

**6 X 600 MW Coal Based Thermal Power Plant,  
M/s. KSK Mahanadi Power Company Limited,  
Akaltara, Chhattisgarh.**

**Technical Study Report**

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**Technical Consultant**



Project No.: LTSL- HC21051000

January 4, 2021 || REV: R2

**L&T – Sargent & Lundy Ltd.**

**CIN No. U74210MH1995PLC088099**

<b>Technical Study Report</b>	<b>6 X 600 MW Thermal Power Plant, M/s. KMPCL at Akaltara, Chhattisgarh.</b>	 <b>L&amp;T-S&amp;L</b> <b>L&amp;T – Sargent &amp; Lundy Limited</b>
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### **REVISION SHEET:**

R2	AS/GS/PG/ KKD	RAS/RNP	RK	04/01/2021	Final Report
R1	AS/GS/PG/ KKD	RAS/RNP	RK	16/12/2020	Final Report
R0	AS/GS/PG/ KKD	RAS/RNP	RK	03/11/2020	Final Report
P0	AS/GS/PG/ KKD	RAS/RNP	RK	26/10/2020	Draft Report
<b>Rev.</b>	<b>Prepared By</b>	<b>Reviewed By</b>	<b>Approved By</b>	<b>Approved Date</b>	<b>Remark</b>

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## ACRONYM

\$	Dollar	LHS	Left Hand Side
(g)	gauge	LOP	Lube Oil Pump
μS/cm	Micro Siemens per Centimeter	LOTO	Lock-Out Tag-Out
A	Absolute	LP	Low Pressure
AAQMS	Ambient Air Quality Monitoring System	LRSB	Long Retractable Soot Blower
AC	Alternating Current	LTA	Long Term Access
ACQ	Annual Contracted Quantity	LTSH	Low Temperature Super Heater
ACSR	Aluminum Conductor, Steel Reinforced	LV	Low Voltage
ACW	Auxiliary Water Cooling	m	meter
ADF	Ash Disposal Facility	m <sup>3</sup>	Cubic meter
AGC	Automatic Generation Control	m/s	meter per second
AHP	Ash Handling Plant	mbar	mili bar
AIS	Air Insulated Substations	MCC	Motor Control Center
AI	Alumunium	MCL	Mahanadi Coalfields Limited
ALD	Automatic Load Dropping	MCM	Million Cubic Meter
AMC	Annual Maintenance Contract	MCR	Maximum Continuous Rating
ANSI	American National Standards Institute	MFT	Master Fuel Trip
AOP	Auxiliary Oil Pump	mg	miligram
APC	Auxiliary Power Consumption	mg/l	miligram per litre
APCPDCL	Central Power Distribution Company of Andhra Pradesh Limited	mm	mili-meter
APEPDCL	Eastern Power Distribution Company of Andhra Pradesh Limited	Mn	Manganese
APNPDCL	Northern Power Distribution Company of Andhra Pradesh Limited	MPa	Mega Pascal
APSPDCL	Southern Power Distribution Company of Andhra Pradesh Limited	MoEF	Ministry of Environment and Forest
APTRANSCO	Transmission Corporation of Andhra Pradesh	MoEFCC	Ministry of Environment Forest & Climate Change
APH	Air Pre-Heater	MOP	Main Oil Pump
AQCS	Air Quality Control System	MOT	Main Oil Tank
ARB	As Received Basis	MOU	Memorandum Of Understanding
ARC	Annual Rate Contract	MS	Main Steam
ASME	American Society of Mechanical Engineers	MSL	Mean Sea Level

