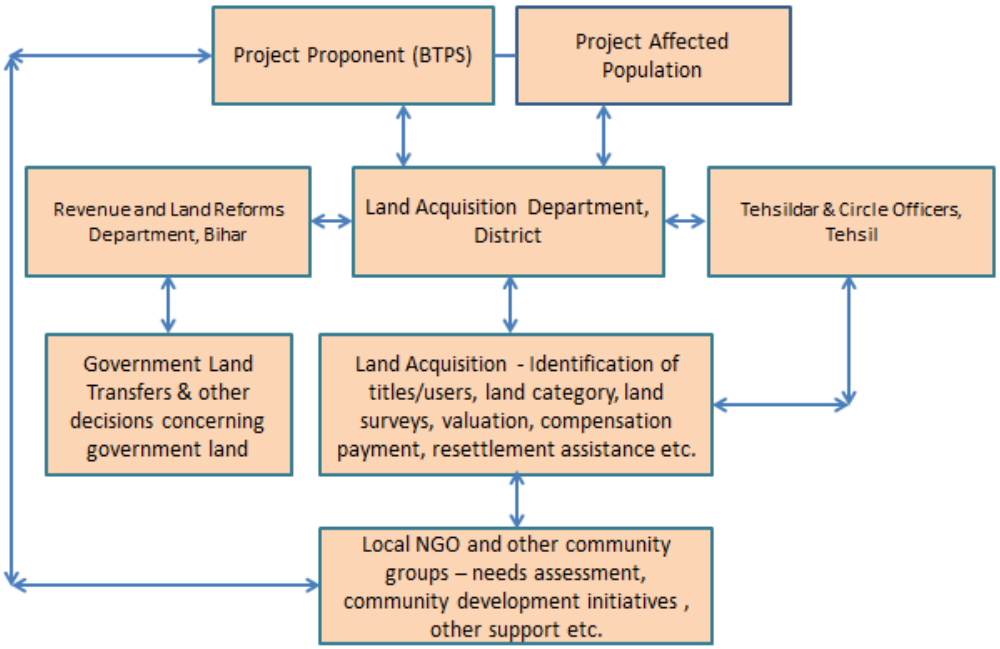
8.2.1 Broad Structure

Given the overall challenges pertaining to land ownership and issues associated with the project and in the state of Bihar in particular, BTPS will need to work in close coordination with the government land authorities on managing land claims, resettlement process and assistance from early stages to minimum conflicts and issues. The key stakeholders for communication will include the land authorities at various levels – state (Revenue and Land Reforms Department), district (Land Acquisition Department), tehsil

(Tehsildar, Circle Officers, Village Accountants etc.) – and the project proponent, project affected population and a reputed NGO.

A broad coordination structure and communication process for the implementation of land and resettlement processes has been presented in ***Figure 8.1***

Figure 8.1 Overview of agencies and organizational structure



8.3 GOVERNMENT AND BTPS OBLIGATIONS: PLANNING, PREPARATION AND IMPLEMENTATION

The role of Government of Bihar and BTPS/BSPGCL through the RAP Framework and subsequently implementation of the RAP will be done specific to the project component requirements.

8.3.1 *RAP Implementation: Planning and Coordination*

The section describes the approach that will be taken to design, plan, and implement resettlement and compensation based on the RAP Framework. It explains the sharing of responsibilities for RAP implementation and also outlines key activities.

8.3.2 *Project Component-wise Obligations of Stakeholders*

Ash Pond Area

As this is located on the government land and there may not be any need for private land acquisition (although this is not resolved yet), the responsibility

and obligation to identify the impacted households, determine adequate compensation package and carry out livelihood restoration measures lies with the project proponent/BTPS mainly and also by appointing consultants and third party agencies to undertake assessments for various aspects of the entire process. However, throughout the entire process of land and asset surveys, market valuation etc. BTPS may seek help from the land administration for advisory support.

Resettlement (in case LARR act, 2013 is triggered) in the context of project components will be managed by Government of Bihar and supported by BTPS/BSPGCL with varied level of responsibility for the various project components. In case there are gaps (with respect to JICA and WB guidelines), if any remaining, BTPS/BSPGCL will be expected to address the same.

However in case the land acquisition is not triggered, in that case the complete responsibility of meeting the WB and JICA guidelines will remain with BTPS/BSPGCL. In such a case, though BTPS/BSPGCL will strive to meet the expected guidelines will keep government abreast of the developments and will seek integration with the existing government schemes, if any.

Ash Pipeline Area

While a majority section is on government land, there is a smaller proportion of private land involved as well. The responsibility for the government land will vest mainly with BTPS.

However, the responsibility for the private land acquisition is with the District Land Administration. The processes of notification, consultation with the communities, and identification of land process, market valuation and compensation and disbursement of the amounts to the identified PAPs will be undertaken mainly by the District and Tehsil land administration, with only supportive and peripheral role by BTPS. Further, the entire RAP process – identification of resettlement site, acquisition of additional private land for the resettlement site, development of infrastructure etc. at the new site and overall implementation will be undertaken by the government authorities, with supportive role by BTPS.

Water Pipeline Area

The ROW permissions for pipeline are being obtained from the government authorities and hence there is no acquisition or land transfer involved. The responsibility primarily lies with BTPS for laying the pipeline, ensuring that the impact on communities is less and compensating for any damages incurred, maintaining proper documentation for the same lies with the relevant team in BTPS.

The responsible group for each of the resettlement process is detailed in ***Table 8.1***

Table 8.1 Resettlement Process and Responsible Agency

No.	Elements	Activities	Ash Pond & Ash Pipeline (Government Land)	Ash Pipeline (Private Land)
1.	Definition of Project and its Impacts	General Description of the project, identification of the project area and potential impacts	BTPS	BTPS
2.	Project Objectives	Define objectives of the project	BTPS	BTPS
3	Development of RAP Framework	Provide an overarching Framework for land acquisition, resettlement, eligibility and compensation	BTPS	BTPS
4	Eligibility and Entitlements	Establish criteria for resettlement entitlements for PAPs in case	BTPS/ Government (depending upon the land ownership status)	BTPS
5	Approval of RAP Framework	Agreement on eligibility, compensation, institutional and implementation arrangement	BTPS/ Government (depending upon the land ownership status)	BTPS, Local Government, PAPs
6	Initial Notification	Notify PAPs and local community of the intention to acquire land, impacts, compensation valuation procedure, grievance procedure, etc.	BTPS/ Government (depending upon the land ownership status)	District and Tehsil land administration
7	Census and Land/ Asset Surveys	Determine the number of PAPs and affected land and assets.	BTPS and consultant, with help from local land administration/ Government (depending upon the land ownership status)	Land authorities
8	Consultation	Discussion of resettlement options (cash, land replacement or PIK), resettlement site and compensation eligibility criteria	BTPS and consultant, with help from local land administration	Land authorities
9	Establish Grievance Redress Procedure	Provide for and publicize avenues for lodging grievances.	BTPS supporting the Government system (depending upon the land ownership status)	Land authorities and BTPS
10	Notification of Cut-Off Date	Community Meeting and notification displayed in public areas.	BTPS and consultant/ Government (depending upon the land ownership status	Land authorities
11	Preparation of Entitlements	Individual and community entitlement matrix preparation based on asset inventory survey	BTPS and consultant/ Government (depending upon the land ownership status	Land authorities and BTPS
12	Compensation Standards and Asset Valuations	Assess that compensation standards reflect current market rates. Identification and valuation of affected	BTPS and consultant/ Government (depending upon the land ownership status	Land authorities

No.	Elements	Activities	Ash Pond & Ash Pipeline (Government Land)	Ash Pipeline (Private Land)
		assets with collaboration from PAPs.		
14	Costs and Budgets	Project cost estimates including valuation of land/assets, relocation allowance, livelihood continuity, etc.	BTPS and consultant/ Government (depending upon the land ownership status	Land authorities and BTPS
15	Resettlement Action Plan	Preparation of RAP for each project component in line with the RAP Framework	BTPS and consultant, along with land authorities, PAPs	BTPS, consultant, PAPs and land authorities
19	Selection of Resettlement Site, Negotiation and Notification	Identification of resettlement location and negotiation with host community. Verbal notification to PAPs	BTPS and consultant/ Government (depending upon the land ownership status	Land authorities and BTPS
20	Compensation Payment	Disbursement of compensation payments.	BTPS and consultant/ Government (depending upon the land ownership status	Land authorities
21	Grievance Redress Hearings	Grievance Redress Committee, including hearing of objections and appeal measures.	BTPS and consultant/ Government (depending upon the land ownership status	BTPS and land authorities
22	Relocation and Reconstructio n of Structures	Transportation, relocation and reconstruction of structures.	BTPS and consultant/ Government (depending upon the land ownership status	Land authorities and BTPS
24	Project Monitoring	Monitoring to ensure compensation has been paid and grievances have been resolved.	BTPS	BTPS
25	Project Evaluation	Project audits	BTPS	BTPS

8.3.3 Organizational Structure and Broad Obligations of BTPS

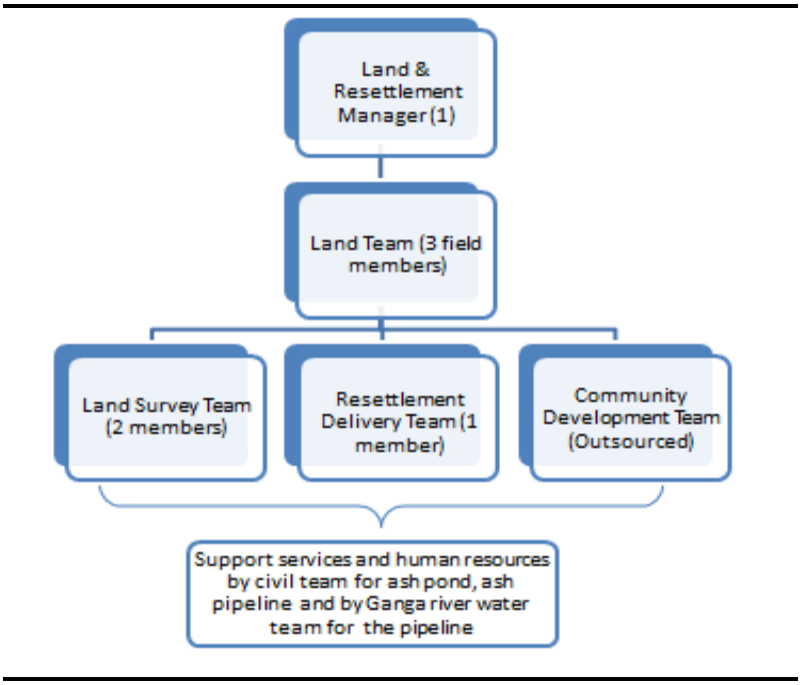
In the existing structure of BTPS, there is no separate land/CSR team at present. The structure primarily comprises of the accounts wing, engineering wing and personnel wing. Land acquisition in the past was entirely led by the land administration/local government and handed over to BTPS. The section engineers under the civil department sometimes serve the merged role of managing the land matters and/or maintaining copies of relevant land records.

For undertaking planning, preparation and implementation of RAP Framework and the RAP, it is imperative to develop internal manpower

resources and undertake capacity building. As only a few of the project components involve land, displacement and resettlement issues, the proposed structure has been kept simple, practical and flexible. A Land and Resettlement Manager will take responsibility for supervising RAP preparation and implementation.

As one of the main project components (i.e. ash pond area) is under government land and as the implementation of RAP in this case is mainly in compliance with the international guidelines, the onus and responsibility for steering this entire process lies on BTPS and BSPGCL. The local land authorities will play a guiding, supporting and advisory role. BTPS may also take support from external consultants (comprising of socio-economic experts, land survey specialists, resettlement specialists, community engagement specialists etc.)

Figure 8.2 ***Proposed Structure for the Land & Resettlement Team***



Each sub-team will have distinct components for implementation and have a common access to the support services unit. The following table provides a broad overview of roles and responsibilities of the sub-teams.

8.3.3.1 *Land Survey Team*

The broad roles and responsibilities of the land team (mainly concerning the ash pond area and also ash pipeline area) will include:

- Develop in-depth knowledge of the state, national and international laws and guidelines and develop awareness of the process of land surveys, determine the boundaries, procurement, categorization, valuation etc.
- Consultations with the cultivators in the ash pond area and

- Undertake land and assets inventory survey in the ash pond area with the help of additional field support members, in particular – identifying the claimants, and mapping their dependence on land parcels etc.
- Provide support in carrying out the census survey and sample socio-economic survey among the impacted peoples
- Maintain systematic records pertaining to all previous land transactions and communication held between BSPGCL, BTPS and the District authorities (Land Acquisition Department, Revenue and Land Reforms Department etc.)

8.3.3.2 Resettlement Team

The broad roles and responsibilities of the resettlement team (mainly concerning the ash pipeline area) will include:

- Consultations with the community to gather their preferences, opinions and an overall feedback on various resettlement options
- Coordination with the relevant land authorities throughout the entire process of identifying a resettlement site, acquisition of land at the resettlement site, actual resettlement and rehabilitation etc.
- Supporting in the development of a resettlement action plan
- Documenting and maintaining records of the entire resettlement and rehabilitation process
- Supporting in undertaking household surveys and identifying vulnerable families, if any
- Devising strategies to improve livelihoods of the displaced households

8.3.3.3 Community Development Team

The community development team may comprise of the 2 members of the land/resettlement team and play an important role in identifying needs, formulating CSR plan and strategies. An outsourced team (NGO etc.) may be involved for undertaking various implementation activities and monitoring. The roles and responsibilities for this team include:

- Undertaking need assessment study and identifying specific needs of the impacted members and the local community at large
- Formulating a CSR plan and a strategy
- Developing specific strategies, targeted community activities, and undertaking budget preparation, annual plans etc.
- Implementation of the various activities identified over different time frames
- Undertaking monitoring and evaluation for the csr programs on a periodical basis (to be defined)

8.3.4 RAP Specific Activities: Field Surveys

8.3.4.1 Census Survey, asset inventory and community engagement

The teams will concurrently conduct:

- the survey of each land parcel affected by the Project, to define the boundaries of the parcel, determine its dimensions, classify the land and size and mark these out on drawings in relation to visible features and by pegging-out on the ground; land classification by category (irrigated agricultural, non-irrigated agricultural, current or old fallow, pasture, habitation etc.); ownership/use status; agro-climatic zone and type of cultivation;
- the household census and socioeconomic survey, to determine the circumstances of each household owning, occupying or using all or part of the land, including demographic details and incomes from various sources, in addition to the impacted land/asset;
- an inventory of assets present on or associated with the land parcel that will be impacted by the Project; residential, commercial and other structures, description of form, material, use etc.;
- consultations and focus group discussions at the village level to identify community level impacts and particular contextual issues that need to be addressed in the RAP; and
- identification of any sensitive cultural sites in the area that the Project would need to avoid or replace.

8.3.4.2 Household and socio-economic survey

The household census for each physically and/or economically displaced household or individual will identify:

- demographic characteristics of the household, in terms of household size, gender, age, skills, educational profile of each member;
- specific vulnerabilities of the household in terms of physical or other disabilities, age-related, social status related, informal settlers or squatters, nomadism;
- livelihood or occupation of each individual (for example, employed, self-employed, entrepreneur, employer, farmer, landless labourer, sharecropper, subsistence farmer, cattle-herder/pastoralist etc);
- supplementary income streams (market produce or livestock, seasonal or part time labour, money sent from elsewhere or remittances etc);
- dependence on natural resources, (grazing, fishing, forest based produce etc) including seasonal dependence;
- access to credit; and
- access to and use of common property resources, public infrastructure and cultural property.

Manual notes will also be taken as back up and to provide more qualitative supporting information.

During the household surveys and wider community consultations the teams will also conduct early consultations on preferred forms of mitigation of envisaged impacts amongst affected parties. Based on the applicable entitlements the teams will identify possible locations for replacement land and housing, and will also look to identify other types of development measures that could be used, as in the case of community compensation. All project affected persons will have access to a suit of mitigation measures and livelihood restoration strategies, based on their entitlement, to address the negative effects of the displacement.

8.3.4.3 Sign off and Cut-off date

- **Establishing the cut off dates**: As the Project designs and layouts will be finalised in phases, it would be impossible to establish a single cut-off date for the entire Project. Considering this limitation, and not underestimating the risks of encroachment and influx of outsiders in the Project area, segmented or fragmented cut-off dates are proposed to be formally established for Project sub-components, as and when the full surveys and asset inventory process is completed.

- **Design Entitlements Resettlement Measures**: The information obtained through the socio-economic survey will be assimilated and assessed to identify potential sources of primary, secondary and supplementary income. This will be carried out in parallel with surveying and analysing the current socio-economic contexts of the Project area, demand for goods and services, availability of support services such as credit agencies and current skill pool and labour requirements (to match with what the displaced families have). The RAP team in consultation with the affected persons will also need to identify new economic opportunities, such as land based opportunities, or skill based livelihood opportunities both within and outside the Project area.

- **Developing income and/or livelihood restoration programmes**: Alternative livelihood restoration measures are important elements of the mitigation strategy. These packages will be developed including specific actions to enable people to restore and where possible enhance their existing livelihoods, or to allow them to develop new skills and capacities suited to alternative livelihoods. The livelihood restoration programmes will emphasize specific provisions for vulnerable groups and women.

- **Identification of relocation sites**: Potential host sites for relocation will be secured with the help of the land authorities after consultation with the physically impacted households regarding their preferences as also with the host villages and the local administration.

  Plans developed for this purpose will include housing, infrastructure and social services at the resettlement site to cater to both the affected families

as well as the impacted host community, wherever applicable. The proposed layout for relocation sites will be discussed with the respective host communities in order to consider their feedback on the same.

- **Consultation with affected and host communities**: The details of entitlement Frameworks, livelihood restoration plans and will be disclosed and approved by the affected communities. Consultations are likely to be carried out at the town and district level across the footprint area for each Project component. Host communities, where the PAPs will be relocated and/or provided replacement land, will be consulted about impacts on them, and mitigation measures will be adopted accordingly. These measures will ensure that the host community's current access to amenities and resources are retained or enhanced as the case may be, and they too get benefits at a community level.

8.3.5 Implementation of the RAP

The implementation of RAP will be a joint responsibility of BTPS (along with consultants and experts) and land administration (district, tehsil etc.) as already indicated in the above section.

Broadly, the tasks will include the following:

- stakeholder and community engagement, disclosure and communication;
- host community consultation and collaboration with GoL offices on finalisation of relocation house sites and land;
- negotiation and finalisation of household and community compensation agreements;
- payments of compensation;
- commencement of transition activities and livelihood restoration programmes;
- construction of housing and land preparation where relevant;
- dismantling/demolition of houses; vacating houses and land;
- signing of resettlement certificates; and
- Government making available replacement land and land use rights, in line with agreed processes.

9 PUBLIC CONSULTATION AND PARTICIPATION

Consultation and participation by the affected communities and individuals is an essential element of the land acquisition, compensation and resettlement process. Throughout the process there will be consultation and involvement of affected parties. Affected parties will be consulted on the following issues and their feedback will be sought:

- the entitlement matrix;
- market valuation, calculation and rates;
- the plans for development of the property or land;
- options and rights pertaining to resettlement and compensation;
- technically and economically feasible options for compensation and resettlement;
- the process of and proposed dates for compensation and resettlement;
- the availability of compensation at full replacement cost for loss of assets and services; and
- other assistance available to maintain or improve their living standards.

Consultations and disclosure will be done at the following key stages:

- prior to the census and socio-economic survey to inform people of the process and during the asset inventory survey;
- during the survey process through interviews, focus group discussions and village consultations to understand impacts and compensation, resettlement and rehabilitation options;
- post completion of the survey to discuss the entitlement matrix and seek feedback on it from the PAPs and to discuss resettlement housing and locations options;
- during the implementation of the RAP at the stage of negotiation of compensation packages with impacted parties, and other concerned parties (government, village elders *etc.*), delivery of compensation and concurrently, through the process of resettlement and livelihood restoration;
- post implementation, during monitoring and evaluation audit processes; and
- throughout the Project operations.

9.1 STAKEHOLDER ENGAGEMENT AND DISCLOSURE PROCESS

The community engagement process for RAP will be tailored to provide information about the proposed activities that are part of each project component. A more detailed Stakeholder Engagement Plan will be prepared describing applicable principles, levels of stakeholder engagement, methods and proposed mediums relevant to the context, time, message and stage of RAP, with the inclusion of suggested tools for planning, recording and

tracking stakeholder engagement. A summary of elements relevant to the RAP Framework are as below.

9.1.1 Resettlement Planning

Once the RAP Framework is agreed in consultation with the relevant stakeholders against which the RAP for the various project components will be prepared, the consultation process will follow the following approach:

- Consultations with the government authorities (if required) to plan and mobilize the land and asset inventory survey and RAP process for each Project component. This will include:
    - review and approval of the survey instruments to be used for the Census survey & Asset Inventory; and
    - discussion on plan of action for the survey and assessment activity
- Prior information to potentially impacted persons through discussions and other participation tools, as well as a simple communication dossier covering the following :
    - RAP Framework and its key provisions;
    - typical activities that would be carried out during the RAP preparation process (baseline survey, land survey, asset evaluation etc.);
    - cut-off date for eligibility;
    - grievance redressal systems;
    - verification of assets surveyed,
    - schedule of events/actions;
    - what can the community expect; and
    - request for cooperation.
- Consultations during the household and community survey that will profile the land – use and tenure, and livelihood patterns of the community, and also seek their feedback on various issues, including alternate livelihoods, resettlement preferences.
- Village level consultations regarding process, compensation, resettlement sites, resettlement and livelihood restoration, proposed compensation. In addition, focus group discussions will be prepared to determine community compensation both for the impacted and host villages.
- Consultations during negotiations for household level entitlements and reaching agreement on various aspects of compensation and livelihood restoration. There will also be on-going consultations during the implementation of the RAP.

9.1.2 Resettlement Implementation

Participatory consultation will continue during the implementation of resettlement for specific Project components. Such consultations will take the form of community-level meetings to track the progress of mitigation measures and feedback on the adequacy, process and effectiveness of the same.

9.1.3 Post Resettlement

Post resettlement evaluation of the resettlement effectiveness will be conducted by BTPS to assess the restoration of socio-economic condition of the PAPs. The process will be led by active involvement of PAPs in providing the valuable input to evaluate the RAP outcome.

The process of engagement with project affected population will continue thought the project life even after the relocation process is completed by the project. The project proponent through its Community Development team will work with the resettled people and the community around the project area for general development.

9.2 STAKEHOLDER ENGAGEMENT FOR RAP

A Stakeholder Engagement Plan (SEP) setting out the approach to engaging with all interested parties during the SIA and RAP for the Project will be prepared with the purpose of informing stakeholders about the developing plans and giving them an opportunity to express their views on the Project and its potential impacts.

These views, including ones on resettlement related impacts (in a broad sense, not based on specific identified areas) will then be taken into account in the impact assessment. The consultations have also sought to identify useful information on the baseline situation and on vulnerable resources and receptors in the study area.

10 GRIEVANCE REDRESSAL MECHANISM

10.1 PURPOSE/OBJECTIVE

A Grievance Redressal Mechanism (GRM) should be established by the project proponent in the early stages. The objective of the GRM is to put in place a formalized mechanism to manage complaints if any, as they arise out of the land acquisition and resettlement process. The GRM is expected to result in minimization of the social risks and reduce conflict and strengthen the relationship between the Project and the communities.

The specific objectives of this GR mechanism are to:

- Establish an efficient channel for the Project affected persons and communities to raise their concerns in an efficient and transparent manner;
- Reduce chances of community conflict by addressing issues in a systemic manner;
- Put in place a culturally acceptable and accessible process to allow the Project affected persons and communities to raise their issues, concerns, problems, and claims;
- Create trust and accountability between the community and BTPS;
- Implement a process through which grievances can be resolved effectively, constructively and in a timely and transparent manner to avoid lengthy disputes.

10.2 GENERAL PRINCIPLES

The fundamental principles underlining the GR mechanisms are:

- The process for grievance resolution will be transparent, in harmony with the local culture and in the appropriate language;
- Communication Channels for grievance redressal will be operational throughout the project process;
- Grievance Redressal mechanism will be available to all the potentially impacted population and other interested parties with no cost implication;
- The records of all complaints and grievances will be maintained with the grievance redressal committee (to be agreed at).
- Special provisions will be made for women, vulnerable and marginalised groups to enable them to voice their concerns and register complaints.
- The redressal of the responses will be targeted in scheduled time span and all the while the complainant will be kept in loop;
- BTPS will not impede access to any judicial or administrative remedies available.

10.3 POTENTIAL GRIEVANCE ISSUES FOR THE PROJECT

There is the possibility that grievances, complaints and disputes may arise during the implementation of resettlement and compensation activities, resulting from the following:

- Inventory mistakes made during the census survey as well as inadequate valuation of properties;
- Loss of land and livelihood and unfair compensation for them;
- Mistakes related to identification and disagreements on boundaries of individuals' lands and development;
- Disagreements on asset valuation;
- Family issues resulting in ownership or share disputes amongst heirs;
- Disputed ownership of assets by different individuals;
- Unfair treatment or inappropriate behaviour by Project staff and/or team;
- Job related issues or others which community perceive as deviation from the commitment made by BTPS;
- Delay in disbursement of compensation packages.
- Access constraints caused due to project and alternative mitigation measures not provided.

10.4 GRIEVANCE PROCESS

The project proponent should form a grievance redressal committee (GRC) at the project level (which will include grievances from stakeholders of all project components).

The Grievance Procedure for receiving, evaluating and addressing Project-related grievances is described below. The Grievance Procedure (mechanism) for the Project comprises of the following key steps as suggested and discussed below:

- receipt and acknowledgement of grievance;
- registration of the grievances;
- review, investigation and resolution of grievance; and
- monitoring and tracking.

10.4.1 Receipt and Acknowledgement of Grievances

Verbal or written grievances received via the different sources (e-mails, letters, phone), or in person will be channelled to the GRC. Grievances would be primarily received by:

- The GRC during engagement with the villages, or through their involvement with the land survey teams;
- Telephone by identifying themselves, to register complaints;

- Written complaints deposited in boxes (should complainants choose to remain anonymous), located at convenient locations in the impacted villages; and
- Contractors (and their sub-contractors) at various locations

Grievances can be received either verbally or by written notification. Systematic grievance records should be maintained by the project proponent. As a preparatory activity, the GRC team will visit each village affected by the project and clearly communicate the grievance procedure. Grievances can also be registered with the village elders either through a written application or in a complaint register, and these will be picked up at least once a month by the GRC Team if the project activities are on-going in those villages.

10.4.2 Registration of the Grievance

The grievances may be registered by the project proponent in a common file/folder in hard copy format in a consistent format (with the help of standard forms).

For each grievance, the following should be included:

- initial grievance sheet (including the description of the grievance) and acknowledgement receipt to the aggrieved;
- grievance monitoring sheet, mentioning actions taken (investigation, corrective measures); and
- status of grievance (pending, closed, unresolved etc.).

All grievances will be recorded regardless of whether they are taken up for consideration or not.

10.4.3 Review, Investigation & Resolution of grievance

The GRC team member will either undertake the investigation or assign it to someone and involve personnel from other Departments (for ex: civil etc.) if it concerns them. In each case, the responsibility should be clearly identified. The purpose of the site inspection is to verify the validity and severity of the grievance. The following will be undertaken:

- Interview the person receiving the complaint to gather as much information as possible on the nature of the grievance and determine the appropriate response and course of action.
- Determine whether the grievance took place within an area affected by Project activities. If the grievance is not related to Project or contractor's activities, inform the complainant that the grievance is not accepted and the underlying reasons, however documenting the same.
- If the grievance received is a major one, this may or may not be dealt at the project level and can be escalated to the company level BSPGCL.

- If the grievance can be resolved immediately, the same be done and the resolution and closure status be recorded (even though the communication was on verbal mode).
- The aggrieved can also take legal recourse under the Indian laws, if such a scenario arises.

10.4.4 Monitoring and Evaluation

The GRC will monitor the status of the pending grievances and attempt to arrive at closure for all of them. In addition the team will track key grievance indicators and report the results of these monitoring efforts internally on a quarterly basis or bi-annually (depending on the frequency and number of grievances).

The reporting will include a summary of the number of grievances registered by category and severity; the average time to resolution; the number of grievances unresolved and any high risk issues. Every half yearly, there will be an internal review of the grievance procedure to understand:

- The category of grievances collected and changing trends (with the reasons for the same);
- The effectiveness of the system in capturing the grievances in different parts of the project;
- Lessons learnt in terms of redressal including coordination on response;
- An analysis of the feedback from the complainant; and
- Suggested actions required for a more effective process.

10.5 DISCLOSURE OF GRC

BTPS will be the responsible agency for wider disclosure of grievance redress mechanism in the project area. Various methods such as leaflet, pamphlet, and village-specific meetings can be adopted to create awareness about the GRC existence and procedure. The entire process of grievance procedure from registration to closure should be communicated effectively. The field staff could also communicate the process during the land survey and RAP process.

10.6 EXISTING PROCESS OF DOCUMENTING CONCERNS OF STAKEHOLDERS

Both BSPGCL and BTPS do not have a formal grievance mechanism to officially register, track and redress the grievances received from the internal and external stakeholders.

For internal stakeholders, the grievances, if any, are received and addressed mainly verbally and via emails for some of the employee staff in the organization. For community stakeholders, there is no direct interface and there is no mechanism established to hear any concerns and expectations etc.

BTPS has not undertaken any consultations with the local community and the potential PAPs for the proposed expansion unit.

However, consultations with the local community have been undertaken previously with the community members as part of the public hearing process and some of the concerns have already been raised and addressed to an extent. The BTPS representatives have undertaken consultations with smaller groups, considering the overall community sensitivities.

11 IMPLEMENTATION SCHEDULE & BUDGET

11.1 RESETTLEMENT ACTION PLANS

The process of preparing the resettlement action plans (RAP), in line with the RAP Framework requirements will involve the following:

- establishment of the cut of date and carrying out of a census to identify PAPs;
- census will generate information about the PAPs, their entitlements regarding compensation, resettlement and rehabilitation assistance as required;
- disturbances, especially those affecting income-earning activities, shall be properly recorded for the sake of compensation or asset replacement;
- based on the census and inventory of losses, and in consultation with the PAPs, a time phased action plan with a budget for provision of compensation, resettlement, and other assistance as required, shall be prepared.

To ensure transparency of procedures, PAPs shall be involved in the process of asset inventory and informed of the method of valuation used to assess their assets. All payments of compensation, resettlement assistance and rehabilitation assistance, as the case may be, shall be made through bank account or in case of cash payment shall be in the presence of the PAPs in question and the local leaders.

Box 11.1 Contents of the basic elements of a RAP

- Identification of project impacts and affected populations;
- Baseline socio-economic data and census
- Legal framework for land acquisition and compensation;
- Compensation framework;
- Description of resettlement assistance and restoration of-livelihood activities;
- Detailed budget;
- Implementation schedule;
- Description of organizational responsibilities;
- Framework for public consultation, participation, and development planning;
- Description of provisions for redress of grievances; and
- Framework for monitoring, evaluation, and reporting.

11.1.1 Timeframes

Comprehensive time frames shall be drawn up and agreed upon by all parties including the PAPs as part of the RAP document. Compensation payments for acquired land and affected assets and resettlement of households as described above, must be completed as a condition for taking away land and before commencement of the civil works under the project. Adequate time and attention shall be allowed for consultation of both the displaced and host

communities before bringing in the new comers. The actual length of time will depend on the extent of the resettlement and compensation and will have to be agreed upon by all parties.

PAPs will need to be compensated, in accordance with this Resettlement Policy Framework and subsequent Resettlement Action Plan (RAP), before civil works can begin. In particular, land and related assets may be taken away only after compensation has been paid and resettlement sites and other allowances have been provided to PAPs. For project activities requiring relocation or resulting in loss of shelter, the resettlement policy further requires that measures to assist the project affected persons are implemented in accordance with the individual RAPs. In the Implementation Schedule of RAP, details on resettlement and compensation must be provided. The schedule for the implementation of project activity and RAP implementation shall be synchronised to avoid unnecessary pressure and inconvenience to the affected people.

The schedule for the implementation of activities, as agreed between the Project Planning teams and PAPs must include:

- Target date for PAP identity card preparation and distribution;
- Target date for opening of joint bank account for transfer of compensation;
- Target date for compensation and assistance transfer to PAPs account;
- Target dates for development of resettlement site;
- Timetable for shifting of PAPs to resettlement colony or any resettlement site, if required;
- Timetable for dismantling of structures on site;
- Timetables for transfers of resettlement site to PAPs;
- Dates of possession of land by BTPP and;
- The link between RAP activities to the implementation of the overall sub project.

11.2 BUDGET

Budget is outlays for the different expenditure heads and is calculated at the current price index. These costs will be updated and adjusted to the inflation rate as the project continues and during implementation. The RAP for each project component will include a budget for compensation, relocation and other rehabilitation entitlements. The RAP will clearly state where the sources of land and/or funds will come from and how the funds will flow, including a compensation payment schedule.

Budget for RAP will be estimated based on actual outcome of survey of land and assets of the families affected by the project. The RAP budget will also take in to account the other form of assistance proposed and agreed in the RAP Framework, cost of development of resettlement site, cost of RAP

implementation, livelihood restoration, hiring of agencies for various activities related to RAP. A list of heads for budgeting purpose is provided below:

- Land;
- Structures;
- Resettlement site development, if any;
- Cost of trees, crops;
- Transitional allowance;
- Shifting allowance;
- Rental allowance;
- Disturbance allowance;
- Economic rehabilitation grant;
- Cost of skill improvement;
- Additional support to vulnerable group;
- Institutional operating cost;
- Hiring of agency for RAP implementation and monitoring;

12 MONITORING & EVALUATION ARRANGEMENTS

12.1 GENERAL OBJECTIVES OF MONITORING & EVALUATION

Evaluation and monitoring are fundamental components of the Resettlement Action Plan. In order to assess whether the goals of the resettlement and compensation plan are being met, a monitoring plan will be required. This monitoring plan will indicate parameters to be monitored, institute monitoring milestones and provide resources including responsible persons or institutions to carry out the monitoring activities.

The arrangements for monitoring the resettlement and compensation activities will fit the overall monitoring programme of the entire project, which will fall under the overall responsibility of the different executing agencies.

Periodic evaluations will be made in order to determine whether the PAPs have been paid in full and before implementation of the project activities; and whether the PAPs enjoy the same or higher standard of living than before.

12.1.1 *Third Party Monitoring*

An independent agency should be engaged for monitoring and evaluation component of the project/program. This will take the form of carrying out independent monitoring of the implementation of the resettlement and compensation plans at periodic intervals of quarterly or half yearly during the project life.

The objective will be to make a final evaluation in order to determine:

- if affected people have been paid in full and before implementation of the project; and
- if the people who were affected by the subproject have been affected in such a way that they are now living a higher standard than before, living at the same standard as before, or they are they are actually poorer than before.

12.2 INDICATORS

A number of objectively verifiable indicators shall be used to monitor the impacts of the compensation and resettlement activities. These indicators will be targeted at quantitatively measuring the physical and socio-economic status of the PAPs, to determine and guide improvement in their social wellbeing. Therefore, monitoring indicators to be used for the RAP will have to be developed to respond to specific site conditions. As a general guide, the following *Error! Reference source not found.* provides a set of indicators which can be used.

Table 12.1 Types of verifiable indicators

Monitoring	Evaluation
Outstanding compensation or resettlement contracts not completed before next agricultural season.	Outstanding individual compensation or resettlement contracts.
Grievances recognized as legitimate out of all complaints lodged.	All legitimate grievances rectified
Pre- project production and income (year before land used) versus present production and income of resettlers, off farm income trainees, and users of improved mining or agricultural techniques.	Affected individuals and/or households compensated or resettled in first year who have maintained their previous standard of living at final evaluation.
Pre- project production versus present production (crop for crop, land for land).	Equal or improved production per household

(a) Indicators to determine status of affected people

A number of indicators would be used in order to determine the status of affected people (land being used compared to before, standard of house compared to before, level of participation in project activities compared to before, how many kids in school compared to before, health standards, etc). Therefore, the resettlement and compensation plans will set two major socioeconomic goals by which to evaluate its success:

- Affected individuals, households, and communities are able to maintain their pre-project standard of living, and even improve on it; and
- The local communities remain supportive of the project.

(b) Indicators to measure RAP performances

In order to access whether these goals are met, the resettlement and compensation plans will indicate parameters to be monitored, institute monitoring milestones and provide resources necessary to carry out the monitoring activities.