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ASTM	American Society for Testing and Materials	MSV	Main Steam stop Valve
ATRS	Automatic Turbine Run-Up System	MT	Metric Tonne
ATT	Automatic Turbine Tester	MTPA	Million Tonnes Per Annum
AVR	Automatic Voltage Regulator	MU	Milion Units
AWRS	Ash Water Recovery System	MV	Medium Voltage
BAH	Bottom Ash Hopper	MVA	Mega Volt Ampere
BFP	Boiler Feed Pump	MVAR	Mega Volt Ampere Reactive
BG	Bank Guarantee	MW	Mega Watt
BIL	Basic Insulation Level	NAS	National Aerospace Standard
BMCR	Boiler Maximum Continuous Rating	NCLT	National Company Law Tribunal
BMS	Burner Management System	NDE	Non Drive End
BOP	Balance of Plant	NE	North East
BPTA	Bulk Power Transmission Agreement	NEMA	National Electrical Manufacturers Association
BRL	Boiler Rated Load	NFPA	National Fire Protection Association
BTL	Boiler Tube Leakage	NH	National Highway
BTG	Boiler-Turbine-Generator	NHAI	National Highway Authority of India
C&I	Control and Instrumentation	Ni	Nickel
°C	Degree Celsius	NOx	Nitrogen Oxides
Ca	Calcium	NRV	Non Return Valve
CCR	Central control Room	NSR	Nearest Sensitive Receptor
CCW	Closed cycle Cooling Water	NTP	Notice to Proceed
CCTV	Closed Circuit Television	WRD	Water Resource Department
Cd	Cadmium	O&M	Operation and Maintenance
CEA	Central Electricity Authority	O <sub>2</sub>	Oxygen
CECB	Chhattisgarh Environment Conservation Board	OCM	Open Cast Mine
CEMS	Continuous Emission Monitoring System	OE	Owner's Engineer
CEP	Condensate Extraction Pump	OEM	Original Equipment Manufacturer
CERC	Central Electricity Regulatory Commission	OFAF	Oil Forced Air Forced
CFPP	Coal Fired Power Plant	OHC	Occupational Health Center
		ONAF	Oil Natural Air Forced
CIF	Cost, Insurance and Freight	OS	Operating System
CIL	Coal India Limited	OSHA	Occupational Safety and Health Administration
CIRP	Corporate Insolvency Resolution Process	OVEF	Oil Vapour Extraction Fan
CHP	Coal Handling Plant	OWTS	Oily Water Treatment System




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cm/s	centimeter per second	PA	Primary Air
CO	Carbon Monoxide	PAF	Plant Availability factor
COC	Cycles of Concentration	Pb	Lead
COC	Certificate of Compliance	PC	Pulverized Coal
COD	Commercial Operation Date	PG	Performance Guarantee
	Chemical Oxygen Demand	PGCIL	Power Grid Corporation of India Limited
COH	Capital Over Hauling	PGT	Performance Guarantee Test
COLTCS	Condenser on Load Tube Cleaning System	PHE	Plate Heat Exchanger
CPS	Condensate Polisher System	PLC	Programmable Logic Controller
CPU	Condensate Polishing Unit	PLF	Plant Load Factor
Cr	Chromium	PLCC	Power-line carrier communication
CSA	Coal Supply Agreement	PM	Particulate Matter
CSEB	Chhattisgarh State Electricity Board	PO	Purchase Order
CSPDCL	Chhattisgarh State Power Distribution Co.Ltd.	PPA	Power Purchase Agreement
CSPHCL	Chhattisgarh State Power Holding Co. Ltd	ppb	Parts per Billion
CSPTCL	Chhattisgarh State Power Trading Co.Ltd	ppm	Parts per Million
Cu	Copper	PR	Purchase Requisition
CT	Cooling Tower	PRDS	Pressure Reducing and Desuperheating Station
CT	Current Transformer	PSF	Pressure Sand Filter
CTU	Central Transmission Utility	PTC or PTCIL	Power Trading Company India Ltd
CV	Calorific Value	PTC	Performance Test Code
CW	Circulating Water	PTW	Permit To Work
dB (A)	decibel (acoustic)	PVC	Polyvinyl Chloride
DC	Direct Current	PWD	Public Works Department
D/c	Double circuit	PWM	Pulse-Width-Modulated
DCS	Distributed Control System	QA/QC	Quality Audit / Quality Control
DE	Drive End	QAP	Quality Assurance Plan
DG	Diesel Generator	QRA	Quantitative Risk Assessment
DM	Demineralized	RCRIPL	Raigarh Champa Rail Infrastructure Private Ltd.
		RCC	Reinforced Cement Concrete
DEH	Digital Electro Hydraulic	RH	Reheater
DFR	Disturbance Fault Recorder	RHS	Right Hand Side
DISCOMs	Distribution Companies	RMS	Root Mean Square
DSCR	Debt Service Coverage Ratio	ROW	Right Of Way