(c) Indicators to monitor and evaluate implementation of RAPs

Financial records will be maintained by the Local Governments and the executing agencies to permit calculation of the final cost of resettlement and compensation per individual or household.

ANNEXURE - VI

Stakeholders Engagement Plan (Draft)

Stakeholder Engagement Plan (Draft)

Introduction

Bihar State Power Generation Company Limited (BSPGCL) is planning to develop 660 MW Super Critical Thermal Power Plant close to its under construction units (Unit No. 8 and 9) at Barauni in District Begusarai, Bihar. BSPGCL has approached Japan International Cooperation Agency (JICA) for the loan to develop this project.

1.1 CONTEXT OF THE PROJECT

In order to justify the loan to the planned construction of the Project, JICA has initiated a preparatory study, which will include the feasibility study of the power plant and is currently being developed by Kyushu Electric Power Co., Inc (KEPCI). In order to understand the environmental and social consideration of the planned construction project and its associated components (water supply, power evacuation and railway siding) JICA has proposed to conduct an Environmental and Social Impact Assessment (ESIA) study in order to proceed as Japanese ODA project as well as to meet the regulatory requirements of the Ministry of Environment, Forests and Climate Change (MoEFCC), Government of India.

The results of the study will serve as reference information when JICA conducts assessment on the loan to the construction project. The power plant construction project is categorised as "Category A" as it falls under "thermal power plant (including geothermal power plant) sector (which has characteristics likely causing certain impact or in the vulnerable area where it to susceptible to external disturbances" according to JICA's Environmental and Social Guideline (enacted on April 2010).

As per the Indian regulations, the proposed project falls under category A, item 1(d) of Schedule to the EIA notification SO no. 1533 dated 14 September, 2006 as amended till date as per the notification issued by Ministry of Environment and Forests (MoEF) and would require prior Environmental Clearance (EC) from MoEF, Government of India.

1.2 APPLICABLE REFERENCE FRAMEWORK

The study further needs to be complying with the following assessment framework:

- Applicable local and national environmental, health and safety rules and regulations;
- Applicable local and national social legislations;
- JICA's Environmental and Social Guideline (enacted on April 2010);
- Resettlement Plan under Annex A of the World Bank's Safeguard Policy OP4.12;
- The World Bank "Involuntary Resettlement Source Book Planning and Implementation in Development Projects"; and

- Guideline for preparing reports on the projects under category B.

1.2.1 Scope pertaining to stakeholder consultations

Some of the important aspect of the ESIA study with respect to stakeholder consultations is as follows:

- Assist project proponent in organising public consultation for the project including coordination with Bihar State Pollution Control Board (BPCB) and providing technical assistance to prepare necessary documentation, presentation and addressing the clarifications required arising out of the public consultation process;
- Assistance with stakeholder consultations (purpose, participants, and subjects to be discussed) - Prepare venue, presentation materials, handouts, transportation, equipment and other necessary items for stakeholder consultation(s) (purpose, participants, and subjects to be discussed) and
- make prior announcement of the stakeholder consultation by visiting villages and by using other effective methods to let all the affected people know about the consultation on behalf of the project proponent.

ERM understands that detailed stakeholder consultations will be conducted during the Socio –economic baseline date collection stage; however owing to the complexity associated with the project and to ensure proper information in the villages, initial stakeholder consultations have been considered to be undertaken in some of the selected villages.

1.3 KEY DETAILS FOR PRELIMINARY STAKEHOLDER MEETINGS

The scope of the preliminary stakeholder meetings are as follows:

- Information Disclosure pertaining to the project and the associated project components and activities involved;
- Seeking cooperation from the village leaders and community members (including land sellers) for the household surveys which will be conducted over the coming months; and
- Conveying the objective of undertaking such surveys, introducing ERM as a third party engaged in conducting a detailed impact assessment study, in particular to understand livelihood impacts and the process of compensation payments being undertaken in the project area;
- Discussing existing and proposed grievance redressal mechanism for the project;

1.4 TENTATIVE STAKEHOLDER GROUPS

Based on the land information and details provided above, the following table presents a summary of the affected villages, the members of which can possibly form the potential stakeholders for the proposed meetings.

Table 0.1 Tentative Stakeholder Meeting Groups

Project Component	Village	Stakeholder groups	Remarks
Ash Dyke Area	Ramdiri Village	Village leaders, elders (in total a group of 8-10 members)	
	Jagatpura Village	Village leaders/elders, other representative (group of 8-10 members)	
	Village Kasaha or Village Malhipur	(based on additional information on land owners/occupants)	
Water Pipeline	Simariya Village	Village leaders, elders (in total a group of 8-10 members)	
Ash Slurry Pipeline	Discussions with members in Ramdiri and Malhipur (as part of ash dyke area) will also cover the slurry pipeline aspect.		

Note: In total, 4 villages are supposed to be covered through preliminary stakeholder consultations. Based on the ground situation, either 4 of such meetings could be conducted separately in each of the villages, or some of them can be covered together.

1.5 TENTATIVE VENUE AND OTHER ARRANGEMENTS

Some of the key consideration while planning for the stakeholder meeting includes the following:

- Villages for preliminary stakeholder consultations have been selected based on the understanding of the land take issues (refer ***Annexure –I***), and will need to be confirmed with BSPGCL and BTPS;
- The venue may be decided based on the discussions with the senior management of BSPGCL and BTPS;
- Each stakeholder group may comprise of a mix of village leaders/elders, land sellers, panchayat member representatives and/or women members etc. Such a group may be formed and finalized in consultation with BSPGCL and BTPS;
- Senior management of BSPGCL/BTPS may be responsible for conveying about such stakeholder meeting and for informing the participants about the venue and the date/time;
- The dates may be fixed in consultation with BSPGCL – perhaps sometime in the month of June/ July – as will be mutually agreed upon;
- ERM team, with its social specialists will be present to facilitate these stakeholder meetings and to seek cooperation from the local community to undertake household surveys.

Annexure-I

Table 0.2 Project Component and Affected Villages

Project Component	Land Details		Affected Villages
Ash Dyke Area	Patna (496.51 acres) • Government Land – 366.89 acres • Private Land – 129.62	• The private land of 129.6225 acres which has been already acquired under Section 17(1) of L.A. Act belongs entirely to Village-Kasaha (Diara Maranchi Urf Kasaha) of Mokama Tehsil in Patna District. The total number of households is 672 and the total population is 3636 in Diara Maranchi Urf Kasaha. It will be cross-verified whether all the PAFs belong to village Kasaha or if some of the land owners are also from Ramdiri and/or Jagatpura. • The families occupying and cultivating in the Government land mainly belong to villages Ramdiri and Jagatpura. Ramdiri Village is located in Maitihani Tehsil in Begusarai District. Ramdiri is a huge village and is spread across as separate villages but with the same name. In the provisional Census Data, 2011 – Ramdiri village in Matihani Tehsil has been highlighted four times. Jagatpura village could not be found in the Census Data. It will be cross-verified on ground if there is a different revenue village which Jagatpura is a part of. o 1st - Ramdiri Village comprising of 1379 households and a population of 6712 o 2nd – Ramdiri Village comprising of 81 households and a population of 363 o 3rd – Ramdiri Village comprising of 1430 housholds and a population of 6568 o 4th – Ramdiri Village comprising of 4440 households and a population of 21323 • In addition, it has been also reported that a few of the occupants also belong to Malhipur village of Barauni Tehsil in Begusarai District. In provisional Census Data, Malhipur is identified as a town comprising of 2322 households and a population of 12439.	1) Nearest Habitation - Diara Maranchi Urf Kasaha 2) Villagers from Ramdiri and Jagatpura have mainly occupied the government land and are cultivating 3) Malhipur Village
Water Intake Facility and Pipeline	Begusarai District - 15.5 acres approx.	The pipeline passes through Simariya Ghat where some shops and hut structures are set up at present that may be affected in the process. The nature of shops/huts (temporary or permanent) needs to be cross-verified. It is not clear under which revenue village does Simariya Ghat fall under. Simariya village could not be traced in the Provisional Census Data 2011. It is not clear if any small proportion of the pipeline land also falls under Village Kasaha. This will be cross-verified.	Simariya (need to cross-check if this is a revenue village – couldn't trace this in Census Data)
Ash Slurry Pipeline	Begusarai District - 3.75 acres	Majority of the pipeline section comprises of land occupied by the land owners and cultivators from Ramdiri village. In addition, nearly 3.75 acres of land also belongs to Malhipur village.	Malhipur

ANNEXURE - VII

Initial Environmental Evaluation of Transmission line Project (Draft)

Kyushu Electric Power Co., INC, Japan (KEPCO)

Initial Environmental Evaluation (IEE) of Transmission Line Project related with 1x660 MW Coal Based Power Project (Unit # 10) in Barauni

Draft Report

February 2016

www.erm.com

CONTENTS

1 PROJECT DESCRIPTION

1.1 BACKGROUND

Bihar State Power Generation Company Limited (BSPGCL) has a coal based thermal power plant at Barauni in Begusarai district of Bihar, known as Barauni Thermal Power Station (BTPS). BTPS is an old thermal power plant, operating since 1963. Presently BTPS has two operating units of 2 x110 MW (Unit No. 6 & 7) and two under construction units of 2 x 250 MW (Unit No. 8 & 9). On the whole, presently total installed capacity at BTPS is 720 MW comprising of 4 units (2 x 110 MW + 2 x 250 MW). Now BSPGCL is planning to develop a 1 x 660 MW Super Critical Thermal Power Plant within its existing BTPS site. After this expansion of 660 MW unit (Unit No. 10), the total generation capacity of BTPS will be 1380 MW.

The electrical power generated form 1 x 660 MW BTPS is being planned to be transmitted to major load center at Patna, being large-scale consumption region of the State of Bihar. The Gaighat (new) substation is chosen as connection point, same being most cost effective out of all substations meeting the major transmission load centre at Patna. Based on the result of power system study, twin D/C of Aluminium Conductor Steel Reinforced (ACSR) Moose is adopted. The construction plan of Gaighat (new) substation is incorporated in BSPGCL business plan and construction work for same is also progressing.

Gaighat (new) substation will be located at Bakhtiyarpur, Patna district is in southern side of the Ganga River, whereas BTPS is located on the northern side of the Ganga River. Accordingly, transmission line from BTPS connecting to Gaighat (new) substation will be crossing the Ganga River. It is at a direct distance of about 50 kms from BTPS. However, transmission line length is assumed to be approximately 60 km from BTPS.
New transmission line is planned, constructed and managed under the responsibility of Bihar State Power Transmission Company Limited (BSPTCL).

1.2 PROJECT JUSTIFICATION

The electricity generated from Unit No. 6 & 7 (2 x 110 MW) and Unit No. 8 & 9 (2 x 250 MW) is connected with 220 kV transmission line, it will be able to supply to Begusarai district.

Out of the 1380 MW quantum of power generated from BTPS, about 660 MW power required to transfer other growth potential area. Considering the quantum of power transfer requirement (about 660 MW) to Patna region, it is proposed that a new high capacity transmission corridor may be developed to effect above transfer.

1.3 BENEFITS OF THE PROJECT

Bakhtiyarpur region, being connected with capital region of Patna (district) through national highway i.e. NH-30, is anticipated as developing area with transportation facilities, therefore future power demand is foreseen to show upward trend. There are similar 400 kV class transmission lines existing nearby Bakhtiyarpur operating via Barh Power Station, however as the network is owned by Power Grid Corporation of India Limited (Power Grid), the State of Bihar has to pay for receiving power using the Power Grid Network. Therefore, supplying power from Gaighat (new) substation to Bhakhtiyapur is considered to be economical.

Additionally, the project is likely to generate direct and indirect employment opportunities, promote industrial growth and stimulate overall development of the region. BSPTCL, as a responsible corporate entity, always undertakes community development works around the location of its substations. Hence, the basic infrastructure around the proposed substation will also improve substantially.

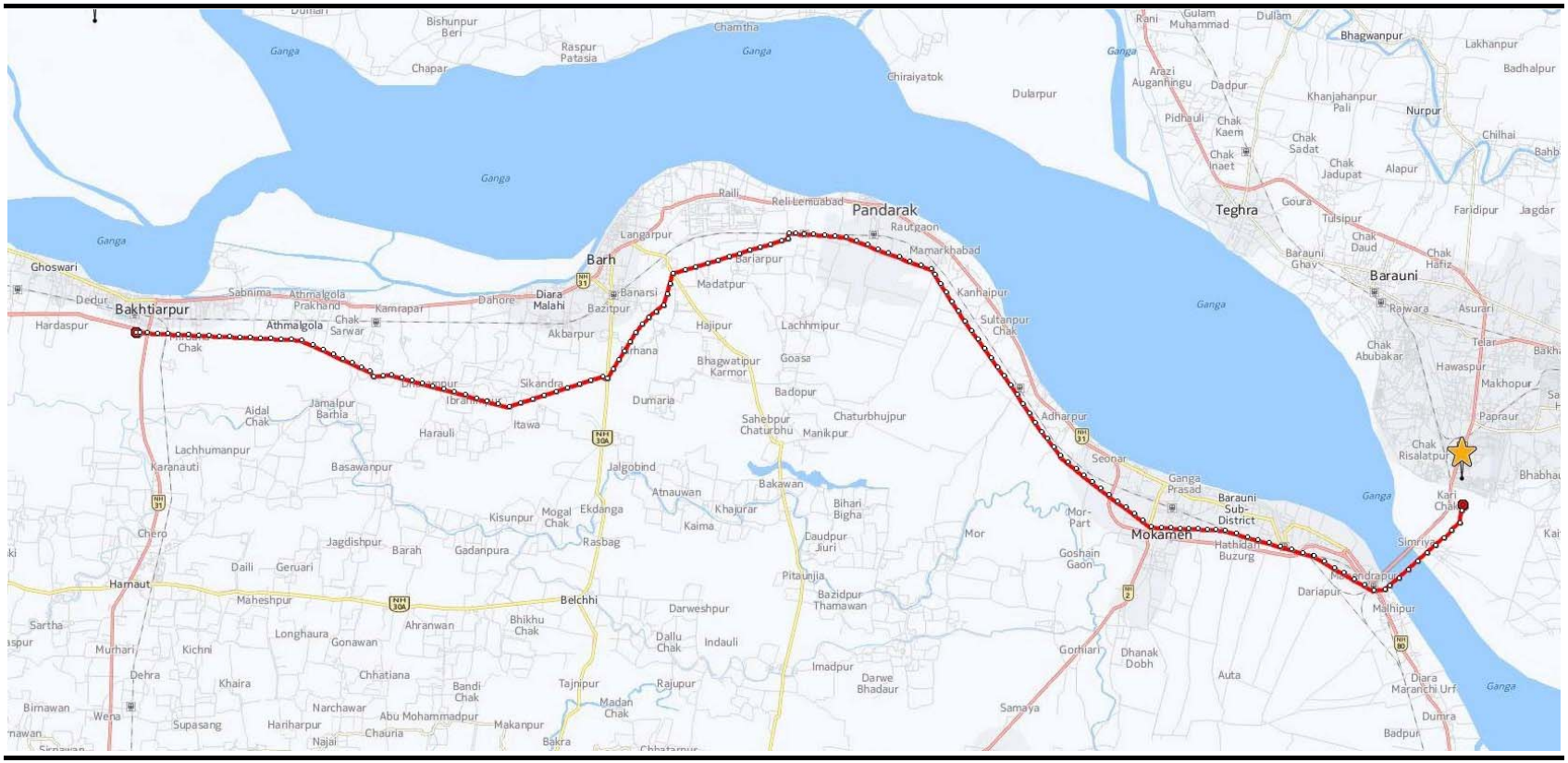
1.4 PROJECT OBJECTIVE

The objective of the project is to establish transmission arrangement between BTPS, Barauni, Begusarai district to Gaighat (new) substation located at Bakhtiyarpur facilitate for transfer of power.

1.5 PROJECT HIGHLIGHTS

Project	400 kV transmission line for BTPS to Bakhtiyarpur sub-station
Location of project	Begusarai district to Patna district
Beneficiary region	Patna
Total length	58.60 km: (7.30 km crossing over River Ganga and 51.30 km in plains)
Number of Towers	Total: 150 Nos. Crossing over River Ganga: 17 Nos (Tension -7 and suspension - 3) Plains: Tension: 133 Nos. (Tension- 19 and suspension – 114)
Crossing	Railway: Four River: three Main Road: six Existing TL: two

Figure 1.1 Proposed 400 kV Transmission Line Route Map



Transmission line activities by their inherent nature and flexibility have negligible impacts on environmental and social attributes. Indian laws relating to environmental and social issues have strengthened in the last decade both due to local needs and international commitments. BSPTCL undertakes its activities within the purview of Indian laws keeping in mind appropriate international obligations and guidelines with respect to environmental and social considerations of Funding Agencies.

The applicable acts, rules, and relevant policies in the context of the project are presented in Table 2.1. The Project Authority will ensure that project implementation is consistent with provisions of such legal framework.

Table 2.1 Legal and Regulatory Provisions

Sl. No.	Acts, Rules & Policies	Relevance/ Applicability to the project
I.	**Constitutional Provisions**	
a	Article 48 A	The State shall endeavor to protect and improve the environment and to safeguard the forests and wildlife of the country.
b	Article 51 A (g)	It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers and wildlife and to have compassion for living creatures.
II	**Provisions Law of the Land/Rules**	
1.	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013	The Act provides for enhanced compensation and assistances measures and adopts a more consultative and participatory approach in dealing with the Project Affected Persons. As and when this Act becomes effective and adopted by the State of Bihar then BSPTCL too shall be bound by and would need to comply with relevant provisions of the Act. However, currently this act is not applicable in the State as the State Legislative Assembly has not yet adopted the resolution regarding applicability of new act as per provision under article 371 A of the constitution of India. As per past experience it has been noticed that the process of adoption of central act takes time due to involvement of elaborate consultation for arriving consensus. BSPTCL taking note of that has taken a conscious decision that private land shall be secured through donations and/ or direct purchases on negotiated rate on willing buyer and willing seller basis till the new act is adopted by their State Assembly.
2.	Electricity Act, 2003	Transmission line projects are constructed under the ambit of Electricity Act, 2003 following the provisions of Section 67 & 68 of act. Under the provisions of Section 68(1):-Prior approval of the Govt. of Bihar (GoB) is a mandatory requirement to undertake any new transmission project 66kV upward to plan and coordinate activities to commission a new transmission/ distribution project.

Sl. No.	Acts, Rules & Policies	Relevance/ Applicability to the project
3	Forest (Conservation) Act, 1980	This Act provides for the conservation of forests and regulates the diversion of forest land to non-forestry purpose. When any transmission/distribution line traverses forest land, prior clearance is mandatorily required from Ministry of Environment Forests and Climate Change (MoEF&CC), Government of India (GoI) under the Forest (Conservation) Act, 1980. However, proposed transmission line is not traversing through a forest land; therefore, forest diversion is not applicable for this project.
4.	Environment (Protection) Act, 1986	It is umbrella legislation for the protection and improvement of environment. This Act as such is not applicable to transmission/ distribution projects. Even then some limited compliance measures notified under this EPA, 1986 are to be adhered to relevant rules and regulations under the EPA, 1986 applicable to the operations of BSPTCL.
i)	Batteries (Management and Handling) Rules, 2001	As per notification, being a bulk consumer BSPTCL to ensure that the used batteries are disposed to dealers, manufacturer, registered recycler, re-conditioners or at the designated collection centers only. A half-yearly return is to be filed as per Form-8 to the Bihar State Pollution Control Board
ii)	Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2008	As per notification, used oil is categorized as hazardous waste and requires proper handling, storage and disposed only to authorized disposal facility (registered recyclers/ reprosessors). BSPTCL, as bulk user of transformer oil which is categorized as Hazardous Waste, shall comply with the provisions of the said rules for MoEF notification dated 24th September 2008) if the practice of storing of used oil is maintained. In case it is decided to outsource the process of recycle of used oil to registered recycler as per the provisions of notification then BSPTCL shall submit the desired return in prescribed form to concerned State Pollution Control Board at the time of disposal of used oil.
iii)	E-waste (Management and Handling) Rules, 2011	As per notification, bulk consumers like BSPTCL is to dispose e-waste generated by them in environmentally sound manner by channelizing to authorized collection centers/ registered dismantler/ recyclers/return to producers. BSPTCL, being a bulk consumer of electrical and electronics equipment shall maintain record as per Form-2 for scrutiny by State Pollution Control Board.
5.	Biological Diversity Act, 2002	This act is not directly applicable to transmission projects because it deals with the conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith. BSPTCL abides by the provision of the act wherever applicable.
6.	The Right to Information Act, 2005	The Act provides for setting out the practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, the constitution of a Central Information Commission and State Information Commissions and for matters connected therewith or incidental thereto.

Sl. No.	Acts, Rules & Policies	Relevance/ Applicability to the project
7.	Rights of Way(RoW) and Compensation	In case of agricultural or private land the provisions of section-67 and or section-68 (5 & 6) of the Electricity Act, 2003 and section-10 of the Indian Telegraph Act, 1885 are followed for assessment and payment of compensation towards such damages. The major part of the proposed transmission line will be passing through agricultural and private land. As per RoW and compensation will be provided to affected people.
8.	Bihar Kashth & other Forest Produce Transit Regulations Rules, 1973	People have right to cut and transport trees grown on their land in line with regulations as mentioned in Annexure-I. Permit from DFO or Authorized Officer is necessary. Panchayat has been empowered through Bihar Panchayat Raj Adhiniyam, 1993 vide Notification No. Van Vikray/ 2000-2117 dated 01.07.2002 for delegation of powers for transit within the District by Head of Gram Panchayat. 10 Species have been exempted from the purview of Transit Rule vide Notification No. Van Vikraya.38-2000-456 dated 27.02.2009 namely:- Poplar, Eucalyptus, Kadamb, Gumhar, Mango, Lichi, Tar, Khajoor, Semal and Bamboo except *Dendrocalamus strictus*. Felling of trees for construction of transmission lines would be governed under this Act wherever it is applicable.
9.	Ancient Monuments & Archaeological Sites and Remains Act, 1958	The Act has been enacted to prevent damage to archaeological sites and its maintenance. It also places restriction on activities which can cause harm to the monument /property. The law is however applicable only in monuments identified by the Archaeological Survey of India. According to this act, BSPTCL cannot carry out any activity within a protected area as identified by the Archaeological Survey of India without obtaining necessary permissions.
III.	**World Bank OP (Operational Policy)**	
10.	OP- 4.01: Environmental Assessment	To ensure the environmental and social soundness and sustainability of investment projects. Support integration of environmental and social aspects of projects in the decision-making process. According to this guideline, BSPTCL need to prepare the ESIA document
11.	OP- 4.04: Natural Habitats	To promote sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions. As the proposed transmission line is passing through the IBA, BSPTCL need to be prepare detailed impact/risk assessment study for bird species in the IBA.
12.	OP-4.11: Physical Cultural Resources (PCR)	To preserve PCR and in avoiding their destruction or damage. PCR includes resources of archeological, paleontological, historical, architectural, and religious (including graveyards and burial sites), aesthetic, or other cultural significance. During detailed route survey BSPTCL need to identify any such cultural resources in the alignment and accordingly prepare a plan.

Sl. No.	Acts, Rules & Policies	Relevance/ Applicability to the project
13.	OP-4.36: Forests	To realize the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests. The proposed transmission line is not passing through any demarcated forest land, therefore it not directly applicable for this project.
14.	OP 4.12 – Involuntary Resettlement	This policy covers direct economic and social impacts that both result from Bank-assisted investment projects, and are caused by the involuntary taking of land. To avoid or minimize involuntary resettlement and, where this is not feasible, assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher. Land acquisition would not be required for construction of transmission line, only RoW will be taken and compensation will be provided to affected people.
15.	OP 4.10 – Indigenous Peoples	This policy contributes to the Bank's mission of poverty reduction and sustainable development by ensuring that the development process fully respects the dignity, human rights, economies, and cultures of Indigenous Peoples. The Bank provides project financing only where free, prior, and informed consultation results in broad community support to the project by the affected Indigenous Peoples. Such Bank-financed projects include measures to (a) avoid potentially adverse effects on the Indigenous Peoples' communities; or (b) when avoidance is not feasible, minimize, mitigate, or compensate for such effects Bank-financed projects are also designed to ensure that the Indigenous Peoples receive social and economic benefits that are culturally appropriate and gender and inter generationally inclusive. The project shall ascertain broad community support for the project based on social assessment and free prior and informed consultation with the affected Tribal community, if any.
IV	**Environmental & Social Performance Standards**	
16.	PS 1: Social and Environmental Assessment & Management	To identify and assess social and environment impacts, both adverse and beneficial, in the project's area of influence. The assessment shall include all relevant the impacts and risks identified in Performance Standard. BSPTCL need to carry out an ESIA study, as the proposed transmission line is passing through private agricultural land and IBA area.
17.	PS 2: Labour & Working Conditions	Provision of conditions and terms of employment including non-discrimination and equal opportunities, document and communication of the same to all the employee and non-employee workers as per National Labour & Employment Law. BSPTCL and its Contractor shall comply the PS-2 provision during implementation of project.

Sl. No.	Acts, Rules & Policies	Relevance/ Applicability to the project
18.	PS 3: Pollution Prevention & Abatement and Hazardous Material Storage & Handling	Reduce/minimize or control the routine, non-routine or accidental release of pollutants with potentials for local, regional & Transboundary impacts with the application of economically feasible pollution prevention and control technologies and practices in compliance with IFC's EHS guidelines. The operation of transmission line and substation will not generate any significant pollutant, only some hazardous waste in the form of waste will be generated from substation. BSPTCL shall take care of proper handling and disposal as per regulatory provision.
19.	PS 4: Community Health & Safety	Avoid or minimize risks to and im pacts on the health and safety of the local community during the project life cycle from both routine and non-routine circumstances. BSPTCL shall evaluate the risks and impacts of the project on health & safety of the affected community during the project lifecycle and establish preventive/mitigation measures to reduce/minimize the impacts. Disclosure of action plans to affected community and the government agency.
20.	PS 5: Land Acquisition & Involuntary Resettlement	Avoidance or at least minimization of involuntary resettlement by exploring alternative project designs balancing environmental, social and economic costs and benefits; and by acquiring land through negotiated settlements. Compensation and benefits for displaced person as per Performance Standard. Land acquisition would not be required for construction of transmission line, only RoW will be taken and compensation will be provided to affected people.
21.	PS 6: Biodiversity Conservation & Natural Resource Management	Minimize adverse impact on biodiversity in project's area of influence through assessment of significant project impacts on all levels of biodiversity. As the proposed transmission line is passing through IBA area, BSPTCL shall carry out impact on birds, especially protected species and migratory species.
22.	PS 7: Indigenous Peoples	Identification, implementation and documentation of culturally appropriate development benefits for the indigenous community affected by the adverse impacts of the project in consultation with the indigenous community. BSPTCL shall identify the project affected people and formulate a compensation plan as per national/ state regulatory provision.
23.	PS 8: Cultural Heritage	Protect and support cultural heritage by undertaking internationally recognized practices for the protection, field-based study, and documentation of cultural heritage. BSPTCL shall identify any cultural heritage site during detailed route survey and shall prepare protection measures.

3 DESCRIPTION OF THE ENVIRONMENT

3.1 PROPOSED TRANSMISSION ROUTE & STUDY AREA

Proposed power transmission line alignment discussed in following Table.

Table 3.1 Transmission line alignment and important features

Section	Direction	Distance (km)	Sensitivity
BTPS to Simariya	NE- to SW	2.1	Simariya village
Ganga River- Simariya (northern bank) to Dharampur (southern bank)	NE- to SW	1.63	Ganga River
Dharampur to Hatidah	E to NW	1..0	Crossing NH-80 and railway line near Hatidah
Hatidah to Mokama	E to W	6.2	Flat agricultural land
Mokama to Pajana	NE to SW	4.8	Cross over NH-82
Pajana to Kaji Chak	E to NW	14.1	Cross over major district road (MDR)
Kaji Chak to Goar	E to W	7.8	Cross over NH 30A then Kalianpur cross over MDR
Goar to Baktiyarpur via Mirdaha Chak	E to W	17.9	Cross over NH-30A

Source: Kyushu Electric Power Co., Inc

Major part of the transmission line is passing over Patna district and smaller part (BTPS to Simariya) over Begusarai district. The Patna stretch of the proposed transmission line is passing over Mokama Taal.

Mokama Tall is not just single taal but a group of seven taals covering an area of 1062 sq. km and the width varying from 6.5 to 17.6 kms. It is saucer shaped depression running along the right bank of the river Ganga. The name of seven talls from west to east as Fatuha, Bakhtiarpur, Barh, More, Mokama, Barahiya and Singhual Taal. It lies in lower Kiul-Harohar basin, situated between latitudes 24°10′ N and 25°30′ N and 84°40′ E and 86°30′ E.

3.2 PHYSICAL ENVIRONMENT

3.2.1 Climate

Being part of the Gangetic plains of the Indian subcontinent, Climate of the region can be classified as- Summer: March – May; Monsoon: June - September; Post monsoon: October – December and Winter: January – February. January is observed as the coldest month with mean minimum temperature as 9.3 ^{o}C where May is the hottest month with mean maximum temperature as 38.4 ^{o}C. Average total rainfall for the districts was 1021.3 mm; and maximum rainfall occurred from the months June to October.

3.2.2 Ambient Air Quality

The proposed transmission line is mostly passing through rural environmental settings. However, along the proposed transmission line there are two major coal based thermal power plants (Barauni Thermal Power Plant and Barh Thermal Power plant). These power plants are the major source of air pollution. Other sources of air pollution- fugitive dust emission from road, vehicular emission, emissions from brick kilns, emission from burning of cooking fuel, etc. The ambient air quality in Barauni, Mokama area shows that average $PM_{2.5}$ concentration varied from 33.83 µg/m^3 to 48.58 µg/m^3; average PM_{10} concentration varied from 65.29 µg/m^3 to 95.17 µg/m^3. Other gaseous pollutants like SO_2, NO_2, CO[1] were within the permissible limits of national ambient air quality standard for industrial, residential, rural and other areas.

3.2.3 Ambient Noise Quality

Major sources of noise in the study area are road and rail traffic movement, industrial activity (power plants at Brauni and Barh), commercial activity. The day time equivalent noise level in Barauni and Mokama area varied from 51.8 to 62.2 dB(A) while night time equivalent noise level varied from 39.6 to 47.1 dB(A) [Source: ESIA report for Expansion of 1 x 660 MW Barauni Thermal Power Plant, 2015].

[1] ESIA Report for 1 x 660 MW coal based thermal power unit of BTPS.

3.2.4 *Topography and Drainage*

Satellite imagery shows that surface morphology in the project area is dominated by plain land with agricultural land and rural and urban settlements, the river systems with numerous tributary rivers and streams, and relict stream channels.

River Ganga is major drainage channel of the study area. River Ganga is flowing from west to east, located on northern side of the proposed transmission line. The Harohar river, known as Dhowa and Mohane in upper reaches and running from west to east, is the master drainage channel of the taal area. The land between the Ganga and taal area is rather high and natural drainage across the land is not possible. Several rivers that originates in the hills on the south flown northward and join the river Harohar flowing in the valley of taal[1].

The rivers flowing from the south through the taal are generally rainfed and carry very little discharge during non-monsoon period. However, during monsoon months the flood peaks caused due to heavy rains pass quickly through the upper region of the river system having steep gradient and accumulate in lower region (taal area), where the gradient is mild. Further flood water from the Ganga also finds its way in the taal and completely stops drainage out of it. The flooding is more acute when the Ganga remains spate for long duration and 75 to 100% of taal area gets submerged.

Harohar river at Barh taal area

Harohar river at Bakhtiarpur taal area

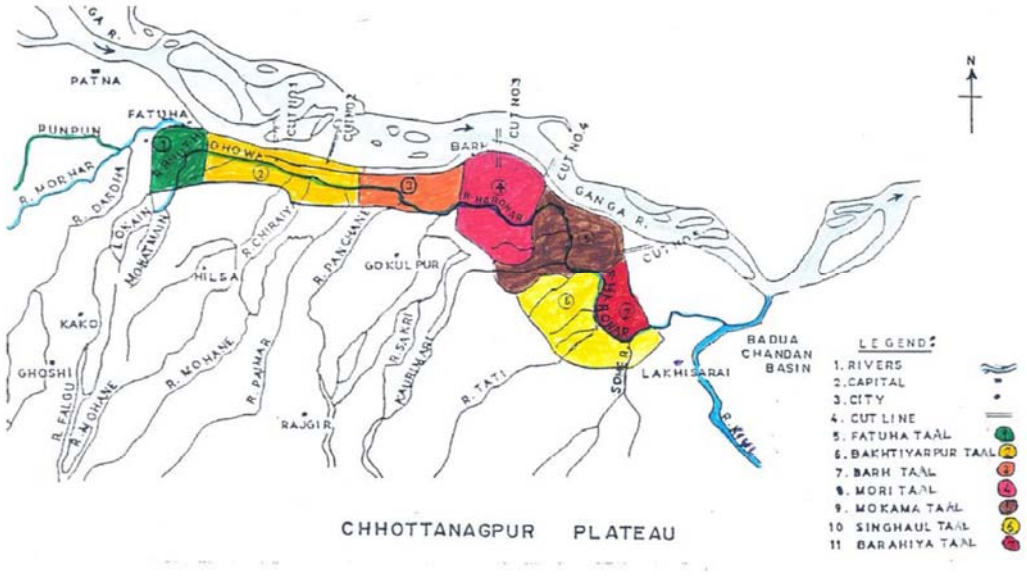
River Ganga near Simariya Ghat

River Ganga and existing Transmission line

Source: ERM, December 2015

[1] Mokama Taal- An Ephemeral Lake Requiring Holistic Management; C. P. Sinha; Proceedings of Taal 2007: 12th World Lake Conference: 1586-1590

Figure 3.1 Drainage Map of Mokama Taal



Source: Mokama Taal- An Ephemeral Lake Requiring Holistic Management; C. P. Sinha; Proceedings of Taal 2007: 12th World Lake Conference: 1586-1590

3.2.5 Land Use and Soil Quality

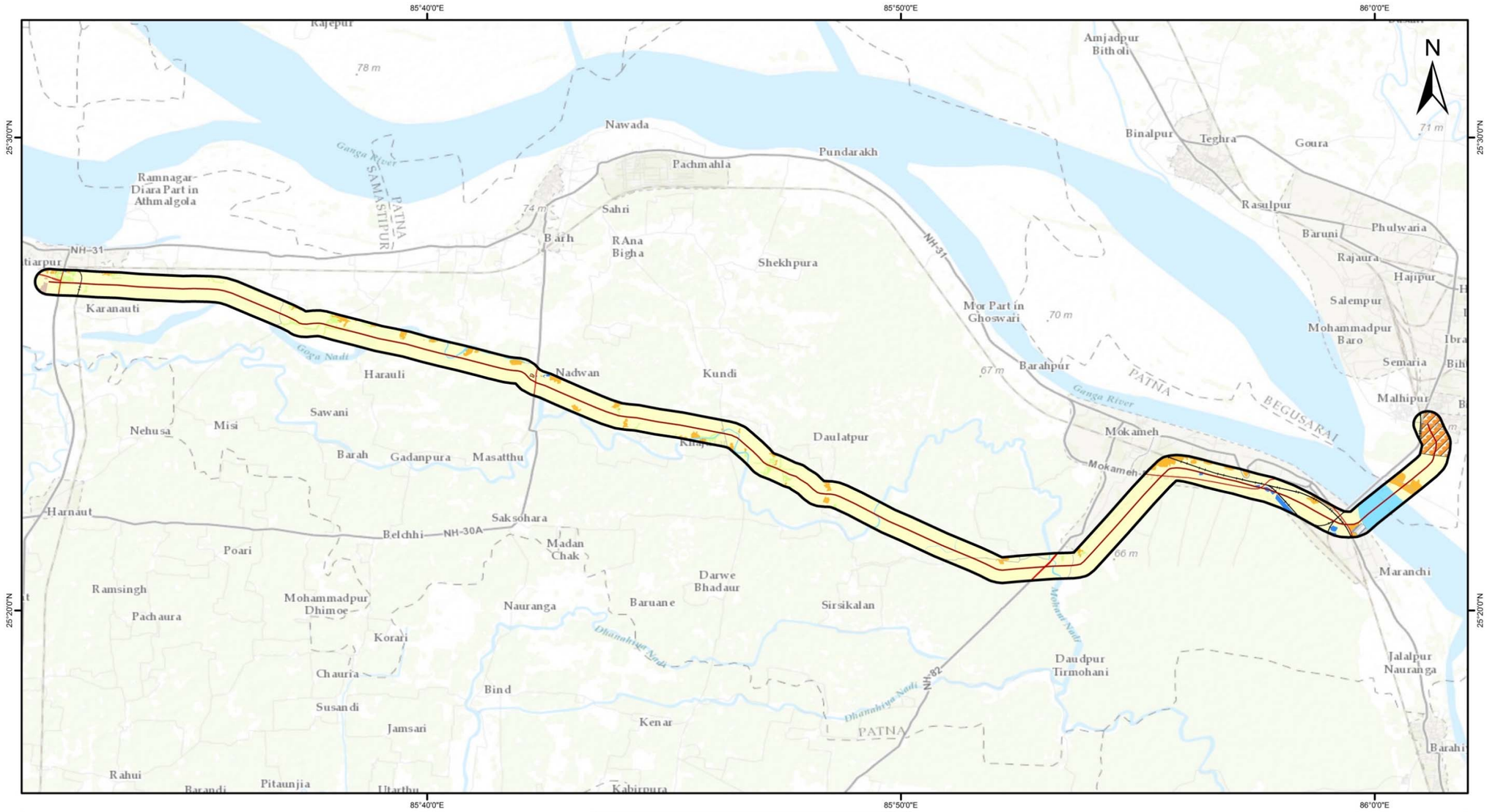
The predominant land use and land cover of the project area includes agricultural land, settlement, Ganga River, industrial areas. Agricultural land in the area is primarily mono-cropped. Vegetation is primarily plantation in agricultural lands. Land use along the transmission line route with 500 m buffer has been provided in Table 3.2 and land use map of transmission line area (500 m along the proposed alignment) is presented in ***Figure 3.2***.

The study area is located in the lower Gangetic plain, which has soil of younger alluvial nature. Texturally the soil present in study area is Sandy-Coarse loamy and Sandy-Fine loamy in nature. The soil of the area is rich with humus and is very fertile.

Table 3.2 Land Use along the Transmission Line (500 m corridor)

Category	Area (sq. km)	Percentage
Agriculture	49.19	86.33%
Brick Kiln	0.17	0.30%
Industry	1.44	2.52%
Open Area	0.09	0.16%
Railway Track	0.17	0.31%
River	2.03	3.56%
Road	0.27	0.47%
Settlement	2.58	4.52%
Vegetation	0.74	1.31%
Waterbodies	0.30	0.53%
Total	**56.98**	**100.00%**

Figure 3.2 Land Use Map of Proposed Transmission Line Area



Legend

Landuse Category

- Transmission Line
- NH
- Road Network
- Railwaytrack
- Buffer 500 m
- Agriculture
- Settlement
- Industry
- Brick Kiln
- Open Area
- Vegetation
- River
- Waterbodies

Scale: 0 2.5 5 10 Kilometers

Data Source: Survey of India Toposheet G45N14, G45N15, G45O2, G45O3

Projection: WGS_1984

Project: 1*660 MW Coal Based Thermal Power Plant - Barauni

Prepared For: BSPGCL

Map Title: Land Use and Land Cover Map

Prepared By: ERM

3.2.6 Surface Water Resources and Quality

The study area is located at the basin of the lower Ganga River. Ganga is a snow fed and major river of the Indian subcontinent. The River Ganga flows through the northern side of the study area from west to east. The river water is used for domestic use, irrigation, industrial, municipal water as well as navigation purpose. The surface water quality of the Ganga River – upstream and downstream of Simariya Ghat was studied for ESIA study for expansion of 1x 660 MW EIA project. The water quality of the river is suitable for CPCB "B" criterion (*Outdoor bathing (Organized)*), "C" criterion (*Drinking water source after conventional treatment and disinfection*), category "D", i.e. *Propagation for Wildlife and Fisheries* and also Criteria "E" (*Irrigation, Industrial Cooling and Controlled Waste Disposal*). Harohar is a rainfed river; during non-monsoon period flow of the river is very minimum. The water is mainly used for domestic purpose.

3.2.7 Ground Water Resource and Quality

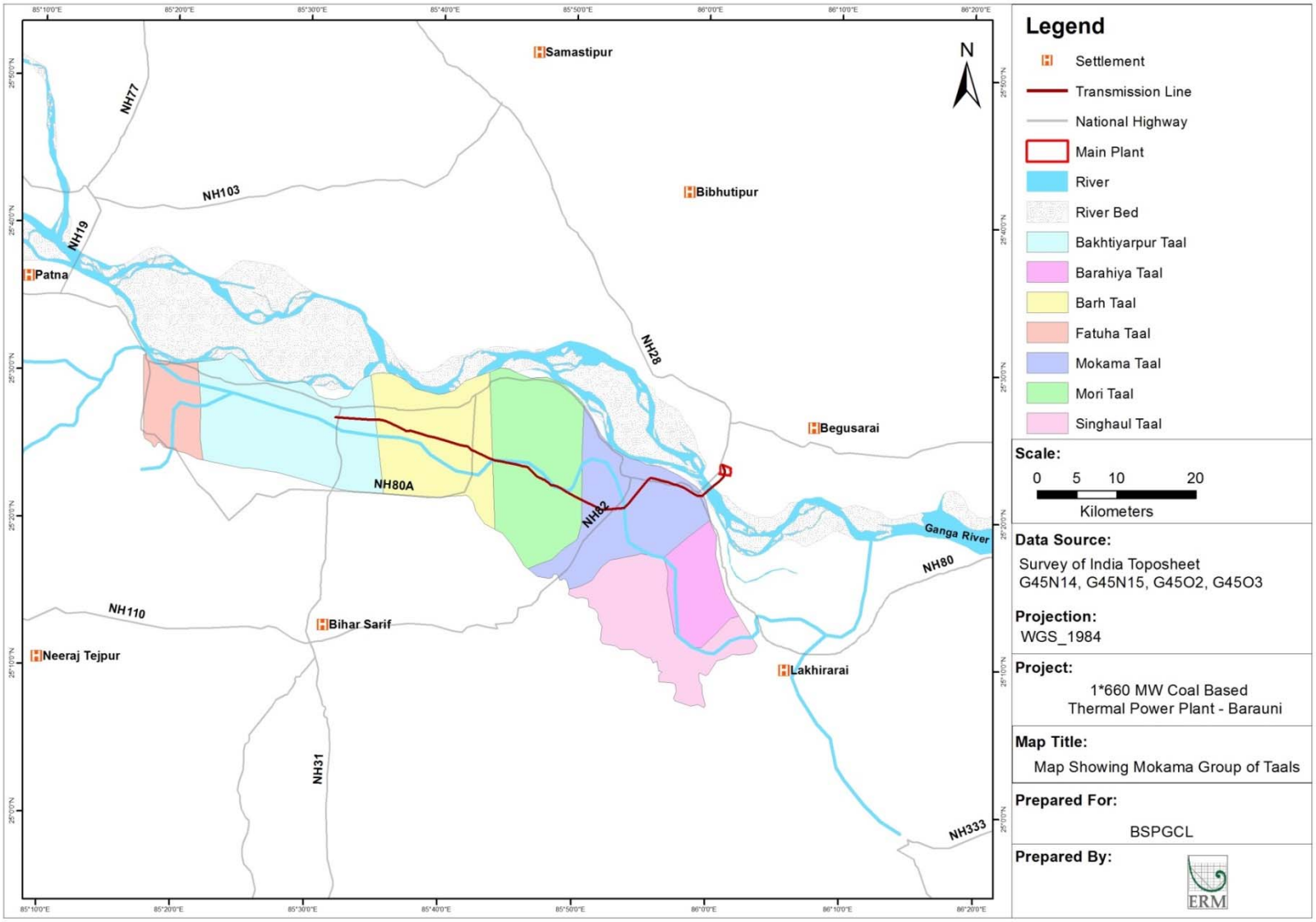
Patna district is underlain by unconsolidated formation which is quaternary to Upper quaternary of age group. Lithologically, the district is made up of recent alluvium, clay, silt, sand, gravel pebbles with concentration of calcareous materials. From the groundwater potential point of view the entire Patna district falls under good to very good category. The presence of kankar (nodules of $CaCO_3$) and fine sand at places render the top clay zone semi-pervious in nature, where ground water occurs under phreatic condition. These aquifers are made up of fine to medium grained sand occasionally coarse with thin layers of gravel at places. The depth to piezometric surface in the area varies from 6.25m to 16.30 m. The deep tube wells tapping these deeper aquifers have yield from 260m^3/hr to 1500m^3/hr with a drawdown of 6 m. The transmissivity of the aquifer varies from 3786 m^2/day to 14133 m^2/day.

The ground water quality in this region is suitable for drinking water standard, prescribed in IS: 10500, 2012 standard, except few parameters – iron. There is arsenic related problem in the ground water in certain pockets (adjacent area to river Ganga) of the study area.

3.3 ECOLOGY AND BIODIVERSITY

The study area has no demarcated forest land. The natural vegetation with high canopy is also not reported / recorded in the study area, i.e. proposed alignment. Only homestead plantation and road and canal side vegetation was recorded in the study area. The land use study along the transport route reveals that, major part of the proposed transmission line will be passing through mono-crop agricultural land. However, the proposed transmission line on southern bank of the Ganga River is located in Mokama Taal Important Bird Area. As discussed in the Topography and Drainage section, Mokama Taal is group of seven taals. The proposed transmission line is falling in four taal areas, namely Bakhtiarpur, Barh, More, Mokama taals.

Figure 3.3 Mokama Taal IBA Area



Box 3.1 Mokama Taal IBA

The biological resources of the taal area are rich and diversified. It has already been enlisted as an Important Bird Area (IBA) by Indian Bird Conservation Network. About 149 species of birds have been recorded from the area. The site also holds, on a regular basis, over 20,000 breeding and migratory water birds. The Black Ibis (*Pseudibis papillosa*), Glossy Ibis (*Plegadis falcinellus*), Eurasian Spoonbill (*Platalea leucorodia*), Greylag Goose (*Anser anser*) and Barheaded Goose (*A. indicus*) are some of the species reported from the area. Similarly, Lesser Whistling Duck (*Dendrocygna javanica*) is found in thousands, along with a few hundred Large Whistling Duck (*D. bicolor*) Ten globally threatened and Near Threatened species are found here. Critically endangered species like Indian vulture (*Gyps indicus*), White rumped vulture (*Gyps bengalensis*), endangered species like Greater Adjutant Stork (*Leptoptilos dubius*) and vulnerable species like Lesser Adjutant Stork (*Leptoptilos javanicus*), Pallus Fish Eagle (*Haliaeeetus leucoryphus*), Greater spotted eagle (*Clanga clanga*) etc. are also reported from the area. Kawar (Kabar) Lake, an IBA site is close to Mokama, and when the birds get disturbed at Kawar they fly to Mokama.

Source: Bird Life International (2015) Important Bird Areas factsheet: Mokama Taal (Barah) Wetlands. http://www.birdlife.org

Sinha, C.P. 2008. Mokama Taal-An Ephemeral Lake Requiring Holistic Management. In Sengupta, M abd Dalwani, R (Eds) Proceedings of Taal2007:The 12th World Lake Conference, 1586-1590.

The primary ecological survey was conducted during 16th to 17th December 2015. During primary survey, the taal areas have no water, except low depression areas within the taal. Presently the taal areas have used for cultivation of various winter crops (wheat, mastered, etc.). The aquatic birds were recorded only in waterlogged areas of taal. Major aquatic birds recorded during primary survey period – openbilled stork, large egret, medium egret, small egret, white breasted kingfisher, etc.

Mokama Taal (water logged area)

Mokama Taal (agricultural land)

Existing Transmission Line in Mokama Taal area

More Taal Area (Agricultural activity)

Marshy area at Barh Taal area

Existing Transmission line at Barh Taal area

Bakhtiarpur Taal area (agricultural activity)

Existing transmission line at Bakhtiarpur Taal area

Source: ERM, December 2015

The migratory birds and protected species may have threat or risk from proposed transmission line. The size of the birds and habitat and behaviour discussed in Table 3.3.

Table 3.3 Description Habitat, Behaviours of Important Bird Species

Species	Description	Habitat	Behaviour
Black Ibis (*Pseudibis papillosa*)	Medium sized bird of about 68 cm length with a wing span of about 38 cm having a 16 to 19cm long tail	The Black ibis needs a region where bird roosts or built there nests and a region from where it gets its food- like waste water bodies, municipal garbage dumping stations, agriculture farm houses, grazing fields	Standing fly-catching was uncommon and applied in a habitat which had a considerable amount of flies. Packing, a visual feeding technique was applied in all the habitats.
Glossy Ibis (*Plegadis falcinellus*)	Medium-sized bird of 48–66 cm (19–26 in) long, averaging around 59.4 cm (23.4 in) with an 80–105 cm (31–41 in) wingspan	Glossy ibises feed in very shallow water and nest in freshwater or brackish wetlands with tall dense stands of emergent vegetation such as reeds.	Tropical populations nest to coincide with the rainy season. When not nesting, flocks of over 100 individuals may occur on migration, and during the winter or dry seasons the species is usually found foraging in small flocks. Glossy ibises often roost communally at night in large flocks, with other species, occasionally in trees which can be some distance from wetland feeding areas.
Eurasian Spoonbill (*Platalea leucorodia*)	Length: 70-95 cm; Wingspan: 115-135 cm; Weight: 1130-1960 gm.	The Eurasian Spoonbill frequents extensive wet areas such as flooded lands, rivers, marshes and large water bodies	The Eurasian Spoonbill forages by walking slowly in shallow water with semi-open bill partially submerged. The preys are detected by touch. The species can be partly nocturnal.
Greylag Goose (*Anser anser*)	On average the length of a mature bird is 80 cm (31 inches). Wingspan reaches 76 to 89 cm.	During the breeding season Greylag geese live in lowland marshes and fens that have a lot of vegetation, as well as offshore islands. Outside of the breeding season they spend time in fresh-and salt-water marshes, estuaries, stubble fields, pasture lands, and potato fields	The species feeds diurnally, especially during the morning and evening, although non-breeding birds may also feed at night. It roosts at night and during the middle of the day on open water, and may fly to feeding areas more than 10 km away from roosting sites.
Barheaded Goose (*Anser indicus*)	A mid-sized goose, it measures 71–76 cm (28–30 in) in total length and weighs 1.87–3.2 kg	The summer habitat is high-altitude lakes where the bird grazes on short grass. The species has been reported as migrating south from Tibet, Kazakhstan, Mongolia and Russia before crossing the Himalaya	The bar-headed goose migrates over the Himalayas to spend the winter in parts of South Asia (from Assam to as far south as Tamil Nadu.The modern winter habitat of the species is cultivated fields, where it feeds on barley, rice and wheat, and may damage crops

Species	Description	Habitat	Behaviour
Lesser Whistling Duck (*Dendrocygna javanica*)	The lesser whistling duck is 45–53 cm (18–21 in) long.	This is a largely resident species distributed widely across lowland wetlands of the Indian Subcontinent and Southeast Asia. They sometimes make local movements in response to weather and changes in water availability and the more northern birds winter further south	They fly slowly but with rapid wing-flapping and usually produce a repetitive wheezy seasick call as they circle overhead. They are very nocturnal and often rest during the day
Large Whistling Duck (*Dendrocygna bicolor*)	The large whistling duck is 18-21 in (45-53 cm) long	Variety of lowland freshwater and brackish habitats, including still freshwater lakes, rice paddy fields, or reservoirs with plentiful vegetation	This species makes irregular local movements within habitat, the periodic appearance of huge numbers in some areas suggesting that it is highly mobile and apt to undertake long-distance movements. The species is active both diurnally and nocturnally (Johnsgard 1978, Brown et al. 1982), foraging mainly during the first two hours after dawn and last two hours before sunset (Hockey et al. 2005)
Indian vulture (*Gyps indicus*)	The long-billed vulture is a typical vulture, with a bald head, very broad wings and short tail feathers; measuring 80–103 cm (31–41 in) long and 1.96 to 2.38 m (6.4 to 7.8 ft) across the wings	It is found in cities, towns and villages near cultivated areas, and in open and wooded areas. This species feeds almost entirely on carrion, and often associates with White-rumped Vulture (*G. bengalensis*) when scavenging at rubbish dumps and slaughterhouses.	Like other vultures it is a scavenger, feeding mostly from carcasses of dead animals which it finds by soaring over savannah and around human habitation. They often move in flocks
White rumped vulture (*Gyps bengalensis*)	White-rumped vultures are medium-sized, dark vultures. Adults are 75 to 85 cm tall, their wing span is 180 to 210 cm, and their weight ranges from 3.5 to 7.5 kg	It is generally found in open areas and fields enclosing scattered trees. White-rumped vultures feed mostly on the ground, but roost and nest in trees and cliffs, and spend much of their time soaring on wind currents searching for carrion	White-rumped vultures feed almost exclusively on the remains of dead animals, regardless of whether it is fresh or putrid. "Roosts and often hunts in flocks. Spend most of their time gliding effortlessly and gracefully on thermals over a vast range searching for carrion that they can feed on or spotting other scavengers. Once food is sighted, large numbers gather almost immediately and demolish the meat with incredible speed

Species	Description	Habitat	Behaviour
Greater Adjutant Stork (*Leptoptilos dubius*)	The greater adjutant is a huge bird, standing tall at 145–150 cm (57–60 in). The average length is 136 cm (54 in) and average wingspan is 250 cm (99 in).	During the non-breeding season, storks in the Indian region disperse widely, mainly in the Gangetic Plains and sightings from the Deccan region are rare.	The greater adjutant is usually seen singly or in small groups as it stalks about in shallow lakes or drying lake beds and garbage dumps. During the day, they soar in thermals along with vultures with whom they share the habit of scavenging. They feed mainly on carrion and offal; however, they are opportunistic and will sometimes prey on vertebrates
Lesser Adjutant Stork (*Leptoptilos javanicus*)	It has a length of 87–93 cm (34–37 in) (outstretched from bill-to-tail measurement), weighs from 4 to 5.71 kg (8.8 to 12.6 lb) and stands about 110–120 cm (43–47 in) tall	The lesser adjutant tends to be widely dispersed and is very local. It is often found in large rivers and lakes inside well wooded regions	The lesser adjutant stalks around wetlands feeding mainly on fish, frogs, reptiles and large invertebrates. They rarely feed on carrion. They may also take small birds and rodents particularly during the breeding season. They are solitary except during the breeding season when they form loose colonies
Pallus Fish Eagle (*Haliaeeetus leucoryphus*)	It measures 72–84 cm (28–33 in) in length with a wingspan of 180–215 cm (71–85 in).[	It breeds in Central Asia, between the Caspian Sea and the Yellow Sea, from Kazakhstan and Mongolia to the Himalayas, Bangladesh and northern India. It is partially migratory, with central Asian birds wintering among the southern Asian birds in northern India, and also further west to the Persian Gulf.	Its diet consists primarily of large freshwater fish. They also regularly predate water birds, including adult greylag geese, by assaulting them on the surface of the water and then flying off with the kill. Since that goose species is slightly heavier than the eagle, this is one of the greatest weight-lifting feats ever recorded for a flying bird.
Greater spotted eagle (*Clanga clanga*)	The eagle is 59–71 cm (23–28 in) in length and has a wingspan of 157–179 cm (5.15–5.87 ft).	This is a species of wooded country. The population is entirely migratory. It breeds from northern Europe eastwards across Asia, and winters in south-eastern Europe, north-eastern Africa, the Middle East and southern Asia. Migration to the breeding grounds takes place fairly late; in Bhutan, for example, birds can be seen with some regularity until the end of March	Small flocks of up to ten birds or so, of varying age, can be seen to patrol the land together. They also associate with other Accipitridae such as local and/or migrant black kites (Milvus migrans lineatus and govinda) or steppe eagles (A. nipalensis), distinctly smaller and larger raptors, respectively

Source: The Book of Indian Bird, BNHS and Threatened birds of Asia: the BirdLife International Red Data Book

3.4 SOCIO-ECONOMIC ENVIRONMENT

The Patna district has 5.84 million of population as per the census of 2011 with a population density of 1,823 per sq. km. The Begusarai district has 2.97 million of population as per the census of 2011 with a population density of 1,549 per sq. km. Agriculture is the main occupation of the people of the study area, majority of the population is engaged in cultivation. The major crops grown in the study area are wheat, pulses, groundnut, mastered, etc. Most of the study area remains submerged during monsoon and cultivation of rainy season crops over it not possible. Even winter season crops suffer if the drainage and reclamation of the area get delayed beyond the sowing time (15th October). The soil of the area is suitable for the cultivation of horticultural plants guava, mango, banana etc. and a various types of vegetables.

4 ROUTE SELECTION AND ALTERNATIVE STUDY

4.1 ROUTE SELECTION - (ASSESSMENT & MANAGEMENT PROCESS)

At the system planning stage itself one of the factors that govern the evolution of system is the possible infringement with the forest. Wherever such infringements are substantial, different alternative options are considered. The route/ site selection criteria followed by BSPTCL is detailed below:

While identifying the transmission system for a generation project or as a part of State Power Grid, preliminary route selection is done by BSPTCL based on the topo sheets of Survey of India and Forest Atlas (Govt. of India's Publication). During route alignment all possible efforts are made to avoid the major vegetated, settlement area involvement completely or to keep it to the barest minimum, whenever it becomes unavoidable due to the geography of terrain or heavy cost involved in avoiding it.

4.2 STUDY OF ALTERNATIVES

For selection of optimum route, the following points are taken into consideration:

i. The route of the proposed transmission lines does not involve any human rehabilitation.
ii. Any monument of cultural or historical importance is not affected by the route of the transmission line.
iii. The proposed route of transmission line does not create any threat to the survival of any community with special reference to Tribal Community.
iv. The proposed route of transmission line does not affect any public utility services like playgrounds, schools, other establishments etc.
v. The line route does not pass through any sanctuaries, National Park etc.
vi. The line route does not infringe with area of natural resources.

In order to achieve this, BSPTCL undertakes route selection for proposed transmission lines in close consultation with representatives from the Department of Revenue, Ministry of Railway, Inland Waterways Authority of India (IWAI). Although under Electricity Act, 2003, BSPTCL has right of eminent domain yet alternative alignments are considered keeping in mind the above-mentioned factors during site selection, with minor alterations often added to avoid environmentally sensitive areas and settlements at execution stage.

- As a rule, alignments are generally cited 10-15 km away from major towns,
- whenever possible, to account for future urban expansion.
- In addition, care is also taken to avoid the ecological sensitive areas.

Keeping above in mind the route of proposed transmission line of 400 kV between BTPS to Bakhtiarpur Substation has been so aligned that it takes care of above factors. As such different alternatives were studied with the help of Govt. published data like Forest atlas, Survey of India topo maps, satellite imageries etc. to arrive at most optimum route which can be taken up for detailed survey and assessment of environmental & social impacts for their proper management.

4.2.1 Evaluation of Route Alignment Alternatives for 400 kV transmission line

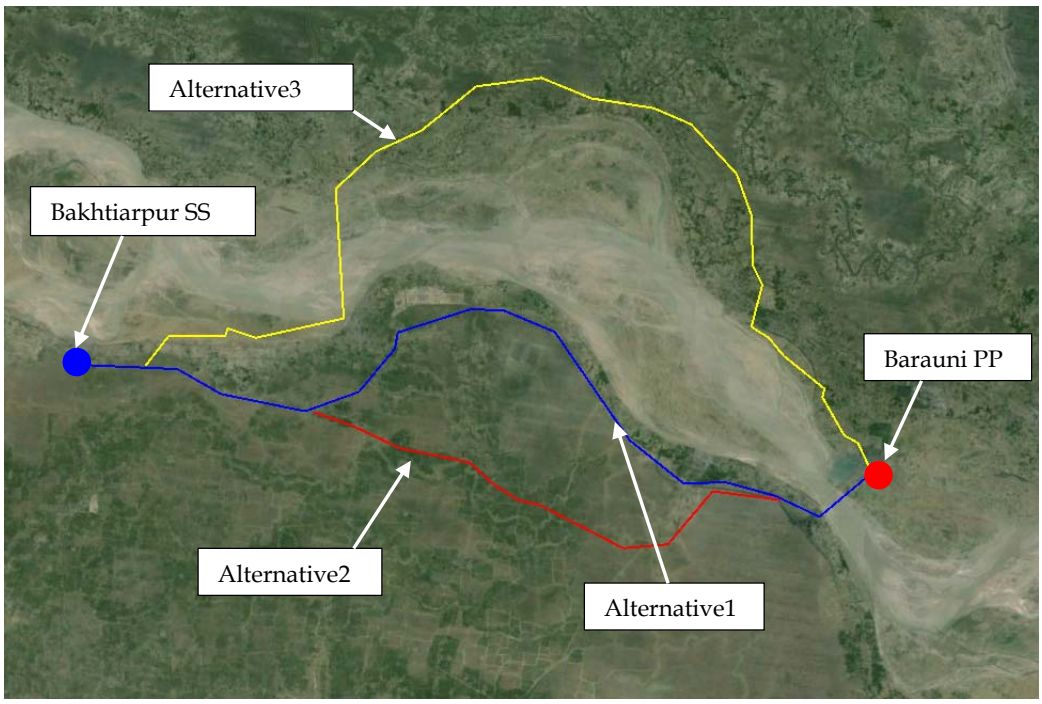
Three different alignments were studied with the help of published data/maps and walkover survey to arrive at most optimum route for detailed survey as shown in . The comparative details of these two alternatives are as follows:

Table 4.1 Alternative Analysis of Route 1 Route 2 and Route 3

Sl. No.	Description	Alternative 1	Alternative 2	Alternative 3
1.	Route Particulars			
i.	Route length	58.60	55.80	76.60
ii.	Terrain (in %)			
a.	Plain	97.5%	97.5	78.4%
b.	River/ flood plain	2.5%	2.5	21.6%
2.	Environmental Details			
i.	Name of District/District details (Through which line pass)	Begusarai Patna	Begusarai Patna	Begusarai Patna
ii.	Town in Alignment nearby	Mokama, Baktiyarpur	Mokama, Baktiyarpur	Kagjania, Baktiyarpur
iii.	House within ROW	The alternative -1 is passing over 6 settlements.	The alternative -2 is passing over 2 settlements.	The alternative -3 is passing over 11 settlements.
iv.	Forest in Km/Ha.	Nil	Nil	Nil
v.	Type of forest Reserve/ Protected /Mangrove/Wild life /Biosphere Res./ any other environ. sensitive area	Major part of the proposed transmission line is passing through Mokama Taal IBA The alternative -1 alignment is passing over 1 block plantation area	Major part of the proposed transmission line is passing through Mokama Taal IBA	Falling in the migratory birds route (Kawar to Mokama Taal). The alternative -3 alignment is passing over 4 block plantation area
vi.	Density of Forest	NA	NA	NA
vii.	Type of fauna	Residential and migratory birds species, small and medium sized mammals	Residential and migratory birds species, small and medium sized mammals	Residential birds species, small and medium sized mammals
vii.	Flora	Mostly planted trees in homestead plantation area	Mostly planted trees in homestead plantation area	Mostly planted trees in homestead plantation area

Sl. No.	Description	Alternative 1	Alternative 2	Alternative 3
ix.	Endangered species if any	Ten globally threatened and Near Threatened species	Ten globally threatened and Near Threatened species	Not reported
x.	Historical/Cultural monument	None	None	None
3.	**Compensation Cost**			
i.	Crop (In Lakhs)	Major part of the transmission line is under mono-cropped agricultural land, and crop compensation will be only for single seasoned crop.	Major part of the transmission line is under mono-cropped agricultural land, and crop compensation will be only for single seasoned crop.	Major part of the transmission line is under bi-cropped agricultural land and crop compensation will be for two seasoned crop.
ii.	Forest & NPV (In Lakhs)	NA	NA	NA
4.	**No. of Crossing**			
i.	Railway	Four	Three	Six
ii.	Power Line	Three	Three	Two
iii.	River stream etc.	Three	Three	Four
iv.	Road	Six	Eight	Seven
5.	Construction problem	Less problem as this line route is easily approachable through available roads, and also passing mostly through plain area with no involvement of forest area	Less problem as this line route is easily approachable through available roads, and also passing mostly through plain area with no involvement of forest area	Less problem as this line is approachable through state highway, village roads
6.	O & M Problem	Very less as most part of the line is approachable and almost parallel to approach road	Very less as most part of the line is approachable and almost parallel to approach road	Less as most part of the line is approachable and near to state highway, road
7.	Overall Remarks	Construction and O & M will be comparatively easier.	Construction and O & M will be comparatively easier.	Construction and O & M will be comparatively difficult

Figure 4.1 Alternative Route



Alternative -1and 2 is passing south of Ganga River while Alternative 3 goes north of the River. Altervative-1 and 2 is mostly passing through the Mokama Taal IBA and also local migratory path. Alternative 3 avoid Mokama Taal IBA as much as possible, but the length is much longer. Alternative 1 and 2 is passing over mostly mono-cropped agricultural land; therefore, crop compensation will be lowered compared to Alternative -3, as it is mostly passing over bi-cropped area. Again Alternative-1 and 2 is passing over only several small settlement area compared to 11 settlements by Alternative-3; therefore, impact and compensation for Alternative-1 and 2 will be less. Both the Altervative-1 and Altervative-2 is passing over non-forest land; however, Alternative 3 is passing over 4 block plantation area. Therefore, tree felling will be very minimal for Alternative -1 and 2.

The BSPTCL has selected Altervative-1 for proposed transmission line.

5 SCREENING OF POTENTIAL ENVIRONMENT IMPACT AND ITS MANAGEMENT

5.1 IMPACT DUE TO PROJECT LOCATION AND DESIGN

Environmental issues of transmission line projects are manageable given the inherently small 'foot print' of towers and flexibility in siting facilities within a relatively large host area and are mostly localized to RoW. However, transmission line project may have some adverse effects on natural resources. These impacts can be minimized by careful route selection and siting of substations. In order to get latest information and further optimization of route, modern survey techniques/tools like GIS, GPS aerial photography are also applied. Introduction of GIS and GPS/Google earth/IBAT in route selection result in access to updated/latest information, through satellite images and further optimization of route having minimal environmental impact. Moreover, availability of various details, constraints like topographical and geotechnical details, forest and environmental details help in planning the effective mitigation measures including engineering variations depending upon the site situation / location. In the instant project also these techniques are to be used for minimizing/mitigating such issues.

5.1.1 *Resettlement*

As described earlier all measures are undertaken by BSPTCL at line routing stage itself to avoid settlements such as cities, villages etc. It may be seen from the above description of proposed route alignment and also keeping in mind that no land is acquired for tower foundation as per existing law, the project does not require any physical resettlement of villagers. This transmission line will connect the BTPS to under construction substation Gaighat (new) substation at Bakhtiarpur. Therefore, for the construction of substation, land procurement is not required.

5.1.2 *Land value depreciation*

Based on past experience land prices are generally expected to rise in the areas receiving power. Further, transmission lines generally pass through uninhabited area, agriculture fields, where the land-use is not going to change in foreseeable future. Therefore, the value of land will not be adversely affected to a significant degree.

5.1.3 Encroachment into other valuable lands

Impacts on agricultural land will be restricted to the construction phase (foundation work, tower erection and stringing) and when large-scale maintenance measures are required. Major stretch of the line will pass through agricultural fields. Agricultural land will be lost at the base of the tower, which is estimated to be 0.172 acres/ km of transmission line[1]. The proposed project envisages construction of 58.85 km of line. So construction of 58.85 km of transmission line -tower will result in a maximum possible loss of approx. 10.1 acres of land. Thus, the total land loss would 10.1 which is quite negligible. The transmission line will traverse agricultural land having crops. However, exact numbers of towers coming on such field which may impact crops and number of families likely to be impacted shall be ascertained only after detailed and check survey and fixing of tower locations. As detailed/check survey activity is part of erection contract and will be finalized only after award of contract and completion of detailed/check survey and tower spotting.

In areas where lines will traverse agricultural land, compensation will be paid to owners for any crop damage incurred as a result of construction activities. BSPTCL field staff will consult affected villagers and local revenue department and apprise him about the project and tower location, which shall be erected in the agricultural land, for compensation. Revenue department after evaluating the loss due to construction activity and productivity of land arrives at the compensation cost which is paid to farmer. Agricultural activities will be allowed to continue following the construction period. If bunds or other on-farm works are disturbed during construction or maintenance, they will be restored to the owner's satisfaction following cessation of construction or maintenance activities. In the event that private trees are felled during construction or maintenance operations, compensation will be paid to the owner in an amount determined by the estimated loss of products from the tree over an eight year period (for fruit bearing trees).

5.1.4 Interference with other utilities and traffic

As per regulations enacted by Government of India, it is mandatory for BSPTCL to seek clearance prior to construction from department of Railways, National Highway Authority and State Highway Authority, Inland Waterways Authority of India, Telecommunications and wherever necessary from Aviation authorities that are likely to be affected by the construction of transmission lines. The transmission lines affect nearby telecommunication circuits by causing electrical interference. A standing committee -- Power Telecom Co-ordination Committee (P.T.C.C.) has been constituted by Government of India to plan and implement the mitigating measures for the induced voltage which may occur to nearby telecom circuit and suggest necessary protection measures to be adopted. The committee suggests

[1] Guidelines for payment of compensation towards damages in regard to Riqht of Way for transmission lines; Ministry of Power, 15th October 2015.

measures like rerouting of the telecom circuits, conversion of overhead telecom circuits into cables etc. to minimize the interference. The cost of such measures is determined by the Committee and is shared by BSPTCL and Telecom Department on the basis of prevailing norms and guidelines.

Wherever transmission line crosses the railways, clearance is taken from that department. In general, the system is planned and executed in such a way that adequate clearance is maintained between transmission lines on the one hand, and railways, civil aviation and defence installations on the other. Wherever the transmission lines pass by the airports the towers beyond specified height are painted in alternate orange and white stripes for easy visibility and warning lights are placed atop these towers.

5.1.5 Interference with drainage pattern

As the transmission lines are constructed aerially and the blockage of ground surface is limited to area of tower footings which is very small (0.2 to 1.0 sq. m) and again fencing is not required, there is little possibility of affecting drainage pattern. In the infrequent instances where the drainage is affected, flow will be trained and guided to safe zones.

5.2 ENVIRONMENTAL PROBLEMS DUE TO DESIGN

5.2.1 Escape of polluting materials

The equipment installed on lines and substations are static in nature and do not generate any fumes or waste materials.

5.2.2 Explosion/fire hazards

During the survey and site selection for transmission lines and sub-stations, it has been ensured that these are kept away from oil/gas pipelines and other sites with potential for creating explosions or fires.

Fires due to flashover from lines can be a more serious problem in deciduous forest/ vegetated area. Since forest involved of forest is nil and most of vegetation in the area are semi-evergreen in the proposed project it is not going to be a problem. Apart from this state of art safety instruments are installed in the substations on both the ends so that line gets tripped within milliseconds in case of fault.

5.2.3 Erosion hazards due to inadequate provision for resurfacing of exposed area

Adequate measures are taken to re-surface the area where excavation works are done. Topsoil disturbed during the development of sites will be used to restore the surface of the platform. Infertile and rocky material will be dumped at carefully selected dumping areas and used as fill for tower foundations.

5.2.4 Environmental aesthetics

Since spacing between the towers in case of 400 kV HVDC lines is approx. 350 to 400 meters these will not affect the visual aesthetics of the localities particularly when it is ensured to route the lines as far away from the localities as possible. BSPTCL takes up plantation of trees to buffer the visual effect around its substations and to provide better living conditions. Wherever BSPTCL feels it appropriate, discussions will be held with local Forest Department officials to determine feasibility of planting trees along roads running parallel to transmission lines to buffer visual effect in these areas. In addition, towers may be painted grey or green to merge with the background.

5.3 ENVIRONMENTAL ISSUES DURING CONSTRUCTION PHASE

5.3.1 Uncontrolled silt runoff

The Project involves only small scale excavation for tower foundations at scattered locations that are re-filled with excavated material therefore; uncontrolled silt run off is not expected.

5.3.2 Nuisance to nearby properties

As already described in preceding paras, during site selection due care is taken to keep the transmission line and substations away from settlements. Further, all the construction activities will be undertaken through the use of small mechanical devices e.g. tractors and manual labour, therefore, nuisance to the nearby properties if any, is not expected.