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EBD	Emergency Blow Down	RPM or rpm	revolutions per minute
EC	Environmental Clearance	RLDC	Regional Load Dispatch Center
EDG	Emergency Diesel Generator	RTU	Remote Terminal Unit
EHG	Electro Hydraulic Governor	SB	Standby
EHS	Environment, Health & Safety	SH	Superheater
EHV	Extra High Voltage	S/S	Sub Station
EMF	Environmental Monitoring Fund	SA	Secondary Air
EOH	Equivalent Operating Hours	S/C	Single circuit
EOP	Emergency Oil Pump	SC Rating	Short Circuit Rating
EOT	Electric Overhead Travelling	SCADA	Supervisory Control and Data Acquisition
EPC	Engineering Procurement Construction	SCC	Specific Coal Consumption
ERC	Energy Regulatory Commission	SCOD	Scheduled Commercial Operation Date
ESP	Electro Static Precipitator	SCR	Selective Catalytic Reduction
ETAP	Electrical Transient and Analysis Program	SECL	South Eastern Coalfield Limited
ETP	Effluent Treatment Plant	SEPCO	SEPCO Electric Power Construction Corporation
EWLL	Elsewedy Land Losers	SF6	Sulphur Hexafluoride
FD	Forced Draft	SG	Steam Generator i.e. boiler
Fe	Iron	SHR	Station Heat Rate
FG	Flue Gas	SHAKTI	Scheme for Harnessing and Allocating Koyala (Coal) Transparently in India
FGD	Flue Gas Desulphurization	SIPS	System Integrity Protection Scheme
FOBT	Free on Board including Trimming	SLD	Single Line Diagram
FRP	Fibre-reinforced Polymer	SLDC	State Load Dispatch Center
FSA	Fuel Supply Agreement	SNCR	Selective Non-Catalytic Reduction
FY	Financial Year	SO <sub>2</sub>	Sulphur Dioxide
FW	Feed Water	SOE	Sequence of Events
GAR	Gross As Received	SOP	Standard Operating Procedure
GE	General Electric Company	SOx	Oxides of Sulphur
GCV	Gross Calorific Value	SPL	Sound Pressure Level
GIS	Gas Insulated Station	SPM	Suspended Particulate Matter
		ST	Station Transformer
GoCG	Government of Chhattisgarh	STC	Steam Turbine Control
GoI	Government of India	STG	Steam Turbine Generator
GPS	Global Positioning System	STP	Sewage Treatment Plant
GSC	Gland Steam Condenser	SW	South West
GST	Goods and Service Tax	SWAS	Steam and Water Analysis System

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GSUT	Generator Step-Up Transformer	TANGEDCO	Tamil Nadu Generation and Distribution Corporation Limited
GUVNL	Gujarat Urja Vikas Nigam Limited	t/h or TPH	tonnes per hour
H <sub>2</sub>	Hydrogen	TCHR	Turbine Cycle Heat Rate
ha	hectare	TDS	Total Dissolved Solids
HBD	Heat Balance Diagram	TG	Turbine & Generator
HFO	Heavy Fuel Oil	TMCR	Turbine Maximum Continuous Rating
Hg	Mercury	TPP	Thermal Power Plant
HHV	Higher Heating Value	TPRI	Thermal Power Research Institute Co., Ltd
HDPE	High Density Polyethylene	TSCS	Turbine Stress Control System
HP	High Pressure	TSI	Turbine Supervisory Instrumentation system
		TSP	Total Suspended Particles
HR	Heat Rate	TSS	Total Suspended Solids
HSE	Health Safety and Environment	TT	Transfer Tower
HV	High Voltage	UAT	Unit Auxiliary Transformer
Hz	Hertz	UHR	Unit Heat Rate
IA	Instrument Air	UHV	Useful Heating Value
ID	Induced Draft	UPPCL	Uttar Pradesh Power Corporation Ltd.
IDC	Interest During Construction	UPS	Uninterruptible Power Supply
IDCT	Induced Drought Cooling Tower	USD	United States Dollar
IEC	International Electro technical Commission	V	Volt
IEEE	Institute of Electrical and Electronics Engineers	Va	Vanadium
IFC	Issued for Construction	VAT	Value Added Tax
IGBT	Insulated Gate Bipolar Transistor	VFD	Variable Frequency Drive
IP	Intermediate Pressure	VMS	Vibration Monitoring System
IRP	Insolvency Resolution Process	VOC	Volatile Organic Compounds
ISA	International Society of Automation	VRLA Battery	Valve Regulated Lead Acid Battery
IWWTS	Industrial Waste Water Treatment System	VT	Voltage Transformer
JOP	Jacking Oil Pump	VWO	Valve Wide Open
kA	kilo ampere	W	Working
kcal	kilo calorie	WBD	Water Balance Diagram
km	kilometer	WMS	Weather Monitoring Station
KMPCL	KSK Mahanadi Power Company Limited	WR	Western Region