5.3.3 Interference with utilities and traffic and blockage of access way

Access to the site will be along existing roads or village paths; minor improvements to paths may be made where necessary, but no major construction of roads will be necessary either during construction or as a part of maintenance procedures.

As and when a transmission line crosses any river/ road/ railways line, the terminal towers are located at sufficient distance so as not to cause any hindrance to the movement of traffic. Stringing at the construction stage is carried out during lean traffic period in consultation with the concerned authorities and angle towers are planted to facilitate execution of work in different stages.

5.3.4 Inadequate resurfacing for erosion control

Since proposed line is to be constructed mostly in plain area, erosion problem is not anticipated. However, if due to terrain at some points transmission towers may be placed on slopes and erosion prone soils, internationally accepted engineering practices will be undertaken to prevent soil erosion. This will include cutting and filling slopes wherever necessary. Furthermore, construction is generally undertaken in dry season.

5.3.5 *Impact on trees due to Clearing of Trees within Right of Way*

Right of Way (RoW) width for the transmission line depends on the line voltage. The maximum permissible width of RoW on forest land/ vegetated land and minimum clearance between Trees and conductors as specified in IS: 5613 and by MoEF&CC guidelines are given in Table 5.1.

At present, a width clearance of 3 m is allowed below each conductor for the movement of tension stringing equipment. Trees on such strips are felled/lopped to facilitate stringing and maintenance of RoW. After completion of stringing, natural regeneration or dwarf tree/medicinal tree plantation is allowed to a certain height. Trimming or pruning is done with the permission from the local forest officer to maintain required electric clearance as necessary during operation and maintenance.

The proposed transmission line has no demarcated forest land or large patches of natural forest. Therefore, clearing of large scale vegetation will not be required. However, the transmission line will be passing through some homestead land plantation or road side and canal site vegetated area. If the transmission line passing through these areas, clearance of vegetation will be required. Considering the major part of the transmission line will be passing through the mono-cropped agricultural land; impact on clearing of vegetation assessed to be **Minor**.

Table 5.1 RoW Clearance between Conductors and Trees

Transmission Voltage (in kV)	Max. RoW (in Meters)	Min. Clearance (in Meter) between conductor & Tress*
11	7	2.6
33	15	2.8
66	18	3.4
110	22	3.7
132	27	4.0
220	35	4.5
400 D/C & S/S	46	5.5

* As per IS: 5613 and MoEF guidelines finalized in consultation with CEA

5.3.6 *Impact of vegetation due to Clearing of Ground Vegetation for Movement of Machinery*

Machinery and equipment is used for installation of transmission, towers and construction of substations and may require clearing of ground vegetation for its movement. This activity causes temporary disturbance to the orchards, plantation and agriculture etc. BSPTCL wherever possible utilises the existing path / access roads for the movement of man and machinery. The existing roads which cannot support heavy machinery load are upgraded and thus the village infrastructure is improved. In areas where lines traverse agricultural land, compensation is paid to owners for any crop damage incurred as a result of construction activities. Agricultural activities are allowed to continue following the construction period. If bunds or other on-farm works are

disturbed during construction or maintenance, they are restored to the owner's satisfaction following cessation of construction or maintenance activities. In the event that private trees are felled during construction or maintenance operations, compensation is paid to the owner as determined by the forest / horticulture departments.

As discussed, the major part of the study area (500 m. of proposed transmission line) remains submerged during monsoon season, as the area lies in Mokama taal. Therefore, Boro crops have been cultivated in the post-monsoon phase, i.e. from mid-October to March. If the installation of transmission line carried out in this window (Oct. to March), damage of crop along the RoW is expected. As people are largely depends on the single cropped agricultural activity, the potential impact on livelihood and income from land based economy assessed to be Moderate.

5.3.7 Worker's health/safety

Provisions for workers' health and safety will be guided by the safety regulations/ procedure of the executing agency or principal contractor. Various aspects such as work and safety regulations, workmen's compensation, insurance are adequately covered under the Erection Conditions of Contract (ECC) etc. are a part of safety procedure will be maintained.

In addition training is imparted to the workers such as working at height, working in strong wind conditions, fire-fighting and other safety measures with respect to the job hazards. Safety tools like helmet, safety belt, gloves etc. are provided to them in accordance to the provisions of safety regulations/ procedure. First aid facilities will be made available with the labour gangs, and doctors called in from nearby towns when necessary. The number of outside (skilled) labourers will be quite small, of the order of 25-30 people per group. The remaining workforce of unskilled labourers will be comprised of local people. Workers are also covered by the statutory Workmen (Compensation) Act.

5.4 ENVIRONMENTAL ISSUES/ IMPACT DURING OPERATIONAL PHASE

5.4.1 *Avian Hazards from Transmission Lines*

Avian hazards mostly encountered in bird sanctuaries area and fly path of migratory bird predominantly related to nesting site. Incidence of collisions with overhead lines is greatest in areas of high bird activity such as migration corridors, nesting and feeding areas, (APLIC 1994[1]). Overhead lines are significant sources of avian collision mortality, particularly during dusk, dawn, and at night when the lines are effectively invisible (Anderson 1978[2]).

Susceptibility of a given bird species to collision with overhead lines is determined primarily by their morphology and behaviour. Body weight, wing size (related to lift), flight speed, and visual acuity are all factors that determine bird species' susceptibility to collisions with structures. Bird Behaviour varies by species and season. Some species are active only by day or night. Crepuscular and nocturnally active species are obviously more susceptible to collision, due to reduced visibility of obstacles in the flight path (Krapu 1974[3]). Older and resident birds are better at recognizing and avoiding hazards, compared to juveniles or migratory birds (APLIC 1994).

The proposed transmission line will be passing through the Mokama taal IBA. The IBA also holds, on a regular basis, over 20,000 breeding and migratory water birds. The bird species like Eurasian Spoonbill, Greylag Goose are partly nocturnal or diurnal feeder. Therefore, during dusk, dawn and night time movement have some collision risk but these birds are medium sized birds. The localised movement from Kawar (Kabar) Lake, to Mokama taal is also reported, during local movement of the birds have some collision risk. The large winged birds like Greater Adjutant Stork, Pallus Fish Eagle and Greater spotted eagle are common to the site, they may hit during passing through the transmission line. However, all these species have visual strength and identify the object from long distance and again these birds are mostly solitary mover. Therefore, risk of collision with transmission line very remote. Existing transmission lines are also passing through the Mokama taal area; there is no report on mass death of avian species due to collision with transmission line.

5.4.2 *O&M Staff/Skills less than acceptable resulting in variety of adverse effects*

The O&M program in BSPTCL is normally implemented by Sub-station personnel for both the lines as well as Sub-stations. However, in respect of the long distance transmission lines there are monitoring offices which are located at various points en-route. Monitoring measures employed includes patrolling

[1] Avian Power Line Interaction Committee (APLIC). 1994. Mitigating bird collisions with power lines: State of the art in 1994. Edison Electric Institute. Washington, D.C. 78 pp

[2] Anderson, W.L. 1978. Waterfowl collisions with power lines at a coal fired power plant. Wildlife Society Bulletin 6: 77–83

[3] Krapu, G.L. 1974. Avian Mortality from Collisions with Overhead Wires in North Dakota. USFWS –Northern Prairie Wildlife Research Center, Jamestown, North Dakota. 6 p.

and thermo-vision scanning. The supervisors and managers entrusted with O&M responsibilities are intensively trained for necessary skills and expertise for handling these aspects.

A monthly preventive maintenance program will be carried out to disclose problems related to cooling oil, gaskets, circuit breakers, vibration measurements, contact resistance, condensers, air handling units, electrical panels and compressors. Any sign of soil erosion is also reported and rectified. Monitoring results are published monthly, including a report of corrective action taken and a schedule for future action.

Exposure to Electro Magnetic Fields (EMF) -There have been some concerns about possible increased risk of cancer from exposure to electromagnetic radiation from overhead transmission lines and research has been undertaken into this matter throughout the world. A World Health Organization (WHO) review also in 1996 held as part of the International EMF Project concluded that:

"From the current scientific literature there is no convincing evidence that exposure to radiation field shortens the life span of humans or induces or promotes cancer".

No EMF exposure guidelines have been drawn in India though exposure guidelines have been drawn up outside India including:

- State Transmission Lines Standards and Guidelines in the USA;
- International Commission on Non-Ionizing Radiation Protection (ICNIRP);
- US National Council on Radiation; and
- American Conference on Government and Industrial Hygienist (ACGIH).

The ICNIRP guidelines present limiting exposure to EMFs, although it adds that the levels quoted should not be interpreted as distinguishing „safe" from „unsafe" EMF levels. The ICNIRP guideline for the general public (up to 24 hours a day) is a maximum exposure level of 1,000 mG or 100 µT. A study carried out by Central Power Research Institute (CPRI) on POWERGRID lines reveals that the EMF about 1 m above ground near a 400 kV single circuit transmission line range from 3 – 7.2 µT in the RoW. Study also reveals that the maximum value of magnetic field within RoW of 400 kV DC overhead power transmission line is approximately 40 µT. The impact of EMF is also dependent on the duration of exposure and therefore no significant adverse impact is envisaged. BSPTCL complies with international norms for field strength limits which are certified by Power Technologies Inc, USA. BSPTCL is following the approved international standards and design, which are absolutely safe. Based on the studies carried out by different countries on the safety of EHV lines in reference to EMF affect BSPTCL have also carried out such studies with the help of PTI, USA and CPRI, Bangalore on their design.

The studies inferred that the BSPTCL design are safe and follow the required international standard.

Poly Chlorinated Biphenyls (PCBs) due to its high heat capacity, low flammability and low electrical conductivity was extensively used as insulating material in capacitors and transformers. But after the finding that these PCBs are non-biodegradable and has carcinogenic tendency, its use in electrical equipments as insulating medium has been banned all over the world long back. However, it has been reported in some studies that chances of contamination of oil with PCB is possible. Keeping that in mind, BSPTCL will not procuring electrical equipments containing PCB more than 2 mg/kg and specification (as per IEC 61619 or ASTM D4059). SF_6 will be reduced as per Global SF_6 Policy/protocol.

Sulphur Hexafluoride (SF6):

The electric power industry has been using Sulfur Hexafluoride (SF6) gas as a dielectric and insulating material for many years. Its popularity is mainly due to its unique physical and electrical properties including: (i) dielectric strength twice that of air, (ii) nontoxic, nonflammable and noncorrosive, (iii) chemically stable with high breakdown strength; (iv) SF6 molecules provide excellent arc extinction during electrical operations which minimizes contact wear and maintenance.

SF6 does not deplete the ozone layer when released into the atmosphere. This is because SF6 does not contain chlorine atoms as do CFCs (chlorinated fluorocarbons). SF6 has been identified as a greenhouse gas. This means that SF6 is one of a group of gases which can absorb and reradiate back to earth some of the earth's natural infrared radiation. Recent measurements show the current concentration of SF6 in the atmosphere is very small, about 3.2 parts per trillion by volume (pptv). In comparison, CO, concentration is estimated at 355 parts per million (ppmv). The relative contribution of SF6 to global warming (or emission rate) is estimated to be about 0.01%.

The EPA is working on a voluntary program to reduce the emission of SF6 into the atmosphere. The program encourages users and suppliers of SF6 electrical equipment to gather data on usage, upgrade old equipment, recover and recycle the gas, and to improve the sealing methods of gas pressure vessels.

6 ENVIRONMENTAL AND SOCIAL MANAGEMENT

6.1 INTRODUCTION

BSPTCL will developed comprehensive Environment and Social (E&S) management procedures and incorporated them to its project cycle, to ensure that its operation eliminates or minimizes adverse environmental and social impacts. The E&S management procedures identify the relevant issues at early stage of project cycle and follow the basic philosophy of sustainable development along with Principles of Avoidance, Minimization and Mitigation.

6.1.1 *Organization, Roles and Responsibilities*

Role of BSPTCL

BSPTCL will have ultimate responsibility for implementing the provisions of the EMP. BSPTCL will also ensure that the activities of its contractors, engaged for construction of transmission line are conducted in accordance with 'good practice' measures, implementation of which will be required through contractual documentation. In order to facilitate this, and to demonstrate commitment to the EMP, BSPTCL /Contractor will conduct regular internal site inspections, the results of which will be documented

Role of BSPTCL Contractors

Contractors will be responsible for implementation of, or adherence to, all the mitigation measures outlined in the contract document. All contractors will be required to comply with the provisions of the EMP and with any environmental and other codes of conduct required by BSPTCL.

Inspection, Monitoring and Audit

Inspection and monitoring of the environmental impacts of the project activities will increase the effectiveness of EMP. Through the process of inspection and auditing, BSPTCL will ensure that the conditions given in the contract documents.

The proposed EMP is provided in Table 6.1.

Table 6.1 Environmental Management Plan

Sl No.	Project activity/ stage	Potential Impact	Proposed Mitigation Measures	Responsibility	Supervision/ Monitoring
A.	**Pre-construction Phase**				
1.	Location of overhead line towers/ poles and alignment & design	Exposure to safety related risks	Finalization of tower/pole location and overhead alignment selection (distance to nearest dwellings or social institutions)	Design & planning team	BSPTCL
2.	Equipment specifications and design parameters	Release of chemicals and gases in receptors (air, water, land)	PCBs not used in substation transformers or other project facilities or equipment. Processes, equipment and systems not to use chlorofluorocarbons (CFCs), including halon.	Design & planning team	BSPTCL
3.	Transmission line design	Exposure to electromagnetic interference	Line design to comply with the limits of electromagnetic interference from overhead power lines	Design & planning team	BSPTCL
4.	Line through identified/ Migratory bird	Damage to the Birds and also to line	Provision of flight diverter/ reflectors, bird guard, elevated perches, insulating jumper loops, obstructive perch deterrents, raptor hoods etc.1.	Design & planning team	BSPTCL
5.	Interference with drainage patterns/ irrigation channels	Water logging and loss of agricultural production	Appropriate sitting of towers to avoid channel interference	Design & planning team	BSPTCL
6.	Equipments submerged under flood	Contamination of receptors	Substations constructed above the high flood level(HFL) by raising the foundation pad	Design & planning team	BSPTCL
7.	Explosions /Fire	Hazards to life	Design of substations to include modern fire fighting equipment	Design & planning team	BSPTCL
B.	**Construction Phase**				
8.	Site clearance	Vegetation	Marking of vegetation to be removed prior to clearance, and strict control on clearing activities to ensure minimal clearance. Trees that can survive pruning to comply should be pruned instead of cleared.	Contractor	BSPTCL
9	Lines through farmland	Loss of agricultural productivity	Use existing access roads wherever possible Ensure existing irrigation facilities are maintained in working condition	Contractor	BSPTCL

[1] As per International/National best practices and in consultation with concerned forest/wildlife authority.

Sl No.	Project activity/ stage	Potential Impact	Proposed Mitigation Measures	Responsibility	Supervision/ Monitoring
			Protect /preserve topsoil and reinstate after construction completed Repair /reinstate damaged bunds etc after construction completed		
		Social inequities	Land owners/ farmers compensated for any temporary loss of productive land as per existing regulation.	IA	During construction
10.	Physical construction	Disturbed farming activity	Construction activities on cropping land timed to avoid disturbance of field crops (within one month of harvest wherever possible).	Contractor	BSPTCL
		Noise, vibration and operator safety, efficient operation	Construction equipment to be well maintained.	Contractor	BSPTCL
		Safety of local villagers	Coordination with local communities for construction schedules, Barricading the construction area	Contractor	BSPTCL
		Local traffic obstruction	Coordination with local authority/ requisite permission for smooth flow of traffic	Contractor	BSPTCL
11.	Disposal of excavated soil	Runoff to cause water pollution, solid waste disposal	Soil excavated from tower footings/ substation foundation disposed of by placement along roadsides, or at nearby house blocks if requested by landowners	Contractor	BSPTCL
12.	Provision of facilities for construction workers	Contamination of receptors (land, water, air)	Construction workforce facilities to include proper sanitation, water supply and waste disposal facilities.	Contractor	BSPTCL
13.	Influx of migratory workers	Conflict with local population to share local resources	Using local workers for appropriate asks	Contractor	BSPTCL
14.	Health and safety	Injury and sickness of workers and members of the public	Safety equipment's (PPEs) for construction workers Contract provisions specifying minimum requirements for construction camps Contractor to prepare and implement a health and safety plan. Contractor to arrange for health and safety training sessions	Contractor	BSPTCL
C.	**Operation & Maintenance**				

Sl No.	Project activity/ stage	Potential Impact	Proposed Mitigation Measures	Responsibility	Supervision/ Monitoring
15.	Line through identified bird flyways, migratory path	Injury/ mortality to birds, bats etc due to collision and electrocution	Provision of flight diverter/reflectors, elevated perches, insulating jumper loops, obstructive perch deterrents, raptor hoods etc.	BSPTCL	BSPTCL
16.	Oil spillage	Contamination of land/nearby water bodies	Substation transformers located within secure and impervious sump areas with a storage capacity of at least 100% of the capacity of oil in transformers and associated reserve tanks.	BSPTCL	BSPTCL
17.	SF6 management	Emission of most potent GHG causing climate change	Reduction of SF6 emission through awareness, replacement of old seals, proper handling & storage by controlled inventory and use, enhance recovery and applying new technologies to reduce leakage	BSPTCL	BSPTCL
18.	Electric Shock Hazards	Injury/ mortality to staff and public	Careful design using appropriate technologies to minimise hazards Security fences around substations Barriers to prevent climbing on/ dismantling of transmission towers Appropriate warning signs on facilities Electricity safety awareness raising in project areas	BSPTCL	BSPTCL
19.	Transmission line maintenance	Exposure to electromagnetic interference	Transmission/ distribution line design to comply with the limits of electromagnetic interference from overhead power lines	BSPTCL	BSPTCL
20.	Uncontrolled growth of vegetation	Fire hazard due to growth of tree/shrub /bamboo along RoW	Periodic pruning of vegetation to maintain requisite electrical clearance. No use of herbicides/ pesticides	BSPTCL	BSPTCL

ANNEXURE - VIII

DRAINAGE STUDY

1. Storm Water Drainage System for Unit No.10

The storm water drainage system for Unit No. 10 is consisting of network of open drains in the plant area of Unit No.10. The drainage system for the Unit No.10 will be designed considering the conditions same as Unit No. 8 & 9, i.e. maximum hourly rainfall of 90 mm/hr. with runoff coefficient of 0.9 for paved area and 0.6 for unpaved area.

The scope of the drainage system for Unit No.10 is limited to the connection of the Unit No.10 area drains to the Unit No. 8 & 9 drainage system. The plant storm water for Unit No. 8 & 9 will be collected in storm water collection pit and subsequently pumped to the discharge point outside the main plant area.

2. Storm Water Drainage Study

The Unit No. 10 main plant area facilities are accommodated in the space available in the plant boundary of the Unit No. 8 & 9. The drainage system for unit 8&9 is designed considering the rain water runoff from the whole plant area including the facilities of Unit No. 10.

As the physical condition and land use pattern of the site is unchanged from the Unit No. 8 & 9, so separate drainage study is not required for Unit No.10.

ANNEXURE - IX

Railway Siding Feasibility Study

KYUSHU ELECTRIC POWER COMPANY, INC

FINAL
FEASIBILITY STUDY REPORT
FOR DEVELOPMENT OF
RAIL INFRASTRUCTURE TO INSTALL ONE ADDITIONAL UNIT [10TH] OF 660 MW
AT
BARAUNI THERMAL POWER STATION
IN
SONPUR DIVISION
ON
EAST CENTRAL RAILWAY

APRIL 2016

(A GOVERNMENT OF INDIA ENTERPRISE)
REGIONAL PROJECT OFFICE, KOLKATA
56, CHITTARANJAN AVENUE [2ND FLOOR]
KOLKATA – 700012.

LIST OF CHAPTERS

CHAPTER – I

INTRODUCTION, CONCEPT OF THE STUDY AND TRAFFIC FACILITIESS

CHAPTER- I

INTRODUCTION CONCEPT OF THE STUDIES & TRAFFIC FACILITIES

1.0 Introduction

1.0.1 BSPHCL (Bihar State Power Holding Company Limited), a State owned 'Electricity Regulation Board' is operating within the State of Bihar. Erstwhile Bihar State Electricity Board (BSEB) was unbundled into 5 organizations namely Bihar State Power Generation Company Limited (BSPGCL), Bihar State Power Transmission Company Limited (BSPTCL), North Bihar Power Distribution Company Limited (NBPDCL), South Bihar Power Distribution Company Limited (SBPDCL) & Bihar State Power Holding Company Limited (BSPHCL), the last one being the 'Apex Holding Company', vide Bihar State Electricity Reforms Transfer Scheme, 2012 under notification 17 dated 30.10.2012.

1.0.2 Barauni Thermal Power Station (BTPS), the only state owned power unit of erstwhile BSEB and presently under BSPGCL is located at a distance of 18.0 kms. from the district town Begusarai at the eastern side of NH-31. The plant siding is connected with Simaria station situated at a distance of 6.26 km. from Barauni station of Sonpur division of East Central Railway.

1.0.3 BTPS was commissioned in mid-1960 initially with 3 units of 15 MW each all of which have been de-commissioned. The 4th & 5th units [2 x 50 MW] which were commissioned in the year 1955 had to shut down in April' 1996 and March' 1995 respectively due to pollution problem and re-commissioning of these units were considered non-viable. The 6th & 7th units having capacity 110 MW each are also at present not functioning properly. The Unit No.6 is running at 9.08% PLF against ideal numbers 85%. Unit No.7 is under renovation and maintenance (R&M) and the work is likely to be completed soon.

1.0.4 While the Unit No.6 is also proposed for renovation and modernization, BSPGCL has decided for augmentation of the power plants by the way of expansion programme of commissioning of two new coal base Units, 8th & 9th of 250 MW each at the same place at south side of the existing plant and work for which is under process. A sketch plan showing the location of Barauni TPS is shown as Annex-1.0.

1.0.5 On being deputed by the Power Plant Authority for consultancy services for the work of preparation of Feasibility Study Report, Detailed Project Report & Detailed Engineering and Project Management Consultancy services for rail-infrastructure development work, RITES had undertaken the job and the DPR for the project has been approved by Railway in June 2015. Concerned Engineering Scale Plan (ESP) has also been approved by E. C. Railway on 30.07.2015.

1.0.6 As already planned earlier, the Power Plant authority has decided to install one super critical coal fired unit of 660 MW at the premises of 8th & 9th units. With a view to improve the power situation in the State of Bihar, in fiscal year 2013 and upon request from Central Government, Japan International Corporation Agency (JICA) investigated the site condition of BTPS for technical assistance and necessary Japanese ODA loan for the State of Bihar in connection with development of the unit and has agreed to enter into an agreement with Central Government for installation of the 10th unit.

1.0.7 M/s. Kyushu Electric Power Co., (KEPCo) INC, Japan on behalf of JICA has entrusted RITES for consultancy services for preparation of Feasibility Study Report (FSR) to plan the Rail-infrastructure to deal with the additional fuel requirement for the 10th unit of the Power Plant.

1.1 Scope of Works

1.1.1 The scope of works as defined in the 'Request For Proposal' (RFP), as terms of references, are reiterated here under:-

A. Study of traffic projection: Traffic projection based on the estimated coal requirement of the proposed BTPS (1 x 660 MW) shall be studied. The traffic projection shall be studied considering unloading of coal by use of Track Hopper / Wagon Tippler from the nearest Railway station to plant siding shall be concluded considering case of coal supply and unloading of coal for all units 6 to 9.

B. System design / System operation: Based on above study design and operation of Railway system for the proposed BTPS 1 x 660 MW unit shall be studied. Existing

Railway infrastructure at BTPS shall be considered.

C. Civil Engineering and construction: Civil Engineering and construction plan shall be studied based on the above system design and operational method. Appropriate construction plan shall be suggested.

D. Signalling and Telecommunication: Signalling and Telecommunication system shall be studied based on the above.

E. Power supply / Electrification: Power supply and Overhead Electric (OHE) shall be studied based on the above requirement.

F. Cost Estimate: Estimate and costs required for the construction and / or modification of the new Railway facility for the proposed BTPS 1 x 660 MW unit. Estimate with regard to additional facilities need to be created for this proposed BTPS 10th unit if demanded by Railway authorities which will be added in the part of the estimate.

1.1.2 The above works will be undertaken in two phases, e.g.; Phase-I and Phase-II, the activities to be involved are reiterated below:

Phase - I:

(i) Topographical survey by Total Station of the Power Plant yard as well as nearest Rail head Simaria station area for establishing the technical as well as operating feasibility for the junction arrangement;

(ii) To study the existing junction arrangements at Rail head Simaria station for augmentation of station yard, if required, for the projected traffic;

(iii) To study the existing layout of the power plant yard to provide the location of the additional Wagon Tippler or Track Hopper, as suitable;

(iv) To prepare a discussion plan showing the proposed modification of the power plant yard with additional wagon tippler and / or track hopper and junction arrangement at Simaria station after reconnaissance survey of the area;

(v) Preparation of signalling plan required for reorganization of Signalling arrangements at Simaria station as well as in the existing power plant yard, if necessary;

(vi) To evolve a system of working for working of trains at the proposed wagon tippler / track hopper;

(vii) Alteration of laying of Overhead Electrical Equipments (OHE) required for dealing of trains by electric traction;

(viii) Preparation of tentative cost estimate for Civil, S & T and Electrical works;

(ix) Preparation of Civil Engineering plan and L section in scale 1:2500 horizontal and 1:500 vertical or any suitable scale as may be necessary for preparation of the layout plan;

(x) Preparation and submission of draft Feasibility Study Report covering the scope of works as mentioned in item No. (i) to (x) to the Client i.e. KEPCo INC.

Phase - II:

(i) To prepare Civil Engineering layout plans, on the basis of the accepted layout for the proposed rail infrastructure in scale 1:2500 horizontal and 1:500 vertical or any suitable scale applicable for preparation of the layout;

(ii) To study for Signalling & Telecommunication and Electrification arrangements for the selected alignment for the proposed siding as well as at Simaria station and / or a suitable crossing station for dealing of trains to and from the proposed siding;

(iii) To prepare tentative cost estimate for Civil Engineering, S & T, and Electrical works separately for the selected alignment for the proposed siding to develop the rail infrastructure;

(iv) To prepare final Feasibility Study Report on the basis of accepted layout for the proposed siding incorporating the scope of work as mentioned in item No. (i) to (iii) above for submission to both the KEPCo INC and Railway authorities for obtaining in-principle approval.

1.1.3 Initially, it was advised for development of rail-infrastructure facilities only for dealing of inward coal and fuel oil rakes for the Power Plant. During examination of the draft Feasibility Study Report, submitted by RITES in September 2015, and subsequently KEPCo. INC, has confirmed to include the arrangement of 'Fly ash' loading line in the final FSR for outward despatch of fly-ash rakes directly from the siding.

1.2 Coal linkage & Rail Transport clearance

1.2.1 As has been assessed, 2.65 MTPA of coal is required to run the expansion project for the unit No. 8 and 9 and coal linkage from Urma Paharitola Coal block in Rajmahal Coalfields has duly been allotted. Due to delay in excavation of the mines, a tapering

linkage of 1.53 MTPA from ECL sources has also been allocated. As far as information available, the allotment of Urma Paharitola Coal Blocks has been cancelled by Ministry of Coal and linkage from Badam Coal block in Jharkhand has been granted for the 8th& 9th units. Coal linkage for 10th unit is yet to be obtained by the Power Plant authority.

1.2.2 The proposed additional unit (10th) of 1 x 660 MW is scheduled to be constructed at the same vicinity of 8th & 9th units and coal for all the units will be dealt at the same coal handling plant. The new unit is being constructed as a 'Super Critical Unit', the rate of coal consumption, as has been furnished by the KEPCo INC is 9840 tonne per day. Considering the average consumption of coal for a Thermal Power Plant, it can be predicted that about 5 to 6 coal rakes per day will have to be dealt in the power plant yard having total capacity of 1160 MW.

1.2.3 The requirement of Fuel oil in respect of LDO and HFO are 15 KL and 1485 KL respectively. For dealing of fuel rakes for the 8th& 9th units of the Power Plant, one fuel oil unloading line has been provided. As such, though the source of the fuel oil is yet to be confirmed by the Power Plant authority, since the quantity is very negligible, there will be no problem in dealing the additional fuel oil rakes for the 10th unit with the facilities already proposed.

1.2.4 While examining the draft Feasibility Study Report for the 10th unit, submitted in September 2015, the KEPCo.INC has advised their intention to develop the facility of dealing 'fly ash' consignments for direct despatch from the Power Plant yard through IR system. Notwithstanding, it has been informed that 468 tonnes of bottom ash will be generated from the power plant, the destination wise despatch particulars of fly-ash rake from the Power plant is yet to be confirmed by the Power Plant authority. However, in consideration of the demand for provision of fly-ash handling arrangement, some modification of the rail-infrastructure has been suggested.

1.2.5 Availability of coal linkage and environment clearance is the prerequisites for setting up of any Power Plant unit. The Power Plant authority has to assure the linkage of coal as well as the source of fuel oil and the despatch particulars of fly-ash before preparation of Detailed Project Report.

1.3 Concept of the Study

1.3.1 On being engaged for the project management consultancy services, the site including the existing serving station were visited jointly by the officials of KEPCo. INC, Power Plant authority and RITES for a reconnaissance survey. Although, coal linkage for the upcoming 10th unit is yet to be obtained, it may be presumed that coal traffic is scheduled to come from Rajendrapul side.

1.3.2 The feasibility for an alternative connection from Rajendrapul station was also examined again but this idea has to be given up to avoid enormous cost involvement due to various technical constraints, such as, (i) existence of NH-31 parallel and adjacent to the rail track, (ii) severe level difference between existing track at Ranjendrapul and proposed In-plant yard, etc.

1.3.3 After reconnaissance survey of the area, a discussion plan was developed and a brief report incorporating, the engineering aspects, proposed pattern of working including cost implications was submitted vide RITES' letter No. RITES/RPO-KOL/REP/KEPC/FSR/ Barauni/Vol-II/3436 dated 06.08.2015 to KEPCo. INC, for acceptance of the same.

1.3.4 A number of discussions and meetings were held with the representatives of KEPCo. INC, and the Power Plant authorities at Patna and Barauni to finalize the alignment for the proposed modification. Lastly a video conference was held on 14.09.2015 when the representatives of the Company were present on line from Japan & Patna i.e., Headquarters & Site office of KEPCo. INC and the representatives of RITES from Kolkata office. The different issues as raised were discussed and clarified as under.

(a) The generating capacity of the Power Plant after full commissioning of all the units will be 1160 MW. Thus, the normal requirement of coal rake either in BOXN or BOBRN wagons will be 5-6 rakes per day and there will be no problem in dealing all the rakes if the inward coal rakes are offered in both types of wagons evenly. As such no additional Wagon Tippler for the 10th unit has been proposed.

(b) But the Indian Railways have shortage of BOBRN wagon fleets and as such, it is

apprehended that most of the coal rakes will be offered in BOXN wagons. Though under ideal condition there should not be any difficulty in dealing 6 rakes in two wagon tipplers, as per practical situation and difficulties which most of the Power Plants have to face, average 6 rakes may not be dealt with smoothly by 2 Wagon Tipplers owing to various reasons, mainly for the oversized coal. On this aspect, Railway may advice for provision of additional wagon tippler. The Power Plant authority has to assure that 5 to 6 rakes of coal even in BOXN wagons can be unloaded daily within permissible free time by means of 2 Wagon Tipplers after availing normal maintenance time.

(c) The discussion plan and brief report as indicated in paragraph 1.3.3 above was finally accepted by the concerned authority of Project Development Department, KEPCo. INC who requested RITES to submit the Draft Feasibility Study Report detailing the various aspects as discussed above within 28th of September 2016.

1.3.5 With due incorporation of all the above issues, a draft FSR for the project was prepared and the same was submitted to KEPCo. INC vide RITES' letter No.RITES/RPO-KOL/ RFP/KEPC/FSR/Barauni/Vol-II/4314 dated 28.09.2015 for their acceptance with suggestion/comment, if any, before preparation and submission of FSR to E. C. Railway.

1.3.6 After continuous interaction about various issues on the draft FSR, it was agreed by RITES to submit a "Revised draft FSR" incorporating the concerned observations of the KEPCo. INC and the same were submitted on January 2016 to obtain acceptance of the FSR.

1.3.7 As advised by the KEPCo INC, in compliance to observations of KEPCo INC, a 'Revised Draft FSR' was prepared and was furnished to Assistant Manager, Engineering Group, International Business Division, KEPCo. INC vide RITES' letter No. RITES/RPO-KOL/REP/KEPC/ Vol.II/287 dated 21.01.2016 requesting to communicate acceptance of the 'Revised Draft FSR' enabling RITES for submission of 'Final FSR to Railways.

1.3.8 Meanwhile, KEPCo has raised an issue of despatching 'fly-ash' likely to be produced from the power plant and advised RITES to examine the feasibility of necessary rail-

infrastructure for dealing of fly-ash wagons. Although, a tentative plan for dealing of 'fly-ash' wagons was developed and the additional scope of works for fly-ash study was furnished by RITES, the KEPCo INC has confirmed that "we consider it is premature to start the fly-ash scope study, given current circumstances".

1.3.9 Subsequently, after lots of interaction, the KEPCo. INC has informed to include limited study for fly-ash loading line in the final Feasibility Study Report based on the communication with BSPGCL; it was assumed that not only coal unloading lines but also ash loading lines would be required for ordinal operation of Barauni unit No.10.

1.4 Junction Arrangement

1.4.1 Existing Simaria station consists of four lines, e.g.; line No.1 (common loop), line No.2 (common main), line No.3 (common loop) & line No.4 (common loop) having CSR of 702.00 m, 762.00 m, 665.00 m & 665.00 m respectively. The lead line of present BTPS siding takes off from line No. 1.

1.4.2 Since construction of any additional full length loop line at Simaria station was found to be technically impossible due to space constraints, for handling the traffic for the 8th & 9th units, a new yard with 3 additional lines in the form of interchange yard of CAL 768.64 m, 740.64 m & 758.68 m at the north side of the existing station yard has been planned and the same is under process of construction.

1.4.3 In consideration of present line capacity utilization of the Hatidah-Barauni section, it was thought that one additional loop at the exchange yard is required to be constructed for flexibility of movement to deal with the anticipated traffic for the 10th unit but this idea has also to be given up due to severe technical constraints to provide the same at the Semeria station.

1.5 Layout of In-plant yard

1.5.1 The proposed Barauni TPS in-plant yard for the 8th& 9th units have been planned to be constructed in two phases, i.e., Phase-I and Phase-II. The rail-infrastructure facilities, as

approved by East Central Railway under CE's Drg. No. Y-46-2015, are indicated below, phase wise:-

Phase-I

(i) Wagon Tippler No.1 with Pre & Post tippling lines of CAL 766.947 m & 1042.214 m;

(ii) Wagon Tippler No.2 with Pre & Post tippling lines of CAL 783.497 m & 820.00 m;

(iii) One Engine Escape cum Empty Despatch line of CAL 855.679 m at the Pre tippling zone of Wagon Tippler line No. 1 & 2;

(iv) One Engine Escape cum Empty Departure line at the Post tippling zone of CAL 847.795 m at the Post tippling zone of Wagon Tippler line No. 1 & 2;

(v) One Fuel Oil line of CAL 750.002 m with separate engine escape line of CAL 770.00 m and Brake van reversal loop of 70 m and one Brake van reversal loop of CAL 60.00 m;

(vi) One Engine cum Brake van reversal loop of CAL 60.00 m (FM to FM) at post tippling zone at buffer end;

(vii) One Loco Shed (30 m x 15 m) line consisting of 2 spurs with dead end;

Phase-II

(i) One Track Hopper of length 250 m with provision of Pre & Post hopper lines of CAL 780.945 m & 775.250 m;

(ii) One Hopper by-pass / Empty by-pass line of CAL 788.392 m.

1.5.2 To deal with the additional traffic for the 10th unit, it is now proposed to construct the Track Hopper, already recommended as Phase-II work. In addition, the arrangement of fly ash loading through SILO has been planned with provision of Pre and Post loading lines of adequate length by shifting the location of the Diesel Loco shed, as included in Phase-I, item (vii), already approved by Railway as Phase-I work under development of the 8th & 9thunits. The plan, thus developed was discussed with the officials of Barauni TPS on 08.02.2016 when it was learnt that no structure can be built at the 'green belt' area as per environmental norms and as such the plan for shifting of loco shed in green belt area to accommodate fly ash handling facilities is not permissible.

1.5.3 Since the siding will be constructed on EOL (engine-on-load) concept, the requirement of loco shed line, which has been planned earlier for holding captive 'diesel locomotive' as

Phase-I work has been considered irrelevant in terms of the Para 6.0 of Freight Marketing Circular No. 5 of 2013, issued under Railway Board's letter No. 2012/TC(FM)/18/21 dated 07.03.2013. Accordingly, to provide the arrangement for fly-ash loading system, the facility of loco shed lines has been considered irrelevant and following additions / alterations on the approved plan are suggested:-

(i) Addition of one Empty Reception cum Loaded Despatch line for 'fly ash SILO' of CAL 746.450 m;

(ii) Addition of one Post Loading line for 'fly ash SILO' of CAL 749.500 m at the buffer end;

(iii) Alteration of CAL of the Pre-hopper line which will be augmented to 898.350 m from 780.945 m;

(iv) Alteration of CAL of the Post-hopper line will be augmented to 833.300 m from 775.250 m;

(v) Alteration of CAL of Hopper by-pass / Empty by-pass line which will be augmented to CAL 795.00 m from CAL 788.392 m;

(vi) Shifting of the Center line of Track Hopper from Ch.891.374 m to Ch.822.680 m;

(vii) Provision of one '120 ton in-motion electronic weighbridge' on the SILO line at the Post loading zone at Ch.1029.045 m for simultaneous weighment of fly-ash wagons at the time of loading;

(viii) Addition of one SILO by-pass line.

1.5.4 Details of layout including modifications have been explained in the Civil Engineering chapter and an Engineering Scale Plan incorporating the proposed works is shown as Annex-1.1.

1.6 Signal Interlocking

1.6.1 The entry and exit of trains to and from the interchange yard will be same as suggested for the traffic of 8th & 9th units. To accommodate the lines for fly-ash SILO, the location of the Panel cabin, as was shown in the approved plan, is proposed for shifting to a convenient location. Suitable modification of interlocking gear will be made at the Power plant cabin (under process of construction) to incorporate the working of additional points

and signals.

1.7 Electrification

1.7.1 The additional Railway infrastructure, for the pre & post loading lines for the fly-ash loading arrangement which are to be developed for 10th unit will be provided with 25 KV OHE except for a small portion under the SILO chute which will remain unwired.

1.8 Commercial formalities

1.8.1 The siding will work in compliance with 'Engine-on-Load' (EOL) scheme and there will be no change in the procedure as recommended for the 8th & 9th units.

1.9 System of working

1.9.1 The system of dealing additional coal rakes for 10th unit which is reiterated below will be same as recommended for the 8th& 9th units.

(a) Coal trains for the power plant are usually come from the Rajendrapul end. An incoming coal train has to be received on the interchange yard at Simaria and after reversal of train engine, the rake will be despatched to the power plant yard. Trains between the interchange yard and reception lines of the Power House yard may run on 'last vehicle' as the section is very small and it may not be necessary to reverse the brake van at the interchange yard of Simaria.

(b) Panel Operator, In-plant cabin will accept and admit the train on the respective pre-wagon tippler line according to unloading programme. In case of BOBR rake, unloading will be done on 'track hopper' by the same locomotive. After unloading, brake van, which will usually be next to Train Engine while admitting a rake in the Power Plant yard, will be reversed and the train engine along with the brake van will be attached at the Simaria end via engine reversal / BOBRN empty departure line. On readiness and after receiving line clear from Simaria, the empty rake will be despatched.

(c) BOXN rakes will be unloaded at 'wagon tippler'.

(i) On receipt of the rake in any of the pre-tippling line, the train engine and brake van which will normally with the train engine will be detached and to be kept detained on engine escape / empty departure line. The wagons will be tippled one by one on the respective post-tippling line through and 'wagon tippler' with the assistance of 'Side Arm Charger'. The design of the side arm charger should be such that the same can handle a loaded rake from the place where the train engine will be detached.

(ii) Otherwise, on arrival of the rake on the pre-tippling line, the rake will be drawn ahead by the Electric locomotive so that the train engine comes up to tippler shed and within the reach of side arm charger. The pantographs of the engine will be lowered and brakes of all the wagons will be released. The side arm charger will be deployed to cross the wagon tippler as well as the unwired zone to push the electric engine at the other end of wagon tippler shed and within the reach of wired portion. Then the electric engine will raise pantograph to shunt from the post tippling zone by its own power. If necessary, the brake van may also be detached with the help of train engine.

(d) After unloading, the train engine along with the brake van will be attached at Simaria end and the empty rake will be despatched via the empty departure line as per same procedure for departure of BOBRN empty rakes.

(e) In case Railway desire to run the empty rake towards Barauni direction, that should be informed to the Power plant staff and in such case, the brake van of the empty rake shall be kept at the buffer end of siding.

(f) For loading of Fly-ash, the empty rake meant for loading will be received directly on the Pre-SILO loading line. Movement of train and loading through SILO will be done by Railway electric locomotive working the train. The portion of chute under SILO shall have an unwired zone with a gap of 6.5 m under the SILO. Following precautions have to be observed during loading:-

(i) The train will move towards the SILO with the rear pantograph raised as a customary system.

(ii) The engine, as soon as crosses the SILO will stop at a point where a 'stop board' will be provided keeping the 'without OHE zone' in between front and rear

pantograph.

(iii) After stopping, the front pantograph will be raised and the rear pantograph will be lowered keeping the engine continuously energized.

(iv) There after the train will start at a pre controlled speed to commence loading through SILO. Weighment of the wagons will be done simultaneously.

(v) A rake after loading under SILO will be received on the post loading line. The train engine and brake van, if required, will be reversed and on receipt of line clear from Semaria station, the train will be despatched via the SILO by-pass line.

1.10 Cost Estimate

1.10.1 The cost estimate for provision of the Track Hopper has already shown as Phase-II work in the Detailed Project Report for the 8th & 9th Expansion plan. In the present estimate, the cost for provision of the fly-ash loading lines and the cost for modified Track Hopper lines have been calculated on the basis of present day cost. The difference of cost for modification of Phase-II works and the cost of the additional lines for the 'fly ash' loading arrangement, as suggested in this report has been accounted as ''Abstract Cost Estimate For Development Of 10TH Unit'' project and the same is shown below with department wise breakup.

Estimated cost

Sl. No	Type of works	Cost for fly-ash lines including revised cost for Track Hopper lines
		Amount in INR
1.	Civil Engineering	256,706,900.00
2.	Signal & Telecommunication	32,491,808.41
3.	Electrical Engineering	40,453,714.95
4.	**Total cost of the Work including Phase-II for 8th & 9th units**	329,652,423.37
5.	Cost of the Track Hopper lines as per DPR for 8th & 9th units	**107,301,000.00**
6.	**Cost for development of the 10th unit project excluding cost of track hopper lines** [item 4 – 5]	**222,351,423.37**

CHAPTER – II

CIVIL ENGINEERING

CHAPTER-II

CIVIL ENGINEERING

2.0 Preface

2.0.1 Bihar State Power Generation Company Limited.(BSPGCL) intends to set up one additional unit as 10th Unit Extension Project apart from installation of 8th & 9th units expansion project.

2.0.2 The 10th unit expansion project will be financed by Japan International Corporation Agency (JICA). M/s. KEPCo INC, Japan on behalf of JICA has entrusted RITES through open tender to undertake the works for consultancy services to develop the rail-infrastructure to serve the proposed 10th unit expansion project.

2.0.3 Existing Barauni TPS siding is being served from Simaria station on Hathidah Link - Barauni section of Sonpur Division under East Central Railway.

2.0.4 The rail infrastructure requirement for Track Hopper which was proposed as phase-II work for 8th & 9th units expansion project has been considered for the requirement of proposed 10th unit with some trivial modification by provision of fly-ash loading arrangement by means of SILO by avoiding the requirement of Diesel loco shed lines. The facilities as proposed are summarized below:-

(a) One Pre Empty Reception cum Loaded Despatch line for 'fly ash SILO' of CAL 746.450 m (FM to SRJ) at pre SILO end;
(b) One Post Loading line for 'fly ash SILO' of CAL 749.500 m (SRJ to FM) at post SILO end;
(c) Alteration of CAL of the Pre-hopper line which will be augmented to 898.350 m (FM to Start of TH) from 780.945 m;
(d) Alteration of CAL of the Post-hopper line will be augmented to 833.300 m (SRJ to FM) from 775.250 m;
(e) Alteration of CAL of Hopper by-pass / Empty by-pass line which will be augmented to CAL 795.00 m (FM to SRJ) from CAL 788.392 m.

(f) Alteration of centre line of Track Hopper to Ch. 0/822.680 km from Ch. 0/891.374 km.

(g) One 120 ton in-motion electronic weighbridge has been proposed to be installed on the SILO line at its post loading zone at Ch.1/029.045 km for simultaneous weighment of fly-ash wagons at the time of loading.

(h) One additional SILO by-pass line facilities.

2.1 Survey Methodology

2.1.1 Reconnaissance survey has been conducted over the available corridor to find out the most suitably feasible techno-economical alignment for the proposed railway infrastructure to serve the 10th Unit Extension Project meant for SILO loading facilities.

2.1.2 After in depth study, the most suitable alignment has been selected on the result of reconnaissance survey and accordingly preliminary engineering survey has been carried out with the help of précised and latest survey instruments like Total Station & GPS Instrument, Digital level etc. by adopting modern survey methodology. Survey data downloaded in AUTO CAD format to arrive at the latest existing features of the area / corridor to identify the availability of suitable open space for further development.

2.1.3 Engineering plan along with L/section prepared with AUTOCAD and modern survey software. Spot levels have been taken at suitable intervals. The proposed suitable alignment along with other facilities has been incorporated in the layout plan.

2.1.4 Horizontal control points have been fixed over the selected corridor in respect to fixed reference points and a close traverse was run along the corridor. Vertical control points have been fixed at suitable locations and the levels are connected with the mother Bench Mark by using “AUTO LEVEL”.

2.2 Engineering Parameter

2.2.1 **Gauge**: The proposed railway siding track gauge is adopted as 1676 mm (5’6”) for Broad Gauge to commensurate with the existing track gauge network of the serving Railway

system.

2.2.2 **Fixed Point**: The fixed point for the Engineering survey considered as the take off point for the proposed 10th Unit Extension Project railway siding which is proposed to be taken off from the already approved 8th & 9th unit railway siding alignment under 8th & 9th units expansion project at Ch. 0/256.56 km of pre wagon tippler line no. 1. The proposed take off point of 10th Unit Extension Project railway siding has been reckoned as **Ch. 0.00** km. (**"ZERO")** for onward identification / detailing of the proposed siding.

2.2.3 **Level**: All the levels taken for this survey are related to the Bench Mark kept on concrete pillar designated as BM-9 near grid pillar P-3 by the side of Gupta Bandh opposite site of overhead tank. The value of Bench Mark is 45.568 m above MSL.

2.2.4 **Gradient:** The takeoff point of the proposed 10th Unit Extension Project railway siding which is reckoned as Ch.0/00 km has been kept on 1 in 425 rising grade of already approved 8th & 9th unit railway siding alignment and this grade as the sharpest grade of this section continues up to Ch.0/375.846 km. The balance portion of the proposed siding section will follow different grade both in rise & fall as shown in the plan and which are follows:-

From Ch.0/375.846 km to Ch.0/768.908 km - Rise 1 in 800, Ch.0/768.908 km to Ch.1/202.508 km - Level grade, Ch.1/202.508 km to Ch.1/552.508 km - Fall 1 in 500, Ch.1/552.508 km to Ch.1/902.508 km - Rise 1 in 500 & Ch.1/902.508 km to Meeting Point at Ch.1/933.575 km - Level grade.

2.2.5 **Curve**: On the proposed 10th unit siding alignment total 4 (four) number of curves 4.861º curves of 360.00 m radius each have been designed, planned & required to be introduced with the ultimate motto to provide the most suitable techno-economical alignment by negotiating with the existing ground conditions as well as the physical features. Details of curves as shown in the plan are as follows:- (i). Curve No.1 (LH) of 4.861º with 360.00 m radius in between Ch.0/224.274 km to Ch.0/602.459 km on pre-SILO line, (ii) Curve No.2 (LH) of 7.954º with 220.00 m radius in between Ch.0/887.152 km. to Ch.0/912.915 km on pre-SILO line, (iii) Curve No. 3 (RH) of 7.954º with 220.00 m

radius in between Ch.1/159.079 km to Ch.1/224.955 km on post SILO line & (iv) Curve No.4 (RH) of 4.795º with 365.00 m radius in between Ch.1/289.775 km to Ch.01/664.505 km on post SILO line.

2.2.6 **Speed potential**: Though the track structure of the siding as a whole will be fully suitable for accepting movement with fully loaded rakes of coal and other minerals etc. consisting of BOXN/BOBRN wagons like main line tracks, the permissible speed of the proposed siding will be restricted to 25 KMPH for facilitating smooth running of trains both in empty & loaded directions. However, the train speed will be restricted during unloading / loading operations through SILO arrangements.

2.2.7 **Length**: The route length of the proposed siding will be about 1940.00 m and the track length will be about 2360.00 m.

2.2.8 **Formation**: Formation of the proposed siding / yard lines will cross through both cutting and filling zone. Formation in filling zone is designed to be made of mechanically compacted earth with side slopes of 2H:1V (i.e. 2 horizontal and 1 vertical). The width of single line formation is kept as 7.85 m in filling and 9.25 m in cutting including side drain with side slopes of 1H:1V (i.e. 1 horizontal and 1 vertical). The formation, when in filling zone and if filling height is higher than 6.0 m & when in cutting zone and if depth of cutting is deeper than 6.0 m, berm width of 3.0 m has been designed to be provided on either side of the embankment. The same procedure shall be followed in every successive height / depth of 6.0 m. In formation, in case of clayey soil - a layer of 1000 mm and in case of granular soil - a layer of 600 mm thickness in filling zone and minimum 300 mm thickness in cutting zone, a compacted layer of blanketing material of approved quality granular / stone dust is designed to be provided over the compacted earthwork in formation, conforming to RDSO guide line. Side slope of the embankment is designed to be grass turfed with approved quality and thickness. A cross slope of 1 in 30 on top of formation, both in filling and cutting zone is designed to be provided. A typical profile of embankment and cutting is placed at Annex-2.1.

2.2.9 **Track Centre**: Minimum 6.0 m track center is proposed in between two tracks unless otherwise mentioned in the Engineering Plan.

2.2.10 **Track Structure**: The proposed railway track is designed to be laid on 60 kg / 90 UTS, T-12 grade, 1st quality rails on new 60 kg. PSC Mono block sleepers (T-2496) in straight and in curved alignment of radius less than 5° and in curves of radius above 5°, PSC Mono block sleeper (T-4183 to T-4186) with the provision of check rails. Sleeper density is proposed for 1660 nos. per kilometer over a layer of 300 mm thick machine broken stone ballast cushion. Points & Crossings will be of 60 kg rails along with curve switches, CMS crossings etc. on PSC sleepers with fan shaped layout. A detail of track structure is placed at Annex-2.2.

2.2.11 **Bridges & Culverts**: In the proposed alignment of SILO line at Ch.0/587.961 Km, one minor RCC Box bridge (1 x 3.0 m x 3.0 m - Br. No.1) will required to be constructed to serve for housing of pipe lines coming from river Ganga and crossing the alignments of both SILO line & track hopper lines. The proposed bridge is falling adjacent & same cross center line to Br. No.3 of 8th & 9th unit railway siding alignment. The existing road will required to be diverted suitably as already shown in the plan of 8th & 9th unit railway siding alignment.

2.2.12 **Fixed Structure**: All fixed structures are to be designed to comply with the fixed structure as indicated in the Schedule of Dimension (Revised-2004) for Broad Gauge of Indian Railways.

2.2.13 **Traction / Electrification:** The proposed railway siding line will be provided with Electric Traction system with 25 KV OHE. (Details are placed in the Electrical Engineering Chapter).The total railway siding infrastructure system, right from the takeoff point will be provided with Electric Traction system, fully commensurate with the prevailing and proposed Railway system.

2.2.14 **Road Crossing / Level Crossing**: One village road namely Gupta Bundh crosses proposed SILO alignment near Ch.0/151.00 km along with all other alignments pertaining to track hopper and 8th & 9th units. As this is a yard portion, surface crossing is not permissible. Moreover General Manager cum Chief Engineer, BTPS vide his letter no.125/GM dated 16.11.2013, has confirmed that the existing road on Gupta Bundh shall

be closed and diverted suitably around the extension plant. The existing peripheral road of extension plant crosses the proposed alignment, which is required to be closed or diverted suitably by BSPGCL later on as per requirement.

2.2.15 **Power Line Crossing**: One HT line of 132 KV crosses proposed alignment at Ch.0/036.157 km. On the above location, one tower of 132 KV line infringes with the proposed alignment which are required to be shifted / relocated suitably. This issue has already been discussed in the DPR of 8th & 9th unit railway siding alignment under Phase-I.

2.2.16 **Land:** To be dealt with in line with the directions as already discussed in the DPR of 8th & 9th unit railway siding alignment under Phase-I. The land required for the proposed railway siding infrastructure falls within the Railway land boundary. BSPGCL will have to enter into leasing / licensing arrangement with E. C. Railway for working on Railways land as per the existing rules of Railways. Necessary fees towards leasing / licensing shall be paid directly to Railways by BSPGCL.

2.2.17 **Weighment Facilities:** One 120 ton in-motion electronic weighbridge has been proposed to be installed on the SILO line at its post loading zone at Ch.1/029.045 km for simultaneous weighment of fly-ash wagons at the time of loading.

2.2.18 **Dismantling Works**

(a) Portion of existing underground conveyor line etc. as have been shown in black dotted lines in the plan to be dismantled for laying of the proposed new yard infrastructure.
(b) A portion of line for the existing loading bunker as has been shown in the plan (in black dotted lines) to be dismantled for the proposed yard modification works.
(c) One Irrigation Rest House near Ch.0/112.781 km is found to be infringing which will require to be dismantled.

2.3 Description of Alignment.

2.3.1 The fixed point for the Engineering survey considered as the take off point for the proposed 10th Unit Extension Project railway siding which is proposed to be taken off by means of 1 in 8.5 turnout from the already approved 8th & 9th unit railway siding alignment under Phase-I at Ch.0/256.56 km of pre wagon tippler line no. 1. The proposed take off point of 10th Unit Extension Project railway siding has been reckoned as Ch.0.00 m ("ZERO") for onward identification / detailing of the proposed siding.

2.3.2 After takeoff, the proposed alignment meant for SILO line traverse straight up to Ch.0/224.274 km and takes left turn by forming a 4.861º left hand curve no.1 (LH) of 360.00 m radius. The curve run ends at Ch. 0/602.459 km and further traverse straight up to Ch.0/887.152 km. Curve No.2 (LH) of 7.954º with 220.00 m radius runs in between Ch.0/887.152 km to Ch.0/912.915 km on pre-SILO line. The alignment further traverse straight up to Ch.1/159.079 km. Proposed SILO has been accommodated with its center line point at Ch.1/001.055 km.

2.3.3 From Ch.1/159.079 km, the SILO alignment takes right turn by forming a 7.954º right hand curve No.3 (RH) of 220.00 m radius. The curve run ends at Ch.1/244.955 km and further traverses with a small straight up to Ch.1/289.775 km and further takes a right turn with Curve No.4 (RH) of 4.795º with 365.00 m radius in between Ch.1/289.775 km to Ch.01/664.505 km on post SILO line. The SILO alignment further run straight and finally meets with the E & B Van reversal loop line of already approved 8th & 9th unit railway alignment under Phase-I at Ch.1/933.575 km.

2.3.4 One SILO by-pass line has been arranged in between Ch.0/851.150 km to Ch.1/129.079 km with the provision of a connection to track hopper by-pass line.

2.3.5 The Civil Engineering Plan drawing is placed at Annex-1.1 in 1 sheet.

2.4 Civil Engineering Rough Cost Estimate.

2.4.1 The abstract cost estimate of Civil Engineering works has been computed taking into consideration of the present day costs of the items like Earthwork in formation including blanketing materials, Bridge/Culvert, Permanent way materials comprises of Rail, PSC Sleepers, Points & Crossings, track ballast, track fittings & fixtures etc. & dismantling work etc. excluding the cost of Railway land / Private land & other statutory fees etc. and tabulated accordingly. The cost estimate for provision of the Track Hopper has already shown as Phase-II work in the Detailed Project Report for the 8th & 9th Expansion plan. In the present estimate, the cost for provision of the fly-ash loading line meant for serving SILO and the cost for modified Track Hopper lines have been calculated on the basis of present day cost of men and materials and the difference of cost difference of cost for modification and the cost for new lines as suggested in this report are shown separately. The Civil Engineering cost has been estimated to the tune of Rs.2,567.07 lakh for the entire project including Phase-II work for the 8th & 9th units. The details of cost has been shown at Annex-8.1.

CHAPTER - III

SIGNAL ENGINEERING & TELECOMMUNICATION

CHAPTER – III

SIGNAL ENGINEERING & TELECOMMUNICATION

3.0 Introduction

3.0.1 Bihar State Power Generation Company Limited (BSPGCL) has planned to set up one additional 1 x 660 MW units as extension programme of the existing Barauni TPS. The 10th unit expansion project will be financed by Japan International corporation agency (JICA) and KEPCo INC, Japan on behalf of JICA has entrusted RITES to develop the rail-infrastructure.

3.0.2 The Panel Cabin of the In-plant yard which is under process of construction under 8th & 9th units project, will control the entire signalling system of In Plant yard including the proposed fly-ash loading lines as recommended for the 10th unit of the Power Plant.

3.1 Engineering layout

3.1.1 Following rail-infrastructure facilities which are approved as Phase-I work, are under process of development for the 8th& 9th units expansion project of the power plant:

a) Wagon Tippler line No:-1 with Pre tippling line of CAL 766.947 m and Post Tippling Line of CAL 1042.214 m.

b) Wagon Tippler line No:-2 with Pre tippling line of CAL 783.497 m and Post Tippling Line of CAL 820 m.

c) One Engine Escape Lines of CAL 855.679 m between WTL No.1 and 2.

d) One Engine Escape Lines of CAL 770.00 m between WTL No.1 and Fuel Oil Line.

e) One Engine & Brake Van reversal loop of CAL 60 m.

f) One Fuel Oil Line of CAL 750.002 m.

3.1.2 To deal with the additional traffic for the 10th unit expansion project, following facilities which were also approved as Phase-II work for the 8th& 9th units expansion project are required to be constructed to deal with the projected traffic for the 10th unit of the Power plant:

a) One Track Hopper with Pre hopper line of CAL 898.350 m and Post Hopper Line

of CAL 833.300 m.

b) One Track Hopper of 250 m Long

c) One Hopper By-Pass/Empty By-Pass Line with CAL 795.008 m.

3.1.3 In addition to above to deal the out ward fly-ash traffic to be generated from the Power Plant following facilities are proposed:-

(a) One Pre SILO line of CAL 746.45 m and Post SILO line of CAL 749.50 m;

(b) One Dry Ash SILO and 120 MT In Motion Weigh Bridge between Pre and Post SILO lines;

(c) One SILO bypass line with a connection with Pre hopper line with 1 in 8.5 Cross-over.

3.2 Proposed Signalling and Telecommunication arrangement

3.2.1 Signalling and Telecommunication arrangement required for the additional traffic coming up in connection with 10th unit expansion project is proposed to be introduced as addition and alteration of the Barauni TPS In-Plant yard Panel Interlocking system which is under process of construction under 8th& 9th units expansion project.

3.2.2 Signalling of Proposed Panel Interlocking system of In plant cabin is upgraded in connection with 10th unit expansion project by:-

a) 2 Nos. of Independent shunt signals and 2 Nos of Dependent shunt signals below Fixed Red Signal.

b) Provision of IRS Type Point Machine for Motor operation of 2 Nos. of additional points.

c) Provision of Track circuit & Digital Axel Counter for Track clearance of additional lines.

d) Modification of Domino Type Control cum Operating Panel for additional lines.

e) Up-gradation of Integrated power Supply system (IPS) and Data Logger to deal with additional load and Data.

3.3 S&T Cost estimate

3.3.1 Abstract cost estimate for addition / alteration of the upcoming Panel cabin for Phase II work including new work for Fly ash loading line of the Barauni TPS In-Plant has been estimated to Rs.324.92 lakh. The difference of cost for the signaling facility in connection with 10th unit expansion project will be Rs.190.74 lakh & break up of cost is placed at Annex- 8.2.

3.4 Signalling Plan

3.4.1 The Schematic Plan for the proposed modification of the Signalling arrangement of the Barauni In-Plant Panel Cabin is placed at Annex-3.1.

CHAPTER – IV

ELECTRICAL ENGINEERING

CHAPTER- IV

ELECTRICAL ENGINEERING

4.0 Preface

4.0.1 BSPGCL proposes to install 10th unit of capacity 1 x 660 MW at Barauni Thermal Power Plant in collaboration with M/s JICA of Japan. Hence, rail infrastructure for the 10th unit has to be developed. The study hereunder relates to electrical work of the proposed new rail infrastructure.

4.1 Infrastructure

4.1.1 The Rail infrastructure, as was proposed under Phase-II scheme for the 8th & 9th units installation of the Power Plant, is to construct a Track Hopper of 250 m length for unloading of coal. In addition, an Engine escape line is contemplated so that the placement of rake and movement of electric engine is possible. Both track hopper line and engine escape line will be provided with 25 KV AC traction so that movement of coal rake on EOL system is possible. The electric engine will place first portion of the rake on the track hopper and after unloading of the coal the engine will move further so that 2nd and 3rd part of the rake gets placed on the track hopper. In this process full rake of coal load will be unloaded.

4.1.2 For the purpose of development of outward 'fly-ash' loading system through, as desired by the KEPCo INC, following additional rail tracks have been proposed:

(a) One reception / despatch cum pre-loading line;

(b) One post-loading line;

(c) One SILO by-pass line.

4.2 Type of OHE

4.2.1 All the tracks in the in-plant yard are provided with conventional polygonal type OHE of 25 KV AC traction system. In conformity with the above, the OHE of the new section

would also be of the conventional type comprising copper contact wire (107 sq.mm) and copper catenary wire (65 sqmm) together with allied components.

4.2.2 OHE of the fly-ash SILO line will be at two stretches, i.e. one on the pre-loading line and the other on post loading line. The track just below the SILO will have no OHE for a stretch of 6.5 m to 7.0 m. This portin will be bridged by electric locomotive. After the electric locomotive reaches fly-ash SILO, it will come to a dead stop at a nominated place to be demarcated by provision of a 'engine stop board'. In this position, the rear pantograph of electric locomotive will touch the OHE of pre-loading line while the front pantograph will rest below OHE of post loading line. The locomotive will lower the rear pantograph and raise the front one to move forward.

4.3 Wind load

4.3.1 Wind load in the section is considered as 75.0 kg/m^2

4.4 Sectioning

4.4.1 The track hopper where unloading of coal rakes are to be undertaken, will have to be provided with special type of OHE. This is required because occasions may arise for the operating staff to go on the top of the wagon, particularly in the rainy season when sticky coals are received. Staff needs to climb on the wagon and remove coal from the wagons. For this purpose, 25 KV power supply within the track hopper has to be switched off so that safety to staff is ensured.

This is achieved by providing short type neutral section at both end of the track hopper and simultaneously earthing the section. Any chances of fatal accident to the operating staff, thus gets eliminated. The schematic diagram showing sectioning arrangement is enclosed as Annex-4.1.

4.5 Infringement

4.5.1 There is no infringement in the new rail infrastructure so far 25 KV OHE is concerned.

4.6 Power supply arrangement

4.6.1 The 25 KV power in the section is received from Mokama traction substation of East Central Railway. The existing substation at Mokama has spare capacity to accept additional load due to upcoming of the new track hopper lines. As such, no augmentation of capacity in the traction substation has been considered.

4.6.2 The switching post at Simaria needs modification. A separate SSP is proposed for Thermal power plant. This will ease traffic movement as also improve availability of block for attention to OHE in case of need.

4.7 Power line/DOT line crossing

4.7.1 There is no overhead power line or DOT line in the proposed section. As such, there is no question of replacement or removal of power line crossing.

4.8 Movement of Electric Locomotive under SILO

4.8.1 The electric engine will pull the empty rake for loading of fly-ash and will stop at a place identified by “Electric Engine Stop Board”. At his place the driver will lower the rear pantograph and raise the front pantograph of locomotive. The selection of electric engine stop board will be made in such a fashion that the pantographs of electric loco will remain under the OHE and simultaneously bridge the no-wire zone of OHE. On ready ness of the SILO chute for discharge, the electric engine along with empty rake will slowly move forward & loading of fly-ash in empty wagon will start. After complete loading of rake, the driver will lower the front pantograph and raise the rear one as customary and work the train as per instruction of concerned authority.

4.9 General Illumination

4.9.1 The unloading yard needs proper illumination as unloading activities will be done at night time also. For safety to working personnel as also to prevent pilferage of coal loads, illumination of the yard is essential. Hence, provision of high mast tower with luminaries has been planned. Also, for facility to working personnel the pathways are proposed to be illuminated. However, Barauni Thermal Power authority has to arrange for supplying 200 KW load from its network.

4.10 Estimate

4.10.1 Abstract cost for the electrical work for the 'fly-ash SILO' lines including Phase-II work for the 8th & 9th units will be Rs.404.54 lakh in which the cost for the 10th unit is only Rs.189.63 lakh. The details of estimate is shown as Annex-8.3.

CHAPTER – V

COMMERCIAL

CHAPTER-V

COMMERCIAL

5.0 General

5.0.1 Bihar State Power Generation Company Limited are augmenting the generation capacity of Barauni TPS by commissioning its 10th unit at the same location where the 8th & 9th units are under process of development. For inclusion of the working for the 10th unit. addition / alteration of the siding will be made and operated as per Railway Board's 'Liberalization of siding policies' circulated under F.M circular No. 1 of 2012.

5.0.2 The siding will be opened as per Engine-on-Load' (EOL) scheme and in this respect, Freight Marketing Circular No. 5 of 2013 as issued under Railway Board's letter No. 2012/TC(FM)/18/21 dated 07.03.2013 shall be followed. There will be no change of commercial formalities which has been proposed for the 8th & 9th unit expansion project.

5.1 Weighbridge and TMS Facilities

5.1.1 One 120 ton in-motion electronic weighbridge is proposed ahead of the SILO chute for weighment of loaded fly-ash wagons simultaneously at the time of loading. The weighbridges should conform to the Schedule of Technical Requirements as per RDSO's specification circulated in June, 2005. The siding owner should arrange calibration, testing & certification from the manufacturer/authorized service provider.

5.1.2 The Weigh Bridges should be linked with FOIS Terminal for which a separate office with necessary furniture will be provided at the cost of siding owner. TMS equipment and hardwire peripheral should also be arranged by the siding owner. However, necessary software will be supplied by Railways for issue of computerized Railway Receipt (RR).

5.1.3 The commercial formalities for handling coal rakes including manning of Weighbridge at the loading terminal may be finalized after interaction and discussion with the Commercial Department of Sonepur Division as well as HQs of East Central Railway.

5.2 Execution of Private Siding Agreement

5.2.1 Private Siding Agreement on the prescribed format on the revised layout of the siding shall be executed between Railways and the Power Plant authority. The siding owner shall sign the agreement as soon as the agreement documents are served to them by East Central Railway.

5.3 Pollution Control

5.3.1 The siding authority has to obtain necessary clearance from MOEF for commissioning of the loading arrangement at the siding and the status be informed to the Railways.

CHAPTER – VI

MECHANICAL ENGINEERING

CHAPTER-VI

MECHANICAL ENGINEERING

6.0 General

6.0.1 In accordance with the existing system, all incoming coal rakes for the TPP shall be carried over the IR system from originating point to the siding in Railway owned wagons either BOXN or BOBRN. As per latest policy instructions from IR, inward coal rakes loaded either in BOXN or BOBR wagons for unloading at the plant yard should be unloaded and the empty rakes will run on round-trip BPC. Hence, there will be no need for any Carriage & Wagon maintenance facilities within the siding premises. The same procedure will be followed in case of BCCW wagons, if the same is not procured by the Power plant authority.

6.0.2 For damage and deficiency to wagons inside the siding premises, regular damage and deficiency bills will be raised on the siding owner on the basis of joint sample check to be done in every six monthly or as fixed by East Central Railway. However, for severely damaged wagons, this will be done on case to case basis. Railway's discretion for charging damage/deficiency bills on case to case basis shall be final.

6.0.3 Joint check of loading/unloading points where mechanized equipment are used, should be carried out by officers of Mechanical and Operating / Commercial branches of Railway once in 3 months along with the loader/un-loader. Penalties for damages, if detected, should be imposed as per extant rules.

CHAPTER – VII

OPERATION & MAINTENANCE OF THE SIDING

CHAPTER-VII

OPERATION & MAINTENANCE OF THE SIDING

7.0 General

7.0.1 The modification of the layout for the siding will be made according to the provision of FM circular No, 01 of 2012 circulated under Railway Board's letter No. 99/TC/(FM)/ 26/1/Pt.II dated 30.01.2012 and the entire capital cost for the work will be borne by siding owner and the trains will be worked on EOL concept. Guidelines of the above circular should be followed regarding maintenance of the siding.

7.1 Operating Staff

7.1.1 No additional Operating staff is required for the 10th unit expansion project. The staff to be deployed for 8th& 9th units will serve the purpose.

7.2 Civil Engineering

7.2.1 Civil Engineering maintenance shall be done by the siding owner at his cost and Railways should not claim for any inspection charges. The siding may be maintained by engaging approved Agency

7.3 Signal Engineering & Telecommunication

7.3.1 No additional staff is required to be provided for the 10th unit expansion project.

7.4 Electrical (TRD)

7.4.1 OHE maintenance cost for the modified portion of the siding shall be borne by Railways.

7.5 Commercial activities

7.5.1 No additional commercial staff to be deployed for the 10th unit expansion project.

7.6 Carriage & Wagons

7.6.1 As regard to C&W maintenance, no C&W facility should be developed inside the siding premises. Running repairs of rolling stocks including materials and staff cost in all cases shall be borne by the Railway. However, the cost of re-railment including the repair cost of stock owning to any derailment or accident occurred due to the negligence of siding owner shall be borne by the siding owner.

CHAPTER – VIII

ESTIMATED COST OF THE RAILWAY INFRASTRUCTURE

CHAPTER-VIII

ESTIMATED COST OF THE RAIL INFRASTRUCTURE

8.0 General

8.0.1 The capital cost for modification of the rail-infrastructure, as planned for Phase-II work and the cost for provision of new lines for fly-ash loading arrangement have been worked out on the basis of updated cost of men and materials. The cost does not include the cost of land to be acquired for construction of the siding and also the charges for power and / or traffic block that may be required during construction.

8.1 Civil Engineering Cost

8.1.1 The capital cost of Civil Engineering works for the proposed Railway infrastructure has been assessed taking into consideration the present day cost of earthwork, P-way, track, ballast, track fittings, major & minor bridges, side drains etc. The estimated cost of Civil Engineering works for construction of fly-ash SILO lines including modification of the Track Hopper lines amounts to Rs.2,567.07 lakh and an abstract cost estimate is placed at Annex - 8.1.

8.2 Signal Engineering & Telecommunication

8.2.1 Signalling & Telecommunication works have been computed for addition alteration of the In-plant Panel Cabin, under process of construction for 8th& 9th units. An abstract cost estimate for the S & T arrangements has been worked out to Rs.324.92 lakh and the breakup of cost is placed at Annex-8.2.

8.3 Electrical (OHE) Engineering works

8.3.1 Abstract Cost for OHE for the Track Hopper has been prepared based on the norms adopted in Railways for provision of OHE installation including wiring. The Abstract Cost Estimate for providing OHE and General electrical works is estimated at Rs.404.54 lakh

and is the breakup of cost placed at Annex-8.3.

8.4 Estimated Total Capital Cost

8.4.1 The cost estimate for provision of the Track Hopper has already shown as Phase-II work in the Detailed Project Report for the 8th & 9th Expansion plan. In the present estimate, the cost for provision of the fly-ash loading lines and the cost for modified Track Hopper lines have been calculated on the basis of present day cost and the difference of cost modification and the cost for fly-ash SILO lines as suggested in this report has been shown as the cost for development of the 10th unit of the Power Plant. A department wise breakup of the cost is tabulated below. Summary of abstract cost estimate is given as Annex-8.0.