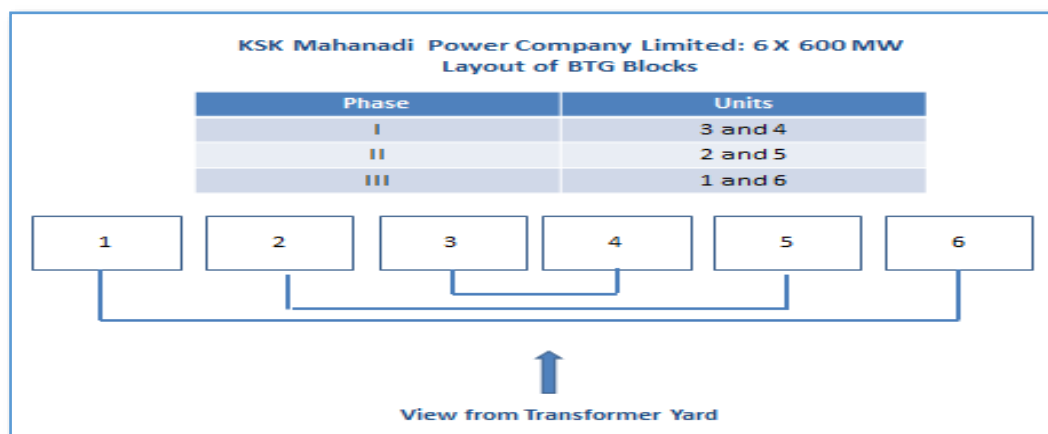
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kV	kilo volt	WRD	Water Resource Department
kW	Kilo Watt	WTP	Water Treatment Plant
KWIPL	KSK Water Infrastructure Pvt. Ltd.		
L&T-S&L	L&T – Sargent & Lundy	WTS	Water Treatment System
L&T-S&L	L&T – Sargent & Lundy	WWTS	Waste Water Treatment System
LC	Letter of Credit	XLPE	Cross-Linked Polyethylene
LD	Liquidated Damage	YTD	Year To Date
LDO	Light Diesel Oil	Zn	Zinc
LILO	Loop In Loop Out		

## EXECUTIVE SUMMARY

The technical study report is intended for assessment of 6 x 600 MW coal fired thermal power plant of M/s. KSK Mahanadi Power Company Limited (“KMPCL”) at village Nariyara, district Janjgir-Champa in the state of Chhattisgarh. KMPCL is a Special Purpose Vehicle (SPV) promoted by KSK Energy Ventures Limited (KSK) (a power plant development company) based at Hyderabad.

The BTG layout of all the units is as shown in the sketch below.




Out of the six (6) units, unit # 2, 3 & 4 are already into commercial operation, having achieved the COD as indicated below-

- Unit-3: 14<sup>th</sup> August, 2013
- Unit-4: 26<sup>th</sup> August, 2014
- Unit-2: 28<sup>th</sup> February, 2018

The other three (3) units (Units 1, 5 & 6) are under construction.

The BOP systems such as DM Plant, Chlorination plant, Dosing plant, ETP, Sewage treatment plant, CAS, H<sub>2</sub> generation, HVAC, firefighting system etc. are majorly ready and in operation. These systems are common for all 6 units. However, the required ducting, piping, cabling, hooks-up etc. with the BTG packages for unit under construction (Unit 1, 5 & 6) are yet to be completed. Major works of CHP is completed and the capacity commissioned is sufficient to handle operation of more than three units. The AHP system is common for all the six units and major portion are in operation (which are catering to the operating units #2, 3 and 4) except bottom ash and fly ash system of Unit #1, 5 and 6. Both bottom ash pond and fly ash dyke is ready. The Fuel Oil Handling System is common for all six units and it is in operation, however, the fuel oil line for under construction units is yet to be laid and commissioned. Out of five (5) nos. of clarifiers, two (2) are in operation.