Estimated cost

Sl. No	Type of works	Cost for fly-ash lines including revised cost for Track Hopper lines
		Amount in INR
1.	Civil Engineering	256,706,900.00
2.	Signal & Telecommunication	32,491,808.41
3.	Electrical Engineering	40,453,714.95
4.	**Total cost of the Work including Phase-II for 8th & 9th units**	329,652,423.37
5.	Cost of the Track Hopper lines as per DPR for 8th & 9th units	**107,301,000.00**
6.	**Cost for development of the 10th unit project excluding cost of track hopper lines** [item 4 – 5]	**222,351,423.37**

8.4.2 In addition to above, as per para 3 of Railway Board's FM circular No.1 of 2012, the overhead charges, in terms of provision of Engineering Code, shall be payable by party,

desirous to set up a siding. These charges shall have respective applicability for the 'Deposit works', as to be executed by Railways, by the party under Railway's supervision or by the party through Railway's Approved consultants respectively as per following table:

Sl. No	Purpose	Execution by	Charges	
1.	Departmental Charges: (inclusive of cost of tools & plants and establishment supervision)	Railway	12½ %	% of cost of project excluding cost of OHE and S&T works.
		Party	6¼ %	
		Approved consultant	4%	
2.	Departmental Charges: for OHE and S&T works (inclusive of cost of tools & plants and establishment supervision)	Railway	12½ %	% of cost of OHE and S&T works for Railway's mandatory supervision.
		Party	6¼ %	
		Approved consultant	6¼ %	
3.	D & G Charges: (for work-charged establishments and other than establishment supervision)	Railway	As per actual, if any, [Ref : Para-1829E]	
		Party		
		Approved consultant		

8.4.3 As par Railway Board's letter No. 2012/CE-I/SP/1 dated 17.08.2012 "the charges mentioned in Para 3 of the FM circular No.1 of 2012 are total charges inclusive of survey and final inspection charges" and as per Railway Board's letter No. 2012/CE-I/SP/1 dated 22.06.2012 "these charges shall be collected from the party in stages as mentioned in Engineering Code". The respective para of the code is reiterated below:

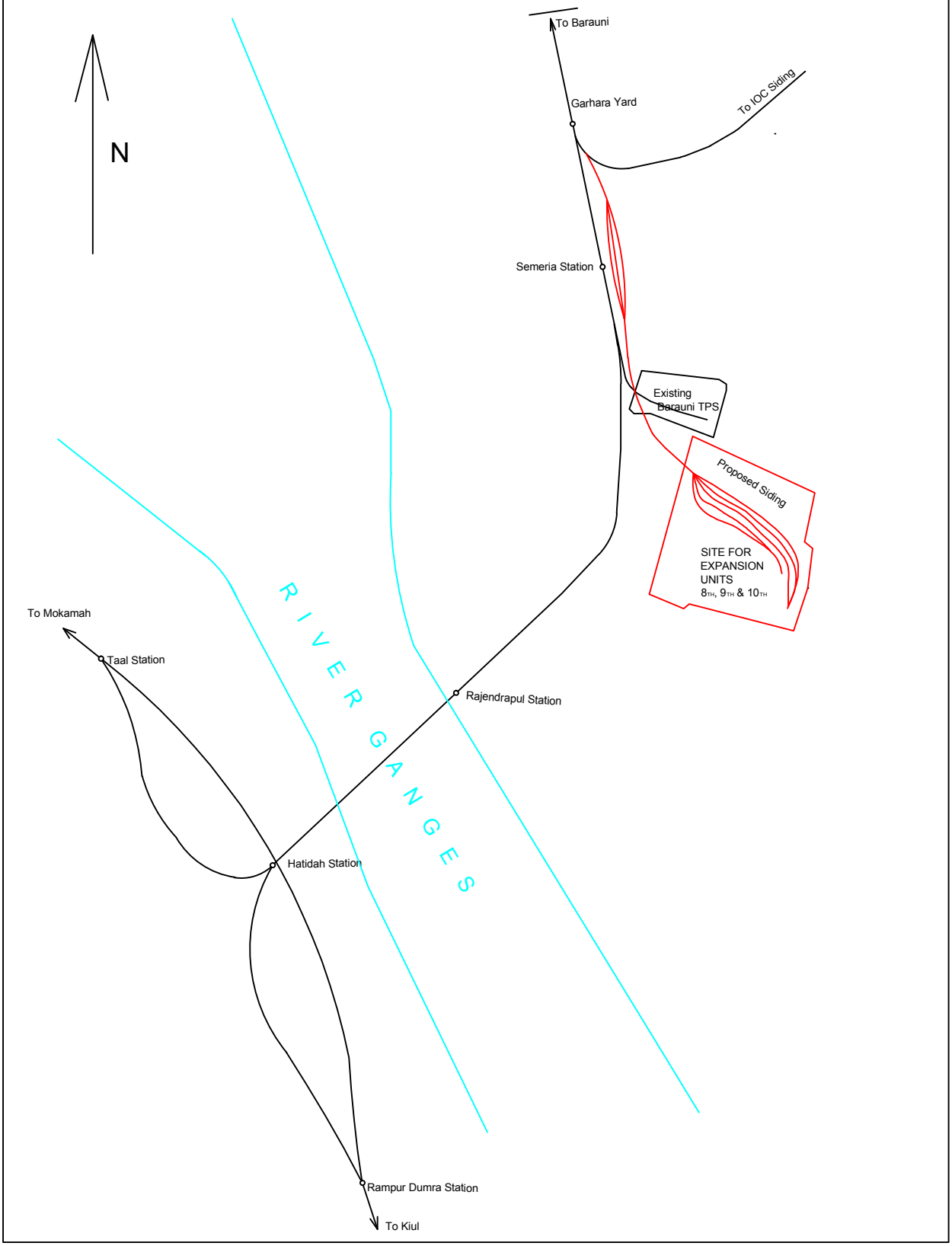
Surveys	(a) 1 % of the assessed cost of the project at the stage the party's proposal for undertaking the survey is approved by the Railway.
	(b) Balance amount to complete 2% of the estimated cost of the project at the stage of conveying approval to Survey/Plans and Estimates.
Final Inspection	2% of the cost of project while applying for the final approval of the completed works.

LIST OF ANNEX

Chapter	Annex No	Subject
I	1.0	A Sketch Plan showing the location of Barauni TPS.
	1.1	Engineering Scale Plan drawing
II	2.0	List of Bench Mark
	2.1	FLY-ASH LOADING LINE List of Curves
	2.2	FLY-ASH LOADING LINE Gradient Statement
	2.3	Typical profile of embankment and cutting.
	2.4	Detail of track structure
	2.5	FLY-ASH LOADING LINE List of Bridges
III	3.1	Modified Signalling arrangements of the In-Plant cabin
IV	4.1	The schematic diagram showing sectioning arrangement
VIII	8.0	Abstract cost of the project.
	8.1	Abstract estimate for Civil Engineering cost.
	8.2	Abstract estimate for Signal & Telecommunication cost.
	8.3	Abstract estimate for Electrical Engineering cost.

Annex-1.0

A SCHEMATIC PLAN SHOWING LOCATION OF BARAUNI THERMAL POWER PLANT



ANNEX - I.1

LEGENDS:-

* Railway Approved Works Shown as
* Existing work shown as
* Proposed works shown as
* IOC Pipe line shown as
* All Dimensions Are In Metre Unless Otherwise Stated.
* Dismantling work shown in black dotted.
* Rail 60Kg T12– 90UTS
* All Turnout Consider PSC Sleeper Fan Shaped Layout(FSLO)
* Ballast cushion 300mm
* Sleeper density 1540 nos per Km.

SALIENT FEATURE :-

1. Co-ordinate of Wagon Tippler-1
   E = 100360.983, N = 79801.685
   Formation Level = 45.038m
   Rail Top Level = 45.726m
2. Co-ordinate Wagon Tippler - 2
   E = 100367.044, N = 79772.305
   Formation Level = 45.038m
   Rail Top Level = 45.726m

NOTE:-

This plan is prepared based on CE's Drg No-Y-35-2010(Alt-1) and as per actual site survey. This survey is conducted on the basis of Reference pillar no. BM 12A (E=100219.069, N=80137.799) & Reference pillar no. BM - 13(E=100213.490, N=80082.520) in side the BTPS existing plant.
Bench mark value has been taken as 45.568m on the top pillar BM-9 near grid pillar P-3.

This drawing is prepared based on E.C. Rly's CE's DRG No. - Y - 46 - 2015 (Sheet No. 2 OF 2)

EAST CENTRAL RAILWAY	
DIVISION	SONPUR DIVISION
SECTION	BJU - MKA
NAME OF WORK:-	LAYOUT PLAN SHOWING PROPOSED RAIL INFRASTUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI THERMAL POWER STATION(BTPS)
AUTHORITY OF WORK	BARAUNI THERMAL POWER PLANT(BTPP)

RITES/KOL/BTPP/BARAUNI/JICA – 000 /2016

SCALE:- 1:1500	SH No. 1 OF 1	RITES THE INFRASTRUCTURE PEOPLE
DATE:-March, 2016	REV No.	

Annex- 2.0

List of Bench Mark

FSR for development of Rail-infrastructure for Barauni TPS 10th unit project

SL. NO	TBM NO.	VALUE IN (M)	LOCATION
1	Mother	45.568	On top of pillar side of Gupta Bundh opposite side of overhead tank.
2	TBM 1	45.336	On top of pillar between Up main & Down main lines at CL of Simaria station
3	TBM 2	45.915	On step of Simaria South Cabin.
4	TBM K 8	46.588	On top of pillar by the side of NH-31 near junction of Gupta Bundh.
5	TBM 3	49.994	On plinth of Rajendra pul station North Cabin.
6	TBM 4	52.151	On top of passenger seat near Rajendra pul station building.
7	TBM 5	52.838	On step of Rajendra pul South Cabin.

Annex- 2.1

FSR for development of Rail-infrastructure for Barauni TPS 10th unit project

FLY-ASH LOADING LINE
List of Curves

Length of line -1/933.575 kms

Sl No	Curve No	Direction	Radius	From kms.	To kms.	Angle of deflection	Length
1	1	LH	360 m	224.247	602.459	60^0 11' 24"	378.212
2	2	RH	220 m	887.152	912.915	06^0 42' 35"	25.763
3	3	RH	220 m	1159.079	1244.955	22^0 21' 55"	85.876
4	4	RH	365 m	1289.775	1664.501	58^0 49' 21"	374.726

Curve Abstract

Length of line -1/933.575 kms

Sl. No	Radius of curve	No. of each	Total length in metre	Total degree of curvature	% of curvature to total length of line
1	220 m	2	111.639	29^0 04' 30"	5.777
2	360 m	1	376.212	60^0 11' 24"	19.457
3	365 m	1	374.726	58^0 49' 21"	19.380

Annex- 2.2

FSR for development of Rail-infrastructure for Barauni TPS 10th unit project

FLY-ASH LOADING LINE
Gradient Statement

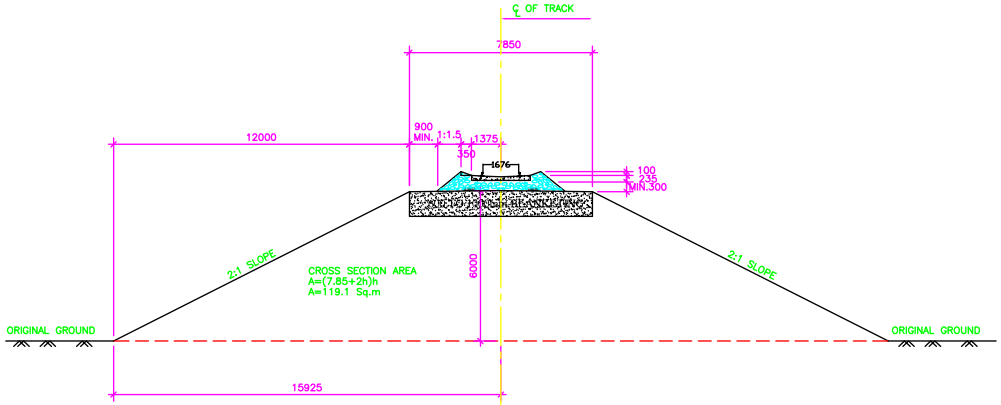
Length of line -1/933.575 kms

Sl. No.	Location in metre		Length in metre	Grade	Remarks
	From	To			
1	0.000	375.846	375.846	1 in 425	RISE
2	375.846	768.908	393.062	1 in 800	RISE
3	758.908	1202.508	443.600	LEVEL	LEVEL
4	1202.508	1552.508	350.000	1 in 500	FALL
5	1552.508	1902.508	350.000	1 in 500	RISE
6	1902.508	1933.575	31.067	LEVEL	LEVEL
Total length			1933.575		

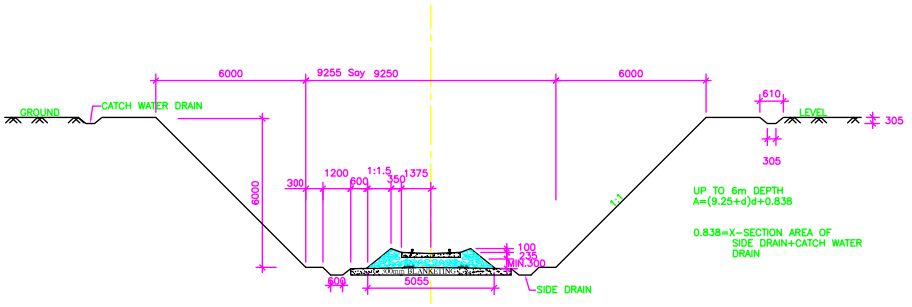
Gradient Abstract

Sl. No	Grade	Length in 'kms'	% of length	Remarks
1.	Level	474.667	24.549	
2.	1 in 425	375.846	19.438	
3.	1 in 500	700.00	36.202	
4	1 in 800	393.062	19.811	
Total			100%	

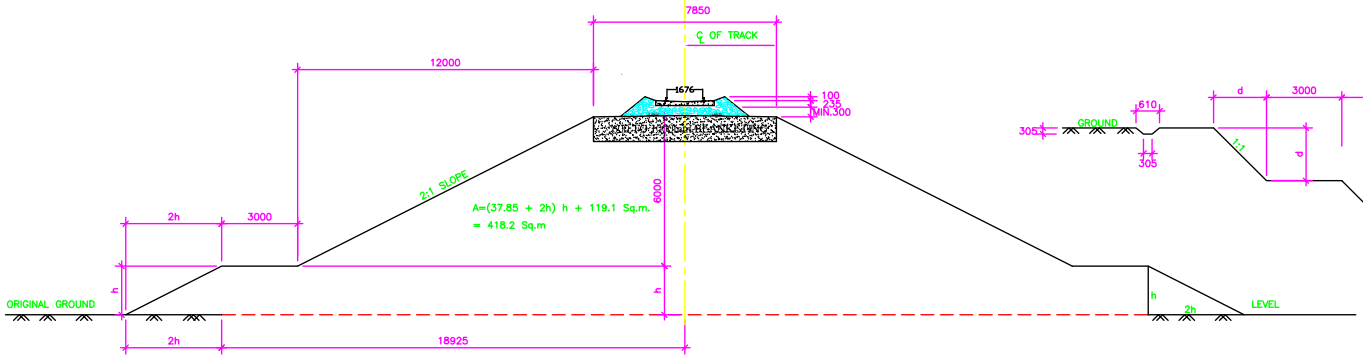
ANNEX:-2.3

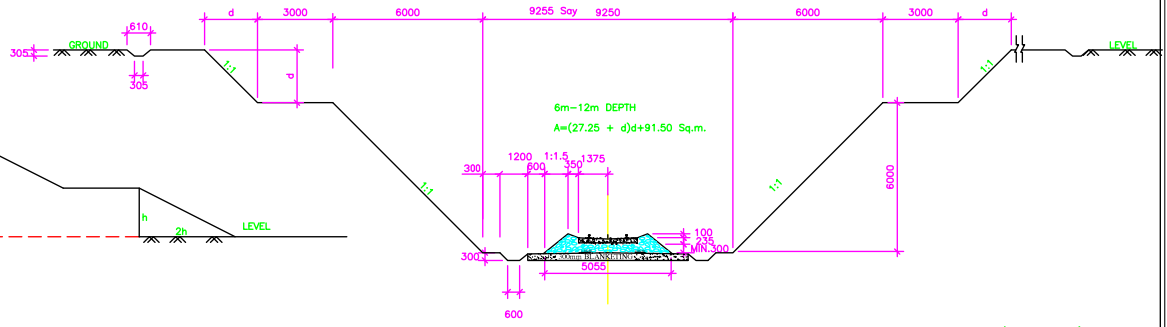


EMBANKMENT UP TO 6m HIGH



CUTTING UP TO 6m HIGH

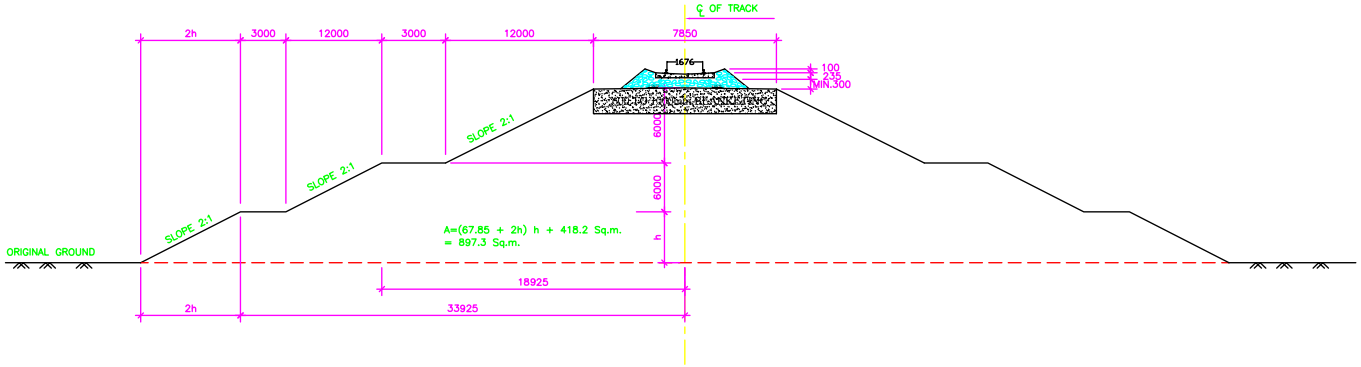




CUTTING ABOVE 6m DEPTH UP TO 12m DEPTH

EMBANKMENT ABOVE 6m HIGH UP TO 12m HIGH

TURFING UP TO 6m (ON BOTH SIDE)
(a) (BANK OF HEIGHT)h x 4.47m.
ABOVE 6m UP TO 12m (ON BOTH SIDE)
(b) (h x 4.47m)+6m



EMBANKMENT ABOVE 12m HIGH UP TO 18m HIGH

NOTE:- 1. ALL DIMENSIONS ARE IN MILLIMETRES

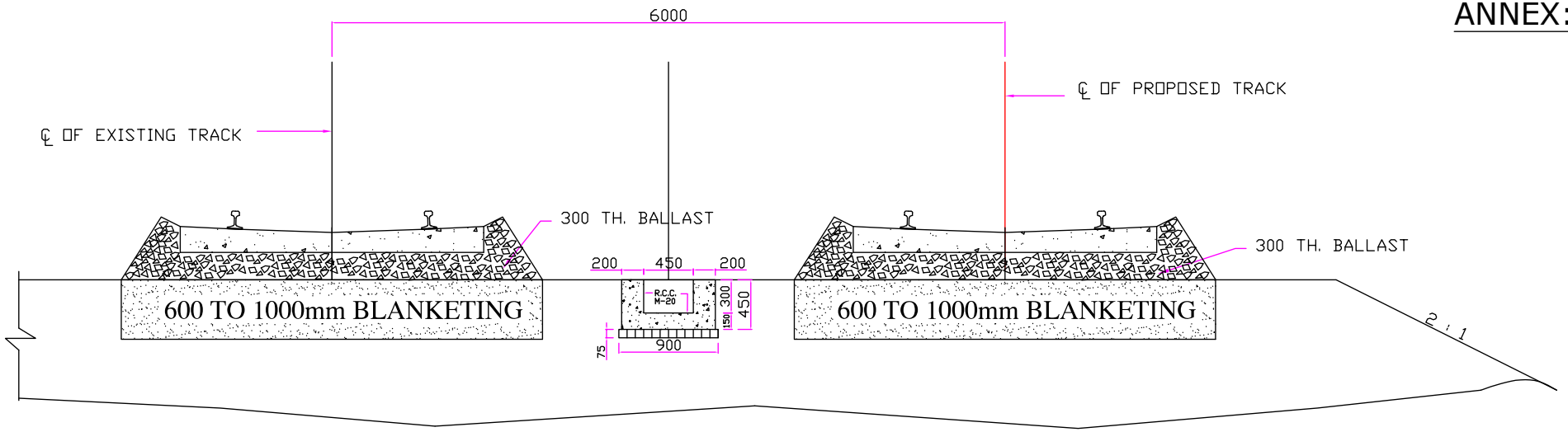
2. AS PER RLY. BOARD LETTER No. 98/W-I/Genl./0/30-Pt.-I dt. 13.01.2015

STANDARD DRAWING.

TYPICAL PROFILES OF EMBANMENT AND CUTTING

SCALE	DRG. NO.	RITES/CAL/	RITES THE INFRASTRUCTURE PEOPLE
NOT TO SCALE	SH. NO.		RITES LIMITED
	DATE	JANUARY 2016	(A GOVT. OF INDIA ENTERPRISES)
	REV. NO.		

ANNEX:- 2.4

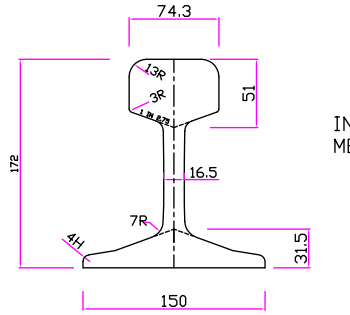


TYPICAL SECTION OF BALLAST PROFILE DOUBLE B.G. LINE

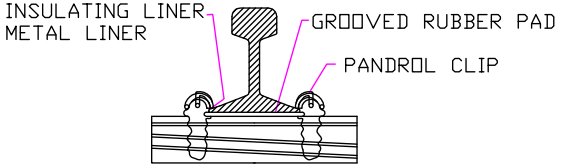
NOT TO SCALE

350mm Th. BALLAST
210mm Th. SLEEPER AT RAIL SEAT
6 mm Th. RUBBER PAD
172mm RAIL Ht.

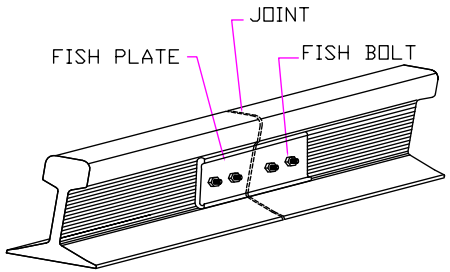
TOTAL 738 mm. F.L TO RAIL TOP



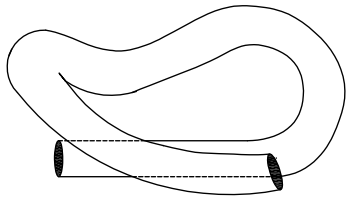
CROSS SECTION OF 60 Kg RAIL



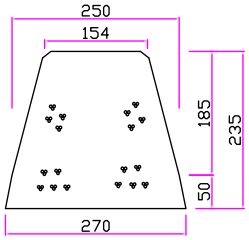
DETAILS AT RAIL SEAT



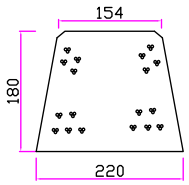
FISH PLATE



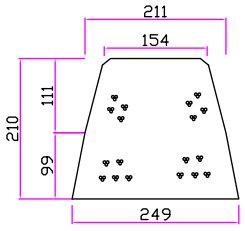
PANDROL CLIP
SCALE - NTS



END ELEVATION

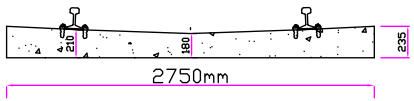


SEC. AT CENTER



SEC. AT RAIL SEAT

DETAILS AT PCS-12 SLEEPER



DETAILS AT MONO BLOCK P.C.S.

ALL DIMENSIONS ARE IN MILLIMETRES

DETAILS OF TRACK STURCTURE

STANDARD DRAWING.

DETAILED OF TRACK STRUCTURE 60Kg. RAIL

SCALE	Drg. No.	RITES/KOL	RITES THE INFRASTRUCTURE PEOPLE RITES LIMITED (A GOVT. OF INDIA ENTERPRISES)
NOT TO SCALE	Sh. No.		
	Date	DEC - 2015	

RITES LIMITED

FLY-ASH LOADING LINE
List of Bridges

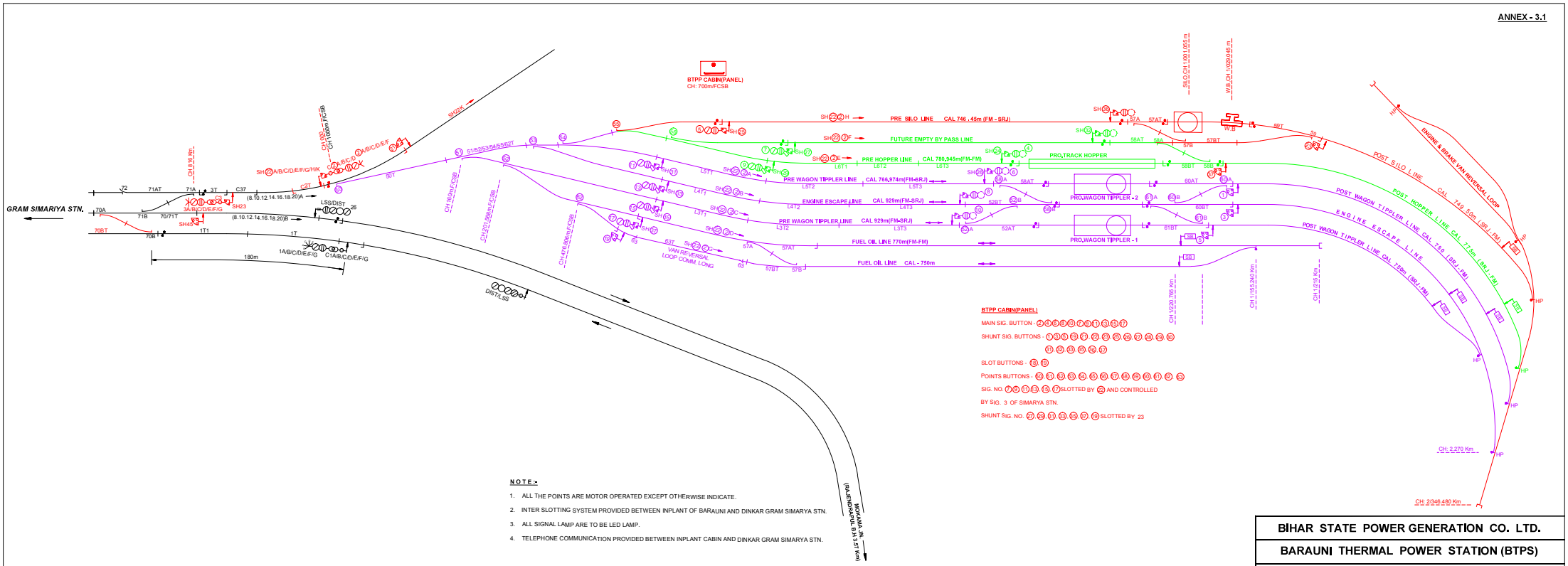
MINOR BRIDGE

Sl. No	Bridge No.	Location In kms.	Span in metre	Type	Remarks
1.	1	0/587.961	1 x 3.0 m x 3.0 m	RCC BOX	IOC pipe line crossing.

ABSTRUCT OF MINOR BRIDGES

SL. NO.	TYPE OF BRIDGE	SPAN IN METRE	TOTAL NO. OF SPAN	CLEAR SPAN IN METER
01	RCC BOX	3.0	1	3.0

ANNEX - 3.1



BTPP CABIN(PANEL)

MAIN SIG. BUTTON - 2 4 6 8 9 11 13 15 17

SHUNT SIG. BUTTONS - 1 3 5 10 12 14 16 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37

SLOT BUTTONS - 38 39

POINTS BUTTONS - 40 41 42 43 44 45 46 47 48 49 50 51 52 53

SIG. NO. 7 9 11 13 15 17 SLOTTED BY 22 AND CONTROLLED BY SIG. 3 OF SIMARYA STN.

SHUNT SIG. NO. 27 29 31 33 35 37 39 SLOTTED BY 23

NOTE :-

1. ALL THE POINTS ARE MOTOR OPERATED EXCEPT OTHERWISE INDICATE.
2. INTER SLOTTING SYSTEM PROVIDED BETWEEN INPLANT OF BARAUNI AND DINKAR GRAM SIMARYA STN.
3. ALL SIGNAL LAMP ARE TO BE LED LAMP.
4. TELEPHONE COMMUNICATION PROVIDED BETWEEN INPLANT CABIN AND DINKAR GRAM SIMARYA STN.

BIHAR STATE POWER GENERATION CO. LTD.

BARAUNI THERMAL POWER STATION (BTPS)

PRO. SCHEMATIC SIGNALLING PLAN

FOR 10 TH UNIT AT

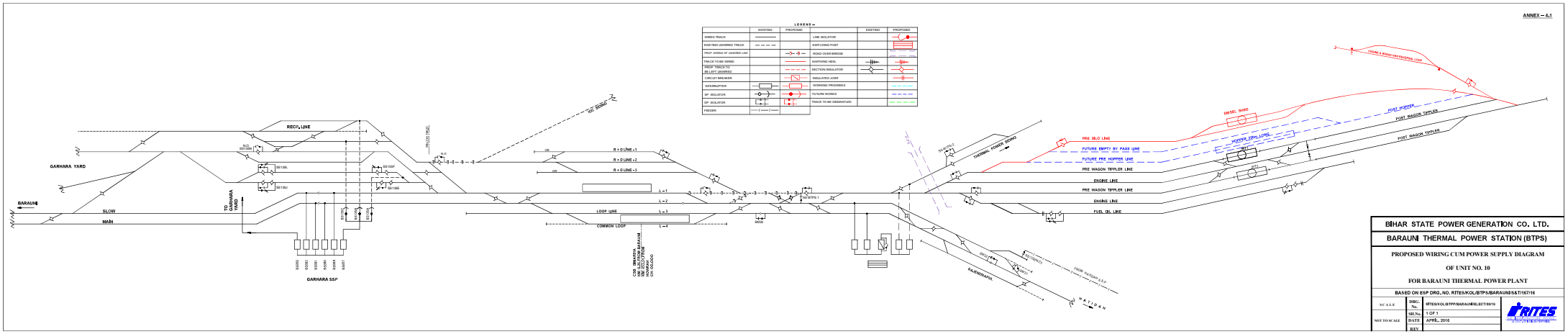
BARAUNI THERMAL POWER PLANT

BASED ON ESP DRG. NO. RITES/KOL/BTPS/BARAUNI/S&T/167/16

SCALE	DRG. No.	RITES/KOL/BTPS/BARAUNI/S&T-122/16
NOT TO SCALE	SH.No.	1 OF 1
	DATE	APRIL,2016
	REV	

RITES LTD. (INFRASTRUCTURE PEOPLE) (A GOVT. OF INDIA ENTERPRISE)

ANNEX – 4.1



BIHAR STATE POWER GENERATION CO. LTD.

BARAUNI THERMAL POWER STATION (BTPS)

PROPOSED WIRING CUM POWER SUPPLY DIAGRAM

OF UNIT NO. 10

FOR BARAUNI THERMAL POWER PLANT

BASED ON ESP DRG. NO. RITES/KOL/BTPS/BARAUNI/S&T/167/16

SCALE	DRG. No.	RTES/KOL/BTPP/BARAUNI/ELECT/8/16
NOT TO SCALE	SH.No.	1 OF 1
	DATE	APRIL, 2016
	REV.	