The EPC Contract for the Power project was awarded on turn-key basis to SEPCO Electric Power Construction Corporation (SEPCO), China with following major parts.

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- Offshore Supply
- Offshore Services
- Onshore Supply
- Onshore Services
- Construction Contract

Project works required but not covered in the EPC contract were awarded via Non- EPC contracts by SPVs of KSK. Details of project implementation are covered in **Section 3.0** of the report.

### **Technical Evaluation of Operational Units**


Total land acquired for the entire project (6X600 MW) is 2132.73 Acres considering all required facilities for the power plant. Land for Railway and Raw water infrastructure is in scope of respective SPV of KSK for which details are not available. No land disputes have been reported by KMPCL. L&T-S&L is of the opinion that 2132.73 Acres of land is sufficient for construction and operation of the power plant as per the project scope considered.

The coal requirement for the power plant is about 15 Million Tonnes Per Annum (MTPA) considering the plant operation at 85 % PLF with design coal. KMPCL has been sourcing fuel from the open market including forward e-auction by Coal India Limited (CIL) and also through coal imports / linkages tied up by the company post the de-allocation of the Morga II and Gare Pelma III coal blocks as per the Supreme Court order dated September 24, 2014. However, the company has secured fuel linkage for supply of ~ 6.82 MTPA for PPA equivalent to 2128 MW through the first reverse auction held by CIL for allocation of coal linkages under the SHAKTI scheme. The Coal is transported from Mines / Source / Port through Railways and Road as applicable.

KMPCL has received the LOA / LOI from MCL / SECL for further allocation of the linkage coal to the tune of 1.28 MTPA. FSAs against these coal allocation is yet to be made.

Coal handling plant is designed with 4x1800 TPH capacity. Major Civil and Mechanical works of CHP has been completed. Two (2) Stacker cum reclaimer each 1800TPH are operational and One (1) is under construction. Erection is not completed for third stacker -reclaimer. Out of four (4) crushers, two (2) Crushers (each 1800TPH) are in operation and other two (2) Crushers are erected in position. However, final box-up & Commissioning is pending.

Two (2) Wagon Tipplers are in operation. Track Hopper-1 is operational with rail line completed for BOBR wagon. Track Hopper -2 is also in operation, however, rail line for the same is not completed and coal is directly dumped through dumper. Rail lines for track hopper-1, Wagon Tripper1 & Wagon Tripler -2 are in operation. As for road transport, coal from truck is directly unloaded in coal yard or track hoppers as per requirements.

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KMPCL has allocation of 100 MCM/year of water from WRD, Chhattisgarh. KMPCL has obtained permission to lift 27 MCM of Water from Sheorinarayan Barrage and rest 73 MCM from Basantpur Barrage. The average water consumption of the plant is 8257 m<sup>3</sup>/hr as per WBD, which is around 72.33 MCM per year, which is within the limit of 100 MCM per year allocated to KMPCL by WRD, Chhattisgarh. The completed raw water intake infrastructure is adequate to cater to the plant raw water requirements. The raw water reservoir has been built inside the plant for a capacity of 12 lakh m<sup>3</sup>, which receives the raw water from the raw water intake system.

Evacuation of power from 6X600 MW has been envisaged through two (2) 400 kV double circuit Quad transmission system and connected to the PGCIL's 800 kV HVDC/765 kV/400 kV Champa pooling station at village Taga, Tehsil Akaltara. At present, all the power generated is being evacuated through KSK-Champa Ckt #3 and Ckt#4 line. Ckt#1 and #2 are under construction.

KMPCL has entered into Bulk Power Transmission Agreement (BPTA) with Power Grid Corporation of India Ltd. (PGCIL) on 24<sup>th</sup> February 2010. KMPCL has entered into Agreement for Long Term Access with Power Grid Corporation of India Ltd. (PGCIL) for transfer of 1000 MW to UP DISCOMs and 500 MW to Tamil Nadu. Also KMPCL entered into Agreement for Medium Term Open Access for transfer of 14.5 MW, 347 MW and 38.5 MW to APSOCL & APEPDCL, AP; which were valid till 2019.

KMPCL has entered into five (5) Power Supply Arrangements for selling power as put up below.

**Table: Power Supply Arrangements**

<b>Sr. No.</b>	<b>Counter Party</b>	<b>Contracted Capacity</b>	<b>Original PPA Date</b>	<b>PPA Term / Expiry Date</b>
1	GUVNL (under sub - judice with GSERC).	1010 MW	3 <sup>rd</sup> June, 2010	25 years
2	APCPDCL	400 MW	31 <sup>st</sup> July, 2012	March 31, 2021
3	CSPTadeco	~90 MW (5% aggregate capacity of the Unit or the Power Station; 90 MW considering 3 units in operation)	18 <sup>th</sup> October, 2013	Perpetual existence without termination or determination by efflux of time or otherwise by any notice by either party till the operation of the Power Station.
4	TANGEDCO	500 MW	27 <sup>th</sup> November, 2013	15 years
5	UP Discom	1000 MW	26 <sup>th</sup> February, 2014	25 years

Details related to PPA are furnished in **Section 7.2** of this report.

Performance Guarantee Tests for Unit-3 and Unit-4 were conducted by SEPCO and test results were within the range of Guaranteed Plant Performance Parameters.



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Plant operational performance (Unit- 2, 3 &4) was reviewed by L&T-S&L for FY 2017-18, FY 2018-19, FY 2019-20 & FY 2020-21 (till Sep'20) based on data provided by KMPCL. It is observed that KMPCL has achieved PLF of 53.6% with Gross Heat Rate of 2411 kcal/ kWh in FY2018; PLF of 49.93% with Gross Heat Rate 2357 kcal/ kWh in FY2019 and PLF of 65.08 % with Gross Heat Rate of 2403 kcal/ kWh in FY 2020. In the FY 2021 till Sep'20, KMPCL has achieved the PLF of 75.12 % with a Heat rate of 2400 kCal / kWh. Auxiliary Power Consumption was 7.7% in FY2018, 7.54% in FY2019, 7.27% in FY 2020 & 7.21 % in FY 2021 (till Sep'20). Details pertaining to Plant Performance are captured in **Section 5** of this report.

O&M of plant is done in-house by KMPCL with the support of various O&M contractors. KMPCL has implemented well laid out preventive maintenance & condition monitoring practices for BTG and BoP equipment.

The reported value of the inventory spares as on 31.08.2020 is INR 50.06 Crore. KMPCL has identified alternate indigenous suppliers for electrical equipment, alternate probable vendors for majority of the equipment of CHP, majority of the equipment spares of AHP, which can be developed in India after development of detail drawing. Dependence of Chinese/overseas suppliers for operation of plant and possibility of procurement of spare parts from various other/ indigenous suppliers is to be explored for BTG equipment.

KMPCL has erected workshop equipment as per requirement. Small lathe machine, drilling and welding machine are available at workshop for small works. However, additional workshop equipment would be required to be installed.

Simulator for training is installed in the plant, however commissioning of simulator is balance. SAP system is not implemented in the plant. Engineering and other technical documents are maintained in soft and hard copies.

KMPCL has floated a bid for FGD installation of 3 operational units during Jan 2020 as can be seen on the company's website. DESEIN Private Limited has been appointed as Owner's Engineering for this project.

Environmental Clearance for the project was issued by MOEF on 19.10.2009 and extended the clearance from time to time up to 17.10.2019. As per Environmental Impact assessment Notification, 2006 and subsequent amendments, the environmental clearance was valid for 7 years and further extendable up to max. 3 more years on the basis of progress of balance construction activity (total 10 years Period). Existing 'Environmental clearance' (EC) has got expired and KMPCL informed that appointment of an environmental consultant to facilitate the EC renewal is done and required documents is expected to be submitted to MoEFCC by 31.12.2020.



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### **Assessment of Cost and Time To Complete of Under Construction Units**

In order to arrive at the hard Cost to Complete (CTC) the project from its present status up to COD, a team of experts of L&T-S&L visited site to assess the physical status of balance supplies (both off-shore and on shore), civil buildings and structures, and erection progress of mechanical, Electrical, C&I and other misc. packages/equipment/ items. The team also made random audit of materials lying at stores