RITES

FINAL FEASIBILITY STUDY REPORT

DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI TPS
SUMMARY OF ALL COSTS

ABSTRACT COST ESTIMATE FOR ALL WORKS INCLUDING PHASE-II FOR 8TH & 9TH UNITS

Sl. No.	Type of works	Cost for fly-ash lines including revised cost for Track Hopper	
		Amount in INR	Amount in USD*
1	Civil Engineering [Annex-8.1]	256,706,900.00	3,875,406.10
2	S & T [Annex8.2]	32,491,808.41	490,516.43
3	Electrical Engineering [Annex-8.3]	40,453,714.95	610,714.30
	Grand Total:	**329,652,423.37**	**4,976,636.83**

ABSTRACT COST ESTIMATE FOR DEVELOPMENT OF THE 10TH UNIT

Sl No	Type of Works	Amount in INR	Amount in USD*
1	Cost for fly-ash lines including revised cost for Track Hopper lines	329,652,423.37	4,976,636.83
2	Cost of the Track Hopper lines [as per DPR for 8^{th} & 9^{th} units	107,301,000.00	1,619,882.25
3	Cost for development of the 10^{th} unit project	**222,351,423.37**	**3,356,754.58**

NB:- The above cost is exclusive of Codal Charges, Departmental charges and other statury charges of Railway

As per conversion rate of USD : INR = 1 : 66.24 as on 20.04.2016

Annex-8.1

CIVIL ENGNEERING ESTIMATE
FINAL FEASIBILITY STUDY REPORT
DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI TPS
COST OF ALL CIVIL ENGINEERING WORKS

SL NO	DESCRIPTION OF ITEMS	AMOUNT [in INR]		
		TRACK HOPPER LINE [PHASE-II]	FLY ASH SILO LINE	TOTAL COST FOR 10TH UNIT
1	Railway formation Works [Annex-8.1.1-A+B]	56,785,150.00	39,772,150.00	**96,557,300.00**
2	Permanent Way Works [Annex-8.1.2-A+B]	81,481,600.00	69,611,000.00	**151,092,600.00**
3	Minor Bridges [Annex - 8.1.3]		5,007,000.00	**5,007,000.00**
4	Other Engineering Works [Annex-8.1.4]	600,000.00	3,450,000.00	**4,050,000.00**
	Total:	138,866,750.00	117,840,150.00	**256,706,900.00**

CIVIL ENGNEERING ESTIMATE
FINAL FEASIBILITY STUDY REPORT
DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI THERMAL POWER STATION
PROPOSED TRACK HOPPER LINE [From Ch:0.000 m to Ch:1947.9 m]
RAILWAY FORMATION WORK

SL NO	DESCRIPTION OF ITEMS	UNIT	QTY	RATE	AMOUNT
				RS P	RS P
1	Preliminary expenses for survey ,soil test etc.	LS			150,000.00
2	Site Clearance including up rooting and removal of grass vegetation,shurbs and trees etc.	sqm	15,000.00	8.00	120,000.00
3	Felling trees of girth (measured at a height of 1m above ground level) including lead and stacking of material within 100m.Girth over 1.5m upto 3 m.	Each	5.00	720.00	3,600.00
4	Earthwork in cutting in formation including side drain, trolley refuges, etc in all sorts of soil except rock not requiring blasting,leading and spreading to adjacent bank and disposal of surplus earth if any, including all lead lift complete.	cum	62,300.00	200.00	12,460,000.00
5	Earthwork in filling in formation in layers as per profile and specification with earth arranged by the contractor including all lead & lift ascents and descent royalty etc.	cum	1,000.00	293.00	293,000.00
6	Mechanical compaction of earthwork in formation with contractor's own plant and machinery etc.	cum	4,000.00	18.00	72,000.00
7	Provision of blanketing layers with contractor's stone dust of approved quality over previously formed embankment including mechanical compaction with contractor's power driven Roller.	cum	18,200.00	1,815.00	33,033,000.00
8	Turfing in slopes with contractors grass sods 10cm thick & 20cm square including all leads & lifts transportation and watering the same till it holds the ground firmly.	sqm	850.00	63.00	53,550.00
9	Construction of Pucca Drain with RCC Work along Embankment	Rm	2,000.00	5,300.00	10,600,000.00
	Total			**Rs**	**56,785,150.00**

CIVIL ENGNEERING ESTIMATE
FINAL FEASIBILITY STUDY REPORT
DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI THERMAL POWER STATION
PPOPOSED FLY-ASH SILO LINE [From Ch:0.000 m to Ch:1933.57 m]
RAILWAY FORMATION WORK

SL NO	DESCRIPTION OF ITEMS	UNIT	QTY	RATE	AMOUNT
				RS P	RS P
1	Preliminary expenses for survey ,soil test etc.	LS			150,000.00
2	Site Clearance including up rooting and removal of grass vegetation,shurbs and trees etc.	sqm	15,000.00	8.00	120,000.00
3	Felling trees of girth (measured at a height of 1m above ground level) including lead and stacking of material within 100m.Girth over 1.5m upto 3 m.	Each	5.00	720.00	3,600.00
4	Earthwork in cutting in formation including side drain, trolley refuges, etc in all sorts of soil except rock not requiring blasting,leading and spreading to adjacent bank and disposal of surplus earth if any, including all lead lift complete.	cum	33,500.00	200.00	6,700,000.00
5	Earthwork in filling in formation in layers as per profile and specification with earth arranged by the contractor including all lead & lift ascents and descent royalty etc.	cum	1,000.00	293.00	293,000.00
6	Mechanical compaction of earthwork in formation with contractor's own plant and machinery etc.	cum	4,000.00	18.00	72,000.00
7	Provision of blanketing layers with contractor's stone dust of approved quality over previously formed embankment including mechanical compaction with contractor's power driven Roller.	cum	12,000.00	1,815.00	21,780,000.00
8	Turfing in slopes with contractors grass sods 10cm thick & 20cm square including all leads & lifts transportation and watering the same till it holds the ground firmly.	sqm	850.00	63.00	53,550.00
9	Construction of Pucca Drain with RCC Work along Embankment	Rm	2,000.00	5,300.00	10,600,000.00
	Total			**Rs**	**39,772,150.00**

Annex-8.1.2-A

CIVIL ENGNEERING ESTIMATE
FINAL FEASIBILITY STUDY REPORT
DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI THERMAL POWER STATION
PERMANENT WAY WORKS FOR TRACK HOPPER LINE [PHASE-II]

SL NO	DESCRIPTION OF ITEMS	UNIT	QTY	RATE	AMOUNT
				RS P	RS P
1	Laying and linking of BG straight & curve Track (less than 5^0)with new 60 Kg (IRS T-12) 90 UTS First Quality Rail on PSC sleepers (1660 Nos/Km) with cost of Rail and standard fitting with 300 mm Ballast cushion including packing complete.	TM	2,900.00	26,000.00	75,400,000.00
2	Assembling Laying & Linking 1 in 8.5 P & C fan shape with new 60 Kg (IRS T-12) 90 UTS First Quality lead Rail on ballast cushion 300 mm including 4 round through packing.	SET	3.00	2,000,000.00	6,000,000.00
3	Manufacturing & Fixing of Fouling Mark.	EACH	3.00	2,200.00	6,600.00
4	Dismantling of existing Trun Out	SET	2.00	1,500.00	3,000.00
5	Dismantling of Existing Track	TM	90.00	800.00	72,000.00
	TOTAL			**RS**	**81,481,600.00**

Annex-8.1.2-B

PERMANENT WAY WORKS FOR FLY-ASH SILO LINE					
SL NO	**DESCRIPTION OF ITEMS**	**UNIT**	**QTY**	**RATE**	**AMOUNT**
				RS P	**RS P**
	PERMANENT WAY WORKS				
1	Laying and linking of BG straight & curve Track (less than 5^0)with new 60 Kg (IRS T-12) 90 UTS First Quality Rail on PSC sleepers (1660 Nos/Km) with cost of Rail and standard fitting with 300 mm Ballast cushion including packing complete	TM	2,130.00	26,000.00	55,380,000.00
2	Laying and linking BG curve track 5º & above with 60 Kg (IRS T-12) 90 UTS First Quality Rail (Single)on PSC sleepers (1660 Nos/Km)with one extra at staggered joint on Ballast cushion 300 mm including 4 round through packing & check rail fitting complete	TM	115.00	28,000.00	3,220,000.00
3	Assembling Laying & Linking 1 in 8.5 P & C fan shape with new 60 Kg (IRS T-12) 90 UTS First Quality lead Rail on ballast cushion 300 mm including 4	SET	5.00	2,000,000.00	10,000,000.00
4	Manufacturing & Fixing of Fouling Mark.	EACH	5.00	2,200.00	11,000.00
5	Miscellaneous works			LS	1,000,000.00
	TOTAL			**RS**	**69,611,000.00**

Annex-8.1.3

CIVIL ENGNEERING ESTIMATE
FINAL FEASIBILITY STUDY REPORT
DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI THERMAL POWER STATION
BRIDGE WORKS

	A	MINOR BRIDGES			AMOUNT [Rs]		
SL NO	Br. No.	DESCRIPTION	Ch No.		TRACK HOPPER LINE	FLY ASH SILO LINE	TOTAL
1	1	1 x 3 m x 3 m RCC Box					
2	1	1 x 3 m x 3 m RCC Box	0/587.161			5,007,000.00	5,007,000.00
		TOTAL		Rs	**5,007,000.00**		

Annex-8.1.4

CIVIL ENGNEERING ESTIMATE
FINAL FEASIBILITY STUDY REPORT
DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI THERMAL POWER
OTHER ENGINEERING WORKS

SL NO	DESCRIPTION OF ITEMS	QTY	UNIT	RATE	AMOUNT	
					TRACK HOPPER LINE	FLY ASH SILO LINE
A	**Civil Engineering**					
1	Construction of In motion Weigh Bridge	No	1	250,000.00		250,000.00
	Total					**250,000.00**
B	**For S&T Works**					
	Phase-II					
1	Glued joints	Pcs.	20	30,000.00	600,000.00	
	For Fly-ash SILO lines					
1	Modification of Panel Cabin	sqm	100	20,000.00		2,000,000.00
2	Glued joints	Pcs.	40	30,000.00		1,200,000.00
	Total				**600,000.00**	**3,200,000.00**
	Total:[A + B]				**600,000.00**	**3,450,000.00**

Annex-8.2

FINAL FEASIBILITY STUDY REPORT

DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI THERMAL

SIGNAL ENGNEERING & TELECOMMUNICATION ESTIMATE

BSTRACT COST ESTIMATE FOR MODIFICATION OF PANEL INTERLOCKING AT INPLANT YAR

Sl. No.	Description	Amount (Rs.)
1	Modfication of Panel cabin	32,491,808.41
	Total =	32,491,808.41

Annex-8.2.1

FINAL FEASIBILITY STUDY REPORT

DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI THERMAL POWER STATION

SIGNAL ENGNEERING & TELECOMMUNICATION ESTIMATE

ABSTRACT COST ESTIMATE FOR MODIFICATION OF PANEL INTERLOCKING AT INPLANT YARD

Sl. No.	Description	Qty	Unit	Rate (Rs.)	Amount (Rs.)
1	Modfication of Panel Interlocking Domino type complete with Push Button, indication lamps etc.	LS			150,000.00
2	Electrical Point Machine complete with ground	6	No.	90,000.00	540,000.00
3	Electric Key Transmitter (EKT)	4	No.	6,000.00	24,000.00
4	MACLS complete with all accessories with LED lit				
	i) 2 Aspect	6	No.	62,000.00	372,000.00
5	Dependent type Position Light Shunt Signal with LED lit	6	Nos.	32,000.00	192,000.00
6	Independent type Position light Shunt Signal with LED lit	2	Nos.	53,000.00	106,000.00
7	Track Circuit complete with Battery Charger, Battery and other accessories	11	Nos.	35,000.00	385,000.00
8	SSDAC for Track clearence	4	Nos.	850,000.00	3,400,000.00
9	Underground Signalling Cable PVC insulated unscreened				
	i) 24 Core	6	Km.	357,000.00	2,142,000.00
	ii) 18 Core	8	Km.	257,000.00	2,056,000.00
	iii) 12 Core	20	Km.	195,000.00	3,900,000.00
	v) 6 Core	20	Km.	116,000.00	2,320,000.00
	vi) Al Power cable 2C - 25 sq. mm	6	Km.	130,000.00	780,000.00
10	6 Quad Telecom cable with jointing kits	6	Km.	354,000.00	2,124,000.00
11	Cable indoor copper conductor plain annealed high conductivity 650V grade PVC insulated unarmoured IRS-S-76/89.				
	i) -do- 3 x 0.75 Sq.mm	20	Coil(100 M each)	850.00	17,000.00
	ii) -do- 16 x 0.2 Sq.mm	400	Coil(100 M each)	455.18	182,072.00
	iii) -do- 7 x 0.75 Sq.mm	6	Coil(100 M each)	2,500.00	15,000.00
	iv) -do- 10 Sq.mm	4	Coil(100 M each)	10,400.00	41,600.00
12	Switch Board Cable 30 pair conductor dia.0.63 mm	400	Mtrs.	82.00	32,800.00
13	GI Pipe	20	Nos.	750.00	15,000.00
14	RCC Pipe	30	Nos.	400.00	12,000.00
15	Signalling Relay of sorts	500	Nos.	3,500.00	1,750,000.00
16	Steel Apparatus case	20	Nos.	11,000.00	220,000.00
17	Relay Rack	7	Nos.	15,500.00	108,500.00
18	Cable Termination Rack	2	Nos.	20,000.00	40,000.00
19	Earth Electrode	30	Nos.	1,500.00	45,000.00
20	Upgradation of Data logger	LS			200,000.00
21	Upgradation of Intregated Power Supply (IPS)	LS			200,000.00
22	Wiring and terminating materials	LS			100,000.00
23	Cable terminating materials	LS			100,000.00
24	Building materials (sand,cement etc.)	LS			200,000.00

25	Paints & Consumables	LS			50,000.00
26	Misc. Stores & Furniture	LS			100,000.00
				SUB TOTAL	21,931,972.00
27	Transportation,installation etc	40	%		8,772,788.80
				SUB TOTAL	30,704,760.80
28	Contingency	1	%		307,047.61
				SUB TOTAL	31,011,808.41
29	Cable trenching, laying & refilling	20	Km.	74,000.00	1,480,000.00
				Sub TOTAL	32,491,808.41
	CIVIL ENGG.				
1	Construction of Panel Room, Relay Room, Evaluator Room , IPS Room, Battery Room etc	100	Sq. Mtrs.		
2	Glued Joints	40	Nos..		
				Total =	32,491,808.41

N.B. The cost of Civil and Electrical portion associated with S&T works have been included in the Civil and Electrical Estimate respectively.

Annex-8.3

FINAL FEASIBILITY STUDY REPORT

DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI THERMAL POWER STATION

ELECTRICAL ENGNEERING ESTIMATE

ABSTRACT COST ESTIMATE FOR ELECTRIFICATION WORK FOR 10TH UNIT

Sl. No.	Items	Amount (Rs.)
1	Cost of OHE for Hopper Line [Phase-II work for 8th & 9th unit]	21,490,764.00
2	Cost of OHE for fly-ash SILO line	18,962,950.95
	Total:	**40,453,714.95**

Annex - 8.3.1

ELECTRICAL ENGINEERING ESTIMATE

FINAL FEASIBILITY STUDY REPORT

DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI THERMAL POWER STATION

PROVISION OF OHE FOR TRACK HOPPER LINE [PHASE-II]

Sl No	Description of the Item	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)
1	Foot by foot survey & preparation of OHE pegging plan including modification, dismantling works	TKM	3	6,152.00	18,456.00
2	Preparation of Design & Drawing of Overhead equipment including modification, dismantling works	TKM	3	8,134.00	24,402.00
3	Concrete for foundation & Plinth				
	(i) Ordinary soil/Hard soil inlcuding rock required chieseling (Grade M-15)	Cu.m	390	6,395.00	2,494,050.00
	(ii) Reinforced Concrete	Cu.m	5	6,835.00	34,175.00
	(iii) Rocky soil	Cu.m	5	6,596.00	32,980.00
4	Supply and Manual erection of traction mast/other special masts (BFB/RSJ/B-Series) including terminating structures & gantry masts				
	(i) Supply	MT	30	104,737.00	3,142,110.00
	(ii) Erection	MT	28	6,141.00	171,948.00
5	Supply & Erection of TTC/Portal assembly complete				
	(i) Supply	MT	5	110,250.00	551,250.00
	(ii) Erection	MT	3	6,141.00	18,423.00
6	Supply of				
	(i) Hard drawn grooved copper contact wire (107 Sq.mm)	Km.	3.55	992,250.00	3,522,487.50
	(ii) Cadmium copper catenary wire (65 Sq.mm)	Km.	3.95	661,508.00	2,612,956.60
	(iii) Large span wire	Km.	0.2	888,687.00	177,737.40
7	Supply & Erection of fabricated steel works other than mast				
	(i) Supply	MT	7	122,754.00	859,278.00
	(ii) Erection	MT	6.5	9,671.00	62,861.50
8	Supply & Erection Guy rod assembly				
	(i) Supply	No.	12	9,500.00	114,000.00
	(ii) Erection	No.	12	658.00	7,896.00
9	Supply & Erection of single Bracket Assembly without insulators				
	(i) Supply	No.	80	15,222.00	1,217,760.00
	(ii) Erection	No.	75	750.00	56,250.00
10	Supply & Erection of Overhead Equipment				
	(i) Supply	Km.	3.5	33,075.00	115,762.50
	(ii) Erection	Km.	0	19,395.00	0.00
11	Supply & Erection of regulating equipment (3 pulley modified type) with normal counter weight assembly for conventional OHE				
	(i) Supply	No.	6	64,655.00	387,930.00
	(ii) Erection	No.	4	2,586.00	10,344.00
12	Supply & Erection of materials for termination of double overhead equipment conductor (Excluding 9 tonne insulator)				
	(i) Supply	No.	6	5,922.00	35,532.00
	(ii) Erection	No.	6	528.00	3,168.00

13	Supply & Erection of materials for termination of single overhead equipment conductor (excluding 9 ton insulator)				
	(i) Supply	No.	36	4,961.00	178,596.00
	(ii) Erection	No.	36	528.00	19,008.00
14	Supply & Erection of anti-creep (excluding 9 tonne insulator and catenary wire with SPS)				
	(i) Supply	No.	3	9,589.00	28,767.00
	(ii) Erection	No.	3	2,186.00	6,558.00
15(a)	Suppy & erection of 9 tonne Insulator (1050 mm suitable for polluted zone)				
	(i) Supply	Each	48	2,981.00	143,088.00
	(ii) Erection	Each	26	1,321.00	34,346.00
15(b)	Suppy & erection of 9 tonne Insulator procelain				
	(i) Supply	No	0	3,325.00	0.00
	(ii) Erection	No	0	353.00	0.00
16(a)	Supply of large (105 sqmm) Copper jumper (G jumper)	Km.	0.1	1,092,000.00	109,200.00
16(b)	Supply & erection of copper jumper (160)				
	(i) Supply	Km.	0.1	1,275,000.00	127,500.00
	(ii) Erection	Mtr	40	353.00	14,120.00
17	Supply of small (50 sqmm) Copper jumper (C/F/AT Jumper)	Km.	0.06	446,000.00	26,760.00
18	Erection of copper jumper (105 sqmm)	Mtr	75	1,102.00	82,650.00
19 a)	Erection of copper jumper (50 sqmm)	Mtr	235	199.00	46,765.00
19 b)	Erection of large span wire	Km.	0	19,395.00	0.00
20	Supply & Erection of Structure bond (Wire bond type)				
	(i) Supply	Each	100	574.00	57,400.00
	(ii) Erection	Each	100	162.00	16,200.00
21	Supply & Erection of Transverse and Special Bond (Wire bond type)				
	(i) Supply	Each	20	544.00	10,880.00
	(ii) Erection	Each	20	166.00	3,320.00
22	Supply & Erection of longituditinal bond (Wire bond type)				
	(i) Supply	Each	400	369.00	147,600.00
	(ii) Erection	Each	400	153.00	61,200.00
23	Supply & Erection of single earth electrode with earth pit box cover complete				
	(i) Supply	Each	40	3,996.00	159,840.00
	(ii) Erection	Each	40	1,211.00	48,440.00
24	Supply & Erection of section insulator assembly including core insulator (excluding cut in insulator)				
	(i) Supply	Each	8	48,197.00	385,576.00
	(ii) Erection	Each	2	1,881.00	3,762.00
25	Supply & Erection of pull off arrangement for one OHE (excluding 9 tone insulator)				
	(i) Supply	No.	38	7,718.00	293,284.00
	(ii) Erection	No.	36	470.00	16,920.00
26	Supply & erection of various types of caution boards to RDSO specification	No.	10	1,665.00	16,650.00
27	Supply & erection of number plates (enamelled)				
	(i) Supply	No.	87	670.00	58,290.00
	(ii) Erection	No.	87	33.00	2,871.00

28	Supply & Erection of sectioning Diagram Board (Size 4'x2')	No.	2	7,146.00	14,292.00
29a)	Supply of bracket insulator for Polluted Zone (1050mm)	No.	80	3,300.00	264,000.00
29b)	Supply of Stay Insulator for Polluted Zone (1050mm)	No.	80	3,300.00	264,000.00
30	Supply of Porcelain Insulator				
	(i) Stay	No.	0	2,522.00	0.00
	(ii) Bracket	No.	0	2,454.00	0.00
31(a)	Supply & Erection of 25 KV Single Pole Isolator 1600 Amp complete with insulators etc.				
	(i) Supply	No.	3	53,220.00	159,660.00
	(ii) Erection	No.	3	3,859.00	11,577.00
31(b)	Supply & erection of 25 KV Double pole isolator 1600A complete with insulator				
	(i) Supply	No.	1	103,978.00	103,978.00
	(ii) Erection	No.	1	3,530.00	3,530.00
31(c)	Interlock for isolator				
	(i) Supply	No.	2	12,177.00	24,354.00
	(ii) Erection	No.	2	1,071.00	2,142.00
31(d)	Supply & erection of earthing heel				
	(i) Supply	No.	2	9,133.00	18,266.00
	(ii) Erection	No.	2	914.00	1,828.00
32	Supply & erection of additional fittings at turnouts, overlaps etc				
	(i) Supply	No.	5	5,321.00	26,605.00
	(ii) Erection	No.	2	395.00	790.00
33	Supply & Erection of Key Box for isolator etc.	No.	1	957.00	957.00
34	Supply & erection of 25 KV Post Insulator with clamps etc.				
	(i) Supply	No.	10	6,000.00	60,000.00
	(ii) Erection	No.	10	629.00	6,290.00
35	Supply & Erection of earh bus of MS flat size 50mm x 6mm				
	(i) Supply	Mtr	200	276.00	55,200.00
	(ii) Erection	Mtr	200	126.00	25,200.00
36	Supply & Erection of 25 KV feeder wire 37/2.25 mm, 150 sqmm copper				
	(i) Supply	Km.	0.00	1,007,179.00	0.00
	(ii) Erection	Mtr	0	132.00	0.00
37(a)	Extra for supply & erection of termination arrangement of Feeder (excluding 9 ton insulator)				
	(i) Supply	No.	0	3,437.00	0.00
	(ii) Erection	No.	0	339.00	0.00
37(b)	Supply & erection of suspension arrangement of feeder				
	(i) Supply	No.	0	1,630.00	0.00
	(ii) Erection	No.	0	184.00	0.00

38	Extra Erection charge under Power block				
a)	Traction masts/TTC/Portal	MT	4	4,651.00	18,604.00
b)	SPS	MT	0.5	14,852.00	7,426.00
c)	Cantilever	No.	5	698.00	3,490.00
d)	OHE	Km.	3.5	19,184.00	67,144.00
e)	Regulating equipment	No.	2	2,558.00	5,116.00
f)	Section insulator	No.	6	1,860.00	11,160.00
g)	Cut in insulator 9 t.	No.	22	349.00	7,678.00
h)	Termination of OHE	No.	0	524.00	0.00
i)	Large jumper wire (105)	Mtr	20	874.00	17,480.00
j)	Small jumper wire	Mtr	60	398.00	23,880.00
k)	Feeder jumper (160)	Mtr	0	706.00	0.00
l)	Large span wire	Mtr	200	38.79	7,758.00
m)	Post insulator	No.	0	1,258.00	0.00
n)	Additional fittings	No	3	790.00	2,370.00
o)	Insulated catenary wire	Mtr	0	94.00	0.00
p)	Pull off arrangement	No	2	940.00	1,880.00
q)	Isolator SP	No	0	4,190.00	0.00
39	Adjustment of OHE after Tower Wagon checking	Span	100	2,504.00	250,400.00
40	Splicing & extension of an overhead equipment under power block	No.	0	4,318.00	0.00
41	Hiring charges of Tower Wagon including crew from Railway	Day	4	72,478.00	289,912.00
42	Supply & Erection of insulated catenary wire (including associated components) underneath FOB/ROB				
	(i) Supply	Mtr	0	2,016.00	0.00
	(ii) Erection	Mtr	0	47.00	0.00
43	Supply & erection of Protective screen				
	(i) Supply	No.	0	42,000.00	0.00
	(ii) Erection	No.	0	2,100.00	0.00
44	Provision of Level crossing height gauge	No.	0	673,738.00	0.00
45	Supply & erection PTFE				
	(i) Supply	No.	0	1,117,450.00	0.00
	(ii) Erection	No.	0	11,175.00	0.00
46(a)	Transfer of OHE from one mast to another under power block	No.	4	5,050.00	20,200.00
46(b)	Dismantling charges under power block				
a)	Cutting of old masts	No.	8	5,320.00	42,560.00
i)	Cutting of Portal/TTC	t.	0	12,882.00	0.00
b)	Dismantling of				
i)	Cantilever	No.	8	647.00	5,176.00
ii)	SPS	t.	0.5	5,703.00	2,851.50
iii	Regulating equipment	No.	0	2,410.00	0.00
iv)	Guy rod	No.	0	1,316.00	0.00
v)	Section Insulator	No.	0	1,861.00	0.00
vi)	Isolator	No.	0	4,190.00	0.00
vii)	Cut in insulator 9 t.	No.	0	2,029.00	0.00
viii)	OHE	Km.	0	29,768.00	0.00
47	Extra for Anti theft charging	LS	LS	30,000.00	30,000.00

48 a)	Supply of Thermal imager	No.	0	512,611.00	0.00
48 b)	Supply of Tree Trimer	No.	0	22,029.00	0.00
48 c)	Supply of OLIVER GHX	No.	0	1,138,201.00	0.00
49	Station Working Rule Diagram	No.	1	9,661.00	9,661.00
50	Anti climbing device on masts to be provided on boundary wall	0	0	0.00	0.00
51	Suply& erection of				
a)	Cantiliever assembly (Tramway)				
	(i) Supply	No.	0	12,100.00	0.00
	(ii) Erection	No.	0	550.00	0.00
b)	Regulating equipment (Tramway)				
	(i) Supply	No.	0	52,800.00	0.00
	(ii) Erection	No.	0	4,400.00	0.00
c)	Section insulator (Tramway)				
	(i) Supply	No.	0	44,000.00	0.00
	(ii) Erection	No.	0	5,500.00	0.00
b)	OHE tramway				
	(i) Supply	No.	0	33,000.00	0.00
	(ii) Erection	No.	0	13,200.00	0.00
52	Supply of Briddle wire	Mtr	0	186.00	0.00
53	Traffic/Power Block charge	LS	LS	0.00	0.00
54a)	Anti corrosive painting on cantilever & mast	No	165	2,000.00	330,000.00
54b)	Prorata cost of Tensile strength test Jig for Insualtor	No	1	217,000.00	217,000.00
55	Manning of Section				
a)	Without gun	Man month	6	10,000.00	60,000.00
b)	With gun	man month	3	15,000.00	45,000.00
56	Supply & Erection of special suspension arrangement under Hopper shed (250 m length)				
	(i) Supply	No.	0	75,000.00	0.00
	(ii) Erection	No.	0	7,500.00	0.00
	Total (A) Rs.				**20,290,764.00**
	Part B				
	Initial spares				350,000.00
	Testing & Measuring equipments				250,000.00
	BD Transport				600,000.00
	Total (B) Rs.				**1,200,000.00**
	Overall total (A+B)				**21,490,764.00**

Annex - 8.3.2

ELECTRICAL ENGINEERING ESTIMATE

FINAL FEASIBILITY STUDY REPORT

DEVELOPMENT OF RAIL-INFRASTRUCTURE FOR 10th UNIT(1X660 MW) AT BARAUNI THERMAL POWER STATION

PROVISION OF OHE FOR FLY-ASH SILO LINE					
Sl No	**Description of the Item**	**Unit**	**Qty**	**Unit Rate (Rs.)**	**Amount (Rs.)**
1	Foot by foot survey & preparation of OHE pegging plan including modification, dismantling works	TKM	3	6,152.00	18,456.00
2	Preparation of Design & Drawing of Overhead equipment including modification, dismantling works	TKM	3	8,134.00	24,402.00
3	Concrete for foundation & Plinth				
	(i) Ordinary soil/Hard soil inlcuding rock required chieseling (Grade M-15)	Cu.m	390	6,395.00	2,494,050.00
	(ii) Reinforced Concrete	Cu.m	2	6,835.00	13,670.00
	(iii) Rocky soil	Cu.m	2	6,596.00	13,192.00
4	Supply and Manual erection of traction mast/other special masts (BFB/RSJ/B-Series) including terminating structures & gantry masts				
	(i) Supply	MT	26	104,737.00	2,723,162.00
	(ii) Erection	MT	26	6,141.00	159,666.00
5	Supply & Erection of TTC/Portal assembly complete				
	(i) Supply	MT	2.4	110,250.00	264,600.00
	(ii) Erection	MT	2.4	6,141.00	14,738.40
6	Supply of				
	(i) Hard drawn grooved copper contact wire (107 Sq.mm)	Km.	3.0	992,250.00	2,976,750.00
	(ii) Cadmium copper catenary wire (65 Sq.mm)	Km.	3.0	661,508.00	1,984,524.00
7	Supply & Erection of fabricated steel works other than mast				
	(i) Supply	MT	3	122,754.00	368,262.00
	(ii) Erection	MT	3	9,671.00	29,013.00
8	Supply & Erection Guy rod assembly				
	(i) Supply	No.	8	9,500.00	76,000.00
	(ii) Erection	No.	8	1,102.00	8,816.00
9	Supply & Erection of single Bracket Assembly without insulators				
	(i) Supply	No.	82	15,222.00	1,248,204.00
	(ii) Erection	No.	82	1,102.00	90,364.00
10	Supply & Erection of Overhead Equipment				
	(i) Supply	Km.	3	33,075.00	99,225.00
	(ii) Erection	Km.	3	19,395.00	58,185.00
11	Supply & Erection of regulating equipment (3 pulley modified type) with normal counter weight assembly for conventional OHE				
	(i) Supply	No.	3	64,655.00	193,965.00
	(ii) Erection	No.	3	2,877.00	8,631.00
12	Supply & Erection of materials for termination of double overhead equipment conductor (Excluding 9 tonne insulator)				
	(i) Supply	No.	8	5,922.00	47,376.00
	(ii) Erection	No.	8	586.00	4,688.00

13	Supply & Erection of materials for termination of single overhead equipment conductor (excluding 9 ton insulator)				
	(i) Supply	No.	4	4,961.00	19,844.00
	(ii) Erection	No.	4	528.00	2,112.00
14	Supply & Erection of anti-creep (excluding 9 tonne insulator and catenary wire with SPS)				
	(i) Supply	No.	2	9,589.00	19,178.00
	(ii) Erection	No.	2	2,186.00	4,372.00
15	Suppy & erection of 9 tonne Insulator (1050 mm suitable for polluted zone)				
	(i) Supply	Each	14	3,325.00	46,550.00
	(ii) Erection	Each	14	1,321.00	18,494.00
16	Supply & erection of copper jumper (160)				
	(i) Supply	Km.	0.1	1,275,000.00	127,500.00
	(ii) Erection	Mtr	100	353.00	35,300.00
17	Supply of small (50 sqmm) Copper jumper (C/F/AT Jumper)	Km.	0.25	446,000.00	111,500.00
18	Erection of copper jumper (50 sqmm)	Mtr	80	199.00	15,920.00
19	Supply & Erection of Structure bond (Wire bond type)				
	(i) Supply	Each	70	574.00	40,180.00
	(ii) Erection	Each	70	162.00	11,340.00
20	Supply & Erection of Transverse and Special Bond (Wire bond type)				
	(i) Supply	Each	20	544.00	10,880.00
	(ii) Erection	Each	20	166.00	3,320.00
21	Supply & Erection of longituditinal bond (Wire bond type)				
	(i) Supply	Each	480	369.00	177,120.00
	(ii) Erection	Each	480	153.00	73,440.00
22	Supply & Erection of single earth electrode with earth pit box cover complete				
	(i) Supply	Each	4	3,996.00	15,984.00
	(ii) Erection	Each	4	1,211.00	4,844.00
23	Supply & Erection of section insulator assembly including core insulator (excluding cut in insulator)				
	(i) Supply	Each	2	48,197.00	96,394.00
	(ii) Erection	Each	2	1,881.00	3,762.00
24	Supply & erection of various types of caution boards	No.	10	1,665.00	16,650.00
25	Supply & erection of number plates (enamelled)				
	(i) Supply	No.	70	670.00	46,900.00
	(ii) Erection	No.	70	33.00	2,310.00
26	Supply & Erection of sectioning Diagram Board (Size 4'x2')	No.	2	7,146.00	14,292.00
27a)	Supply of bracket insulator for Polluted Zone (1050mm)	No.	82	3,300.00	270,600.00
27b)	Supply of Stay Insulator for Polluted Zone (1050mm)	No.	82	3,300.00	270,600.00
28	Supply & Erection of 25 KV Single Pole Isolator 1600 Amp complete with insulators etc.				
	(i) Supply	No.	2	53,220.00	106,440.00
	(ii) Erection	No.	2	3,859.00	7,718.00
29	Supply & erection of additional fittings at turnouts, overlaps etc				
	(i) Supply	No.	6	5,321.00	31,926.00
	(ii) Erection	No.	6	399.00	2,394.00
30	Supply & Erection of Key Box for isolator etc.	No.	1	957.00	957.00

31	Supply & erection of 25 KV Post Insulator with clamps etc.				
	(i) Supply	No.	8	6,000.00	48,000.00
	(ii) Erection	No.	8	629.00	5,032.00
32	Supply & Erection of earh bus of MS flat size 50mm x 6mm				
	(i) Supply	Mtr	100	276.00	27,600.00
	(ii) Erection	Mtr	100	126.00	12,600.00
33	Extra Erection charge under Power block				
a)	Traction masts/TTC/Portal	MT	1	4,651.00	4,651.00
b)	SPS	MT	1.2	14,852.00	17,822.40
c)	Cantilever	No.	10	698.00	6,980.00
d)	OHE	Km.	0.5	19,184.00	9,592.00
e)	Regulating equipment	No.	1	2,558.00	2,558.00
f)	Section insulator	No.	2	1,860.00	3,720.00
g)	Cut in insulator 9 t.	No.	2	349.00	698.00
h)	Termination of OHE	No.	1	524.00	524.00
j)	Small jumper wire	Mtr	15	398.00	5,970.00
j)	Feeder jumper (160)	Mtr	40	706.00	28,240.00
k)	Isolator SP	No	2	4,190.00	8,380.00
33	Adjustment of OHE after Tower Wagon checking	Span	96	2,504.00	240,384.00
34	Splicing & extension of an overhead equipment under power block	No.	1	4,318.00	4,318.00
35	Hiring charges of Tower Wagon including crew from Railway	Day	8	72,478.00	579,824.00
36	Supply & erection PTFE				
	(i) Supply	No.	2	1,117,450.00	2,234,900.00
	(ii) Erection	No.	2	11,175.00	22,350.00
37(a)	Transfer of OHE from one mast to another under power block	No.	4	5,050.00	20,200.00
37(b)	Dismantling charges under power block				
a)	Cutting of old masts	No.	3	5,320.00	15,960.00
i)	Cutting of Portal	t.	0	12,282.00	0.00
b)	Dismantling of				
i)	Cantilever	No.	3	647.00	1,941.00
ii)	SPS	t.	0.05	5,703.00	285.15
38	Station Working Rule Diagram	No.	1	9,661.00	9,661.00
39	Traffic/Power Block charge	LS	LS	0.00	800,000.00
40	Tensile strength test Jig for Insualtor	No	1	217,000.00	217,000.00
41	Manning of Section				
a)	Without gun	Man month	6	10,000.00	60,000.00
b)	With gun	man month	3	15,000.00	45,000.00
	Total (Electrical) Rs.				**18,962,950.95**

ANNEXURE - X

TARIFF CALCULATION

BARAUNI #10 EXPANSION 1x660 MW			
INPUT DATA & ASSUMPTIONS			
ANNEXTURE VII-1			
PARTICULARS	**UNITS**		
PROJECT DETAILS (GENERAL)			
GROSS CAPACITY	MW		660
TOTAL NO OF UNITS			1
CONSTRUCTION PERIOD	quarters		17.33 (52 mos)
TYPE OF COAL/LIGNITE FIRED			COAL
MAIN FUEL			COAL
START-UP FUEL			LDO
BLENDING PROPORTION			
IMPORTED COAL	%		0.0
DOMESTIC COAL	%		100.0
PROJECT CAPITAL STRUCTURE			
TOTAL PROJECT COST	Rs crore		6788.47
DEBT EQUITY RATIO	-		85:15
DEBT	%		85
EQUITY	%		15
DEBT	Rs crore		5770.20
EQUITY	Rs crore		1018.27
SOURCES OF DEBT			
FOREIGN	Rs crore		0
LOCAL	Rs crore		4751.93
TECHNICAL OPERATING PARAMETERS			
AUX. CONSUMPTION OF ELECTRICITY GENERATED	%		5.25
SENT OUT CAPACITY	MW		625.35
PLANT NORMATIVE PLF	%		85
HOURS IN YEAR	-		8760
OPERATIONAL HOURS	-		7446
GROSS ELECTRIC PRODUCTION	MU		4914.36
NET ELECTRIC PRODUCTION	MU		4656
GROSS HEAT RATE	kcal/kWh		2250
GROSS CALORIFIC VALUE OF START-UP FUEL	kcal/litre		10000
GROSS CALORIFIC VALUE OFDOMESTIC COAL	kcal/kg		4450
SPECIFIC CONSUMPTION OF COAL	kg/kWh		0.51
SPECIFIC CONSUMPTION OF LIME STONE	kg/kWh		0
SPECIFIC CONSUMPTION OF SECONDARY FUEL OIL	ml/kWh		2.5
FINANCIAL PARAMETERS			
RATE OF INTEREST (% P.A.)/REPAYMENT PERIOD			
LOCAL	YEAR/ %	25	8.0
MORATORIUM PERIOD AFTER COMMERCIAL OPERATION	YEAR		0.5
DOMESTIC COAL COST	Rs/tonne		3800
FUEL OIL COST	Rs/kl		55000
LIMESTONE COST	Rs/tonne		0
O & M EXPENSES (2021-22)	Rs lakh/MW		11.69
O & M (ESCALATION)	%P.A		6.29
COAL & FUEL COST (ESCALATION)	%P.A		0
DEPRECIATION RATE			SLM (ESACT)
DEPRECIATION ALLOWED AS SHARE OF CAPITAL COST	%		90
FIRST 12 YEARS OF COMMERCIAL OPERATION			
LAND & SITE DEVELOPMENT	%CAPITAL COST		0
CIVIL WORK BUILDING	%CAPITAL COST		3.34
PLANT AND MACHINERY	%CAPITAL COST		5.28
MISC. FIXED ASSETS	%CAPITAL COST		5.28
REMAINING 13 YEARS OF COMMERCIAL OPERATION			
LAND & SITE DEVELOPMENT	%CAPITAL COST		0
CIVIL WORK BUILDING	%CAPITAL COST		3.88
PLANT AND MACHINERY	%CAPITAL COST		1.78
MISC. FIXED ASSETS	%CAPITAL COST		1.78
WORKING CAPITAL REQUIREMENT			
COAL STOCK	MONTHS		2
FUEL OIL STOCK	MONTHS		2
O & M EXPENSES	MONTHS		1
RECEIVABLES	MONTHS		2
MAINTENANCE SPARES (AS SHARE OF O & M)	%		20%
RATE OF INTEREST ON W.C. LOAN	% YEAR		12.5
OTHER FACTORS			
RETURN ON EQUITY	% YEAR		15.5
DISCOUNTING FACTOR	%		12
TAXES & DUTIES			
SERVICE TAX	%		14.5
INCOME TAX RATE	%		33.99

Note: Auxiliary Power Consumption of 5.25 % is in accordance with the CERC guideline year 2014 and used for tariff calculation purpose although the figure is different from the auxiliary Power consumption mentioned in Section 11 of this DPR.

BARAUNI #10 EXPANSION 1x660 MW GENERAL BREAK DOWN OF PROJECT COST		ANNEXTURE VII-2
Sl. Nr.	DESCRIPTION	Rs crore
1	CIVIL WORKS	939.40
2	STEAM GENERATOR ISLAND (incl. erection, testing & commn.)	979.61
3	TURBINE GENERATOR ISLAND (incl. erection, testing & commn.)	527.70
4	BALANCE OF PLANT	992.40
i)	Mechanical	
	Sub Total BOP (Mechanical)	770.00
ii)	Electrical	
	Sub-total BOP (Electrical)	222.40
iii	Control & Instrumentation	0.00
5	RAW WATER INTAKE PUMP HOUSE & INTAKE LINE	60.00
6	RAILWAY SIDING	32.97
7	INITIAL SPARES	178.44
8	TOTAL PLANT AND EQUIPMENT	2771.12
9	TOTAL PLANT AND EQUIPMENT (INCLUDING CIVIL WORK) (sum of item 10 & 3)	3710.52
10	TAXES & DUTIES	575.40
11	ERECTION, TESTING & COMMISSIONING	245.00
12	TOTAL DIRECT & INDIRECT COSTS	4530.92
	sum of item 9,10,11, & 12	
13	OPTION	679.20
	ESP (to meet 30mg/Nm3 emission)	10.00
	SCR System	105.00
	FGD System	485.00
	TAXES & DUTIES for ESP, SCR & FGD	79.20
14	TOTAL EPC PROJECT COST with OPTION (Sum of 12 & 13)	5210.12
15	PHYSICAL CONTINGENCY @ 3% OF TOTAL PROJECT COST	156.30
16	OVERHEAD CONSTRUCTION CHARGES	
	DESIGN, ENGINEERING, CONSTRUCTION SUPERVISION, INSPECTION AND EXPEDITING AT 0.75% OF DIRECT AND INDIRECT COSTS	33.98
	ESTABLISHMENT CHARGES AT 0.25% OF DIRECT AND INDIRECT COSTS	11.33
	AUDIT AND ACCOUNTS AT 0.25% OF DIRECT AND INDIRECT COSTS	11.33
17	TOTAL OVERHEAD CONSTRUCTION CHARGES	56.64
18	TRAINING OF O&M STAFF AND MOBILISATION COST	3.00
19	OTHER COSTS (PREOPERATIVE EXPENSES)	
i	START-UP FUEL & POWER	50.00
ii	LEGAL EXPENSES	2.29
iii	CONSTRUCTION INSURANCE	2.29
iv	Reclamation & Rehabilitation (R&R)	220.00
v	CSR ACTIVITIES	35.00
vi	MARGIN MONEY FOR WORKING CAPITAL	136.71
vii	Accommodation facility	100.00
20	TOTAL OTHER COSTS (sum of 19 i to 19 vii)	546.29
21	PROJECT COST EXCLUDING IDC & FINANCE CHARGES	5972.35
	sum of item 14, 15, 17, 18, & 20	
22	FINANACE CHARGES	5.77
23	PROJECT COST EXCLUDING IDC (sum of item 21 & 22)	5978.13
24	INTEREST DURING CONSTRUCTION	810.34
25	PROJECT COST INCLUDING IDC (sum of item 23 & 24)	6788.47
COST/MW		10.29

BARAUNI #10 EXPANSION 1x660 MW
PAYMENT SCHEDULE (Rs crore)
ANNEXTURE VII-3

	ITEM / QUARTER	Rs crore	Year 1				Year 2				Year 3				Year 4				Year5		TOTAL
			Q1 (3)	Q2 (6)	Q3 (9)	Q4 (12)	Q1 (15)	Q2 (18)	Q3 (21)	Q4 (24)	Q1 (27)	Q2 (30)	Q3 (33)	Q4 (36)	Q1 (39)	Q2 (42)	Q3 (45)	Q4 (48)	Q1 (51)	Q2 (52)	
1	**DIRECT AND INDIRECT COST**																				
	CIVIL WORKS	939.40	0.0	112.7	28.2	37.6	47.0	47.0	65.8	75.2	65.8	47.0	47.0	56.4	47.0	28.2	75.2	0.0	18.8	140.9	**939.4**
	STEAM GENERATOR ISLAND	979.61	68.6	0.0	29.4	49.0	98.0	88.2	78.4	58.8	39.2	29.4	9.8	39.2	19.6	58.8	58.8	58.8	49.0	146.9	**979.6**
	TURBINE GENERATOR ISLAND	527.70	47.5	10.6	0.0	0.0	10.6	0.0	15.8	58.0	73.9	63.3	52.8	42.2	10.6	10.6	42.2	0.0	10.6	79.2	**527.7**
	BALANCE OF PLANT	992.40	89.3	19.8	0.0	9.9	29.8	59.5	69.5	49.6	119.1	59.5	39.7	89.3	19.8	29.8	138.9	0.0	19.8	148.9	**992.4**
	RAW WATER INTAKE SYSTEM	60.00	0.0	7.2	1.8	2.4	3.0	3.0	4.2	4.8	4.2	3.0	3.0	3.6	3.0	1.8	4.8	0.0	1.2	9.0	**60.0**
	COAL TRANSPORTATION SYSTEM	32.97	0.0	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	3.3	3.3	3.3	**33.0**
	INITIAL SPARES	178.44	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	160.6	17.8	**178.4**
	FREIGHT AND INSURANCE	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	TAXES AND DUTIES	575.40	0.0	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	28.8	57.5	57.5	57.5	**575.4**
	ERECTION, TESTING & COMMISSIONING	245.00	7.4	17.2	2.5	2.5	4.9	7.4	17.2	17.2	17.2	19.6	14.7	19.6	14.7	14.7	19.6	4.9	7.4	36.8	**245.0**
	TOTAL DIRECT & INDIRECT COSTS	**4530.92**	**212.7**	**197.9**	**92.2**	**131.7**	**223.6**	**235.4**	**281.2**	**294.0**	**349.7**	**252.2**	**197.4**	**280.7**	**145.1**	**174.2**	**369.9**	**124.5**	**328.2**	**640.3**	**4530.9**
	OPTION (SUBJECT TO ENVIRONMENTAL REQUIREMENT)	**679.20**	**61.1**	**13.6**	**0.0**	**6.8**	**20.4**	**40.8**	**47.5**	**34.0**	**81.5**	**40.8**	**27.2**	**61.1**	**13.6**	**20.4**	**95.1**	**0.0**	**13.6**	**101.9**	**679.2**
	ESP (to meet 30mg/Nm3 emission)	10.00	0.9	0.2	0.0	0.1	0.3	0.6	0.7	0.5	1.2	0.6	0.4	0.9	0.2	0.3	1.4	0.0	0.2	1.5	10.00
	SCR System	105.00	9.5	2.1	0.0	1.1	3.2	6.3	7.4	5.3	12.6	6.3	4.2	9.5	2.1	3.2	14.7	0.0	2.1	15.8	105.00
	FGD System	485.00	43.7	9.7	0.0	4.9	14.6	29.1	34.0	24.3	58.2	29.1	19.4	43.7	9.7	14.6	67.9	0.0	9.7	72.8	485.00
	TAXES & DUTIES for ESP, SCR & FGD	79.20	7.1	1.6	0.0	0.8	2.4	4.8	5.5	4.0	9.5	4.8	3.2	7.1	1.6	2.4	11.1	0.0	1.6	11.9	79.20
2	**PHYSICAL CONTINGENCY @ 3% OF TOTAL WORK COST**	**156.30**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**7.8**	**15.6**	**15.6**	**156.3**
3	**OVERHEAD CONSTRUCTION CHARGES**																				
	DESIGN, ENGINEERING, CONSTRUCTION SUPERVISION, INSPECTION AND EXPEDITING AT 0.75% OF DIRECT AND INDIRECT COSTS	33.98	5.1	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	**34.0**
	ESTABLISHMENT CHARGES AT 0.25% OF DIRECT AND INDIRECT COSTS	11.33	1.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	**11.3**
	AUDIT AND ACCOUNTS AT 0.25% OF DIRECT AND INDIRECT COSTS	11.33	1.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	**11.3**
	TOTAL OVERHEAD CONSTRUCTION CHARGES	**56.64**	**8.5**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**2.8**	**56.6**
4	**TRAINING OF O&M STAFF**	**3.00**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.8**	**0.8**	**0.8**	**0.8**	**3.0**
5	**OTHER COSTS (PRE-OPERATIVE EXPENSES)**																				
	START-UP FUEL	50.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5	12.5	12.5	12.5	**50.0**
	LEGAL EXPENSES	2.29	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	**2.3**
	CONSTRUCTION INSURANCE	2.29	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	**2.3**
	R&R	220.00	22.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0	22.0	**220.0**
	OTHERS	35.00	3.5	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	3.5	**35.0**
	MARGIN MONEY FOR WORKING CAPITAL	136.71	13.7	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	6.8	13.7	**136.7**
	Accommodation	100.00	10.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	10.0	**100.0**
	TOTAL OTHER COSTS	**546.29**	**49.6**	**24.8**	**24.8**	**24.8**	**24.8**	**24.8**	**24.8**	**24.8**	**24.8**	**24.8**	**24.8**	**24.8**	**24.8**	**24.8**	**37.3**	**37.3**	**37.3**	**62.1**	**546.3**
6	**PROJECT COST EXCLUDING IDC & FINANCE CHARGES**	**5972.35**	**339.8**	**246.9**	**127.7**	**174.0**	**279.4**	**311.7**	**364.2**	**363.4**	**466.6**	**328.5**	**260.0**	**377.3**	**194.1**	**230.0**	**513.7**	**173.2**	**398.3**	**823.5**	**5972.4**
7	**FINANACE CHARGES**	**5.77**	**11.5**																	**-5.8**	**5.8**
8	**PROJECT COST INCLUDING FINANCE CHARGES**	**5978.13**	**351.3**	**246.9**	**127.7**	**174.0**	**279.4**	**311.7**	**364.2**	**363.4**	**466.6**	**328.5**	**260.0**	**377.3**	**194.1**	**230.0**	**513.7**	**173.2**	**398.3**	**817.7**	**5978.1**
9	**INTEREST DURING CONSTRUCTION**	**810.3**	**3.0**	**8.1**	**11.4**	**14.2**	**18.3**	**23.6**	**29.8**	**36.5**	**44.1**	**51.7**	**57.5**	**63.9**	**69.9**	**74.7**	**82.3**	**89.5**	**95.9**	**35.9**	**810.3**
10	**PROJECT COST INCLUDING IDC**	**6788.47**	**354.3**	**255.1**	**139.1**	**188.2**	**297.7**	**335.3**	**394.0**	**399.9**	**510.8**	**380.1**	**317.5**	**441.2**	**264.0**	**304.7**	**596.0**	**262.7**	**494.1**	**853.7**	**6788.5**

BARAUNI #10 EXPANSION 1x660 MW
CALCULATION OF IDC
ANNEXTURE VII-4

	SOURCES OF FUNDS (Rs crore)	TOTAL COST	Year 1				Year 2				Year 3				Year 4				Year5		TOTAL
			Q1 (3)	Q2 (6)	Q3 (9)	Q4 (12)	Q1 (15)	Q2 (18)	Q3 (21)	Q4 (24)	Q1 (27)	Q2 (30)	Q3 (33)	Q4 (36)	Q1 (39)	Q2 (42)	Q3 (45)	Q4 (48)	Q1 (51)	Q2 (52)	
	TOTAL REQUIREMENTS OF FUNDS	**5978.13**	**351.3**	**246.9**	**127.7**	**174.0**	**279.4**	**311.7**	**364.2**	**363.4**	**466.6**	**328.5**	**260.0**	**377.3**	**194.1**	**230.0**	**513.7**	**173.2**	**398.3**	**817.7**	**5978.1**
A	**FOREIGN LOAN**																				
	DRAWNDOWN	**0.00**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**
	CONSTRUCTION INTEREST		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**
	BALANCE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.0**
B	**LOCAL LOAN**	**5081.41**																			
	DRAWNDOWN		298.6	209.9	108.5	147.9	237.5	264.9	309.6	308.9	396.6	279.2	221.0	320.7	165.0	195.5	436.6	147.2	338.5	695.1	**5081.4**
	CONSTRUCTION INTEREST		2.5	6.9	9.7	12.1	15.6	20.1	25.3	31.0	37.5	43.9	48.9	54.3	59.4	63.5	69.9	76.1	81.5	30.6	**688.8**
	BALANCE		301.2	518.0	636.3	796.2	1049.3	1334.3	1669.2	2009.1	2443.2	2766.3	3036.2	3411.2	3635.7	3894.7	4401.2	4624.5	5044.6	5770.2	**5770.2**
	SPLITTING OF IDC BETWEEN LOAN AND EQUITY																				
	LOAN		2.2	5.9	8.3	10.3	13.2	17.1	21.5	26.4	31.9	37.3	41.6	46.2	50.5	53.9	59.4	64.7	69.3	26.0	**585.5**
	EQUITY		0.4	1.0	1.5	1.8	2.3	3.0	3.8	4.7	5.6	6.6	7.3	8.2	8.9	9.5	10.5	11.4	12.2	4.6	**103.3**
C	**EQUITY**																				
	DRAWNDOWN	**896.72**	52.7	37.0	19.2	26.1	41.9	46.7	54.6	54.5	70.0	49.3	39.0	56.6	29.1	34.5	77.1	26.0	59.7	122.7	**896.7**
	CONSTRUCTION INTEREST		0.4	1.2	1.7	2.1	2.7	3.5	4.5	5.5	6.6	7.7	8.6	9.6	10.5	11.2	12.3	13.4	14.4	5.4	**121.6**
	BALANCE		53.1	38.3	20.9	28.2	44.7	50.3	59.1	60.0	76.6	57.0	47.6	66.2	39.6	45.7	89.4	39.4	74.1	128.1	**1018.3**
			351.3	246.9	127.7	174.0	279.4	311.7	364.2	363.4	466.6	328.5	260.0	377.3	194.1	230.0	513.7	173.2	398.3	817.7	5978.1
D	**TOTAL IDC**	**810.34**																			
	FOREIGN LOAN		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
	LOCAL LOAN		2.5	6.9	9.7	12.1	15.6	20.1	25.3	31.0	37.5	43.9	48.9	54.3	59.4	63.5	69.9	76.1	81.5	30.6	**688.8**
	EQUITY		0.4	1.2	1.7	2.1	2.7	3.5	4.5	5.5	6.6	7.7	8.6	9.6	10.5	11.2	12.3	13.4	14.4	5.4	**121.6**
	TOTAL		**3.0**	**8.1**	**11.4**	**14.2**	**18.3**	**23.6**	**29.8**	**36.5**	**44.1**	**51.7**	**57.5**	**63.9**	**69.9**	**74.7**	**82.3**	**89.5**	**95.9**	**35.9**	**810.3**
	IDC %		0.37	1.00	1.41	1.75	2.26	2.92	3.68	4.50	5.45	6.37	7.10	7.89	8.62	9.21	10.15	11.04	11.83	4.44	100.00
E	**TOTAL LOAN WITH IDC**	**5770.20**																			

KYUSHU ELECTRIC POWER CO.,INC.

BARAUNI #10 EXPANSION 1x660 MW

DEPRECIATION (Rs crore)

ANNEXTURE VII-5

YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
CALCULATION OF DEPRECIATION					**BOOK VALUE FOR**																				
1. METHOD	STRAIGHT LINE METHOD				COST																				
2. PERIOD	PLANT LIFE 25 YEARS				INCL.																				
3. RATE OF DEPRECIATION (% P.A.)	13 YEARS	12 YEARS			CONTIN-			TOTAL																	
CIVIL WORK BUILDING	3.34	3.88	90		939.4			**939.4**																	
PLANT AND MACHINERY	5.28	1.78	90		2771.1			**2771.1**																	
MISC. FIXED ASSETS	5.28	1.78	90		3077.9			**3077.9**																	
4. CAPITAL COST EXCLUDING LAND (Rs crore)	6788.47		TOTAL EXCL. LAND		**6788.5**			**6788.5**																	
STRAIGHT LINE DEPRECIATION (ESA)																									
CIVIL WORK BUILDING	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4	31.4	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5	36.5
PLANT AND MACHINERY	146.3	146.3	146.3	146.3	146.3	146.3	146.3	146.3	146.3	146.3	146.3	146.3	146.3	49.3	49.3	49.3	49.3	49.3	49.3	49.3	49.3	49.3	49.3	49.3	49.3
MISC. FIXED ASSETS	162.5	162.5	162.5	162.5	162.5	162.5	162.5	162.5	162.5	162.5	162.5	162.5	162.5	54.8	54.8	54.8	54.8	54.8	54.8	54.8	54.8	54.8	54.8	54.8	54.8
TOTAL	**340.2**	**340.2**	**340.2**	**340.2**	**340.2**	**340.2**	**340.2**	**340.2**	**340.2**	**340.2**	**340.2**	**340.2**	**340.2**	**140.6**	**140.6**	**140.6**	**140.6**	**140.6**	**140.6**	**140.6**	**140.6**	**140.6**	**140.6**	**140.6**	**140.6**

BARAUNI #10 EXPANSION 1x660 MW

CALCULATION OF WORKING CAPITAL

ANNEXTURE VII-6

YEAR	MON-THS	ESCALA-TION (%)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1. COAL STOCK	2	0	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4	157.4
2. FUEL OIL STOCK	2	0	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3	11.3
3. O&M EXPENSES (LOCAL)	1	6.29	6.4	6.8	7.3	7.7	8.2	8.7	9.3	9.9	10.5	11.1	11.8	12.6	13.4	14.2	15.1	16.1	17.1	18.1	19.3	20.5	21.8	23.1	24.6	26.2	27.8
4. STORES AND SPARES (Percentage of O&M)	0.2		15.4	16.4	17.4	18.5	19.7	20.9	22.2	23.6	25.1	26.7	28.4	30.2	32.1	34.1	36.2	38.5	40.9	43.5	46.3	49.2	52.3	55.6	59.0	62.8	66.7
5. RECEIVABLES	2		356.4	354.7	352.4	350.3	348.2	346.1	344.1	342.2	340.4	338.6	344.0	342.5	310.7	275.2	273.7	272.4	273.9	276.1	278.5	281.0	283.7	286.5	289.6	292.8	296.2
TOTAL			**546.9**	**546.5**	**545.8**	**545.1**	**544.7**	**544.4**	**544.3**	**544.3**	**544.6**	**545.1**	**552.9**	**553.9**	**524.8**	**492.2**	**493.6**	**495.6**	**500.5**	**506.4**	**512.6**	**519.3**	**526.4**	**533.9**	**541.9**	**550.4**	**559.4**
1. INCREASE/DECREASE IN W.C.			546.9	0.3	1.1	1.7	2.2	2.5	2.6	2.5	2.2	1.8	6.0	7.0	22.0	54.7	53.2	51.2	46.4	40.5	34.2	27.6	20.5	13.0	5.0	3.5	12.5
2. MARGIN MONEY FOR WORKING CAPITAL			136.7	136.6	136.4	136.3	136.2	136.1	136.1	136.1	136.2	136.3	138.2	138.5	131.2	123.0	123.4	123.9	125.1	126.6	128.2	129.8	131.6	133.5	135.5	137.6	139.8
2a. WORKING CAPITAL REQUIREMENT TO BE FUNDED			410.1	409.9	409.3	408.9	408.5	408.3	408.2	408.3	408.5	408.8	414.7	415.4	393.6	369.1	370.2	371.7	375.4	379.8	384.5	389.5	394.8	400.4	406.4	412.8	419.5
3. WC FUNDED BY EQUITY			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4. WC FUNDED BY LOAN			410.1	409.9	409.3	408.9	408.5	408.3	408.2	408.3	408.5	408.8	414.7	415.4	393.6	369.1	370.2	371.7	375.4	379.8	384.5	389.5	394.8	400.4	406.4	412.8	419.5
5. INTEREST ACCRUED ON WC LOAN			**51.3**	**51.2**	**51.2**	**51.1**	**51.1**	**51.0**	**51.0**	**51.0**	**51.1**	**51.1**	**51.8**	**51.9**	**49.2**	**46.1**	**46.3**	**46.5**	**46.9**	**47.5**	**48.1**	**48.7**	**49.3**	**50.1**	**50.8**	**51.6**	**52.4**
6. INTEREST ON WC (Rs/kWh GENERATED)			**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**

KYUSHU ELECTRIC POWER CO.,INC.

BARAUNI #10 EXPANSION 1x660 MW																									
LOAN AMORTIZATION (Rs crore)																									
LOAN (LOCAL)																									
ANNEXTURE VII-7																									
LOAN AMOUNT	**5770.2**																								
QUARTERLY PAYMENT	**57.7**																								
TERMS OF PAYMENT (YEARS/FREQUENCY)	**25**	**QUARTERLY**																							
GRACE/MORATORIUM (YEARS)	**0.5**																								
ANNUAL INTEREST RATE (%)	**8.0**																								
YEAR	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
BEGINNING OF I QUARTER BALANCE	5770.2	5654.8	5424.0	5193.2	4962.4	4731.6	4500.8	4269.9	4039.1	3808.3	3577.5	3346.7	3115.9	2885.1	2654.3	2423.5	2192.7	1961.9	1731.1	1500.3	1269.4	1038.6	807.8	577.0	346.2	115.4
FIRST QUARTER INTEREST	115.4	113.1	108.5	103.9	99.2	94.6	90.0	85.4	80.8	76.2	71.6	66.9	62.3	57.7	53.1	48.5	43.9	39.2	34.6	30.0	25.4	20.8	16.2	11.5	6.9	2.3
FIRST QUARTER PRINCIPAL	0.0	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7
END OF FIRST QUARTER BALANCE	5770.2	5597.1	5366.3	5135.5	4904.7	4673.9	4443.1	4212.2	3981.4	3750.6	3519.8	3289.0	3058.2	2827.4	2596.6	2365.8	2135.0	1904.2	1673.4	1442.5	1211.7	980.9	750.1	519.3	288.5	57.7
FIRST QUARTER DEBT SERVICE	115.4	170.8	166.2	161.6	156.9	152.3	147.7	143.1	138.5	133.9	129.3	124.6	120.0	115.4	110.8	106.2	101.6	96.9	92.3	87.7	83.1	78.5	73.9	69.2	64.6	60.0
BEGINNING OF II QUARTER BALANCE	5770.2	5597.1	5366.3	5135.5	4904.7	4673.9	4443.1	4212.2	3981.4	3750.6	3519.8	3289.0	3058.2	2827.4	2596.6	2365.8	2135.0	1904.2	1673.4	1442.5	1211.7	980.9	750.1	519.3	288.5	57.7
SECOND QUARTER INTEREST	115.4	111.9	107.3	102.7	98.1	93.5	88.9	84.2	79.6	75.0	70.4	65.8	61.2	56.5	51.9	47.3	42.7	38.1	33.5	28.9	24.2	19.6	15.0	10.4	5.8	1.2
SECOND QUARTER PRINCIPAL	0.0	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7
END OF SECOND QUARTER BALANCE	5770.2	5539.4	5308.6	5077.8	4847.0	4616.2	4385.3	4154.5	3923.7	3692.9	3462.1	3231.3	3000.5	2769.7	2538.9	2308.1	2077.3	1846.5	1615.7	1384.8	1154.0	923.2	692.4	461.6	230.8	0.0
SECOND QUARTER DEBT SERVICE	115.4	169.6	165.0	160.4	155.8	151.2	146.6	141.9	137.3	132.7	128.1	123.5	118.9	114.2	109.6	105.0	100.4	95.8	91.2	86.6	81.9	77.3	72.7	68.1	63.5	58.9
BEGINNING OF III QUARTER BALANCE	5770.2	5539.4	5308.6	5077.8	4847.0	4616.2	4385.3	4154.5	3923.7	3692.9	3462.1	3231.3	3000.5	2769.7	2538.9	2308.1	2077.3	1846.5	1615.7	1384.8	1154.0	923.2	692.4	461.6	230.8	0.0
THIRD QUARTER INTEREST	115.4	110.8	106.2	101.6	96.9	92.3	87.7	83.1	78.5	73.9	69.2	64.6	60.0	55.4	50.8	46.2	41.5	36.9	32.3	27.7	23.1	18.5	13.8	9.2	4.6	0.0
THIRD QUARTER PRINCIPAL	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	
END OF THIRD QUARTER BALANCE	5712.5	5481.7	5250.9	5020.1	4789.3	4558.5	4327.6	4096.8	3866.0	3635.2	3404.4	3173.6	2942.8	2712.0	2481.2	2250.4	2019.6	1788.8	1558.0	1327.1	1096.3	865.5	634.7	403.9	173.1	0.0
THIRD QUARTER DEBT SERVICE	173.1	168.5	163.9	159.3	154.6	150.0	145.4	140.8	136.2	131.6	126.9	122.3	117.7	113.1	108.5	103.9	99.2	94.6	90.0	85.4	80.8	76.2	71.6	66.9	62.3	0.0
BEGINNING OF IV QUARTER BALANCE	5712.5	5481.7	5250.9	5020.1	4789.3	4558.5	4327.6	4096.8	3866.0	3635.2	3404.4	3173.6	2942.8	2712.0	2481.2	2250.4	2019.6	1788.8	1558.0	1327.1	1096.3	865.5	634.7	403.9	173.1	0.0
FOURTH QUARTER INTEREST	114.2	109.6	105.0	100.4	95.8	91.2	86.6	81.9	77.3	72.7	68.1	63.5	58.9	54.2	49.6	45.0	40.4	35.8	31.2	26.5	21.9	17.3	12.7	8.1	3.5	0.0
FOURTH QUARTER PRINCIPAL	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	57.7	
END OF FOURTH QUARTER BALANCE	5654.8	5424.0	5193.2	4962.4	4731.6	4500.8	4269.9	4039.1	3808.3	3577.5	3346.7	3115.9	2885.1	2654.3	2423.5	2192.7	1961.9	1731.1	1500.3	1269.4	1038.6	807.8	577.0	346.2	115.4	0.0
FOURTH QUARTER DEBT SERVICE	172.0	167.3	162.7	158.1	153.5	148.9	144.3	139.6	135.0	130.4	125.8	121.2	116.6	111.9	107.3	102.7	98.1	93.5	88.9	84.2	79.6	75.0	70.4	65.8	61.2	0.0
TOTAL ANNUAL INTEREST	**460.5**	**445.5**	**427.0**	**408.5**	**390.1**	**371.6**	**353.1**	**334.7**	**316.2**	**297.7**	**279.3**	**260.8**	**242.3**	**223.9**	**205.4**	**187.0**	**168.5**	**150.0**	**131.6**	**113.1**	**94.6**	**76.2**	**57.7**	**39.2**	**20.8**	**3.5**
TOTAL ANNUAL PRINCIPAL	**115.4**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**230.8**	**115.4**
TOTAL DEBT SERVICE	**575.9**	**676.3**	**657.8**	**639.3**	**620.9**	**602.4**	**583.9**	**565.5**	**547.0**	**528.5**	**510.1**	**491.6**	**473.2**	**454.7**	**436.2**	**417.8**	**399.3**	**380.8**	**362.4**	**343.9**	**325.4**	**307.0**	**288.5**	**270.0**	**251.6**	**118.9**

KYUSHU ELECTRIC POWER CO.,INC.

BARAUNI #10 EXPANSION 1x660 MW CALCULATION OF FUEL COST

ANNEXTURE VII-8

A. FUEL PRICING		
COAL COST	3800	Rs/t
FUEL OIL COST	55000	Rs/kl
LIMESTONE COST	0	Rs/t
B. GENERATION		
GROSS CAPACITY	660.0	MW
TOTAL AUXILLIARY LOAD	34.7	MW
NET DELIVERED CAPACITY	625.4	MW
PLANT LOAD FACTOR	85.0	%

YEAR		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
PLANT LOAD FACTOR	%	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
HOURS IN YEAR		8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760	8760
OPERATIONAL HOURS		7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446	7446
GROSS CAPACITY	MW	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660	660
NET CAPACITY	MW	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625	625
GROSS ELECTRIC PRODUCTION	MU	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914
NET ELECTRIC PRODUCTION	MU	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656
SPECIFIC CONSUMPTION OF COAL	kg/kWh	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51
SPECIFIC CONSUMPTION OF FUEL	ml/kWh	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
SPECIFIC CONSUMPTION OF LIMESTONE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COAL COST	Rs/t	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800	3800
SECONDARY FUEL OIL COST	Rs/kl	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000	55000
LIMESTONE COST		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VARIABLE GROSS FUEL COST																										
COAL	Rs/kWh	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03
SECONDARY FUEL OIL	Rs/kWh	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
TOTAL		**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**	**2.17**
ANNUAL VARIABLE FUEL COST (Rs crore)																										
COAL		944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22
SECONDARY FUEL OIL		67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57
LIMESTONE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL		**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**

BARAUNI #10 EXPANSION 1x660 MW
TOTAL ENERGY CHARGES (Rs crore)

Annexture VII-9

YEAR		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
GROSS ELECTRIC PRODUCTION	MU	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36	4914.36
NET ELECTRIC PRODUCTION	MU	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36	4656.36
A. ENERGY CHARGES (Rs crore)																										
FUEL COST																										
COAL COST		944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22	944.22
SECONDARY FUEL OIL COST		67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57	67.57
LIMESTONE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL ENERGY CHARGES (Rs crore)		**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**	**1011.79**
B. CAPACITY COSTS (Rs crore)																										
FIXED O&M (INCLUDING INSURANCE)		77.15	82.00	87.16	92.64	98.47	104.66	111.25	118.24	125.68	133.59	141.99	150.92	160.41	170.50	181.23	192.63	204.74	217.62	231.31	245.86	261.32	277.76	295.23	313.80	333.54
DEPRECIATION		340.21	340.21	340.21	340.21	340.21	340.21	340.21	340.21	340.21	340.21	340.21	340.21	340.21	140.58	140.58	140.58	140.58	140.58	140.58	140.58	140.58	140.58	140.58	140.58	140.58
ADVANCE AGAINST DEPRECIATION		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INTT. ON WC (LOCAL)		51.27	51.24	51.17	51.11	51.06	51.04	51.03	51.03	51.06	51.10	51.83	51.92	49.20	46.14	46.28	46.46	46.92	47.47	48.06	48.68	49.35	50.05	50.80	51.60	52.44
INTT. ON DEBT (LOCAL)		460.46	445.46	426.99	408.53	390.07	371.60	353.14	334.67	316.21	297.74	279.28	260.81	63.71	43.32	22.94	3.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INTT. ON DEBT (FOREIGN - EXIM)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
INTT. ON DEBT (FCL)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RETURN ON EQUITY		157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83	157.83
CORPORATE INCOME TAX		39.48	39.48	39.48	39.48	39.48	39.48	39.48	39.48	39.48	39.48	81.27	81.27	81.27	81.27	81.27	81.27	81.27	81.27	81.27	81.27	81.27	81.27	81.27	81.27	81.27
TOTAL FIXED CAPACITY CHARGE (Rs crore)		**1126.39**	**1116.21**	**1102.83**	**1089.79**	**1077.11**	**1064.81**	**1052.92**	**1041.46**	**1030.46**	**1019.95**	**1052.41**	**1042.97**	**852.63**	**639.65**	**630.13**	**622.59**	**631.35**	**644.78**	**659.05**	**674.22**	**690.35**	**707.49**	**725.71**	**745.08**	**765.66**
C. TOTAL CHARGES (Rs crore)		**2138.19**	**2128.01**	**2114.63**	**2101.59**	**2088.91**	**2076.61**	**2064.71**	**2053.25**	**2042.25**	**2031.74**	**2064.20**	**2054.76**	**1864.43**	**1651.44**	**1641.92**	**1634.38**	**1643.14**	**1656.57**	**1670.84**	**1686.02**	**1702.14**	**1719.29**	**1737.51**	**1756.87**	**1777.46**

BARAUNI #10 EXPANSION 1x660 MW TARIFF CALCULATION (Rs/kWh)

ANNEXTURE VII-10

YEAR		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
GROSS ELECTRIC PRODUCTION	MU	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914	4914
NET ELECTRIC PRODUCTION	MU	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656	4656
A. ENERGY CHARGE (Rs/kWh GENERATED)																										
FUEL COST																										
COAL COST		1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92	1.92
FUEL OIL COST		0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14
TOTAL 'A' ENERGY COST (Rs/kWh GENERATED)		2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06	2.06
TOTAL 'A' ENERGY COST (Rs/kWh) AT AUX LOAD		2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17
TOTAL 'A' ENERGY COST (Rs crore)		1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012	1012
B. CAPACITY CHARGE (Rs/kWh)																										
FIXED O&M (INCLUDING INSURANCE)		0.16	0.17	0.18	0.19	0.20	0.21	0.23	0.24	0.26	0.27	0.29	0.31	0.33	0.35	0.37	0.39	0.42	0.44	0.47	0.50	0.53	0.57	0.60	0.64	0.68
DEPRECIATION		0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29	0.29
INTT. ON WC (LOCAL)		0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11	0.11	0.10	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.11
INTT. ON DEBT (LOCAL)		0.94	0.91	0.87	0.83	0.79	0.76	0.72	0.68	0.64	0.61	0.57	0.53	0.13	0.09	0.05	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RETURN ON EQUITY		0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
CORPORATE INCOME TAX		0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
TOTAL 'B' FIXED CAPACITY CHARGE (Rs/kWh GENERATED)		2.29	2.27	2.24	2.22	2.19	2.17	2.14	2.12	2.10	2.08	2.14	2.12	1.73	1.30	1.28	1.27	1.28	1.31	1.34	1.37	1.40	1.44	1.48	1.52	1.56
TOTAL 'B' FIXED CAPACITY CHARGE (Rs/kWh AT AUX LOAD)		2.42	2.40	2.37	2.34	2.31	2.29	2.26	2.24	2.21	2.19	2.26	2.24	1.83	1.37	1.35	1.34	1.36	1.38	1.42	1.45	1.48	1.52	1.56	1.60	1.64
TOTAL 'B' FIXED CAPACITY CHARGES (Rs crore)		1126	1116	1103	1090	1077	1065	1053	1041	1030	1020	1052	1043	853	640	630	623	631	645	659	674	690	707	726	745	766
C. TOTAL TARIFF (Rs/kWh) (A+B)		4.59	4.57	4.54	4.51	4.49	4.46	4.43	4.41	4.39	4.36	4.43	4.41	4.00	3.55	3.53	3.51	3.53	3.56	3.59	3.62	3.66	3.69	3.73	3.77	3.82
D. AVERAGE PRE TAX TARIFF (Rs/kWh) FOR BLOCK OF FIVE YEARS				**4.54**					**4.41**					**3.98**					**3.56**					**3.73**		

BARAUNI #10 EXPANSION 1x660 MW CALCULATION OF LEVELISED TARIFF

ANNEXTURE VII-11

YEAR		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
YEAR-WISE TARIFF																										
VARIABLE COST (Rs/kWh)		2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17	2.17
FIXED COST (Rs/kWh)		2.42	2.40	2.37	2.34	2.31	2.29	2.26	2.24	2.21	2.19	2.26	2.24	1.83	1.37	1.35	1.34	1.36	1.38	1.42	1.45	1.48	1.52	1.56	1.60	1.64
TOTAL		4.59	4.57	4.54	4.51	4.49	4.46	4.43	4.41	4.39	4.36	4.43	4.41	4.00	3.55	3.53	3.51	3.53	3.56	3.59	3.62	3.66	3.69	3.73	3.77	3.82
DISCOUNTING FACTOR AT 12%		1.00	0.89	0.80	0.71	0.64	0.57	0.51	0.45	0.40	0.36	0.32	0.29	0.26	0.23	0.20	0.18	0.16	0.15	0.13	0.12	0.10	0.09	0.08	0.07	0.07
DISCOUNTED FIXED COST		2.42	2.14	1.89	1.67	1.47	1.30	1.15	1.01	0.89	0.79	0.73	0.64	0.47	0.31	0.28	0.24	0.22	0.20	0.18	0.17	0.15	0.14	0.13	0.12	0.11
DISCOUNTED VARIABLE COST		2.17	1.94	1.73	1.55	1.38	1.23	1.10	0.98	0.88	0.78	0.70	0.62	0.56	0.50	0.44	0.40	0.35	0.32	0.28	0.25	0.23	0.20	0.18	0.16	0.14
LEVELISED FIXED TARIFF Rs/kWh		**2.14**																								
LEVELISED VARIABLE TARIFF Rs/kWh		**2.17**																								
TOTAL LEVELISED TARIFF Rs/kWh		**4.32**																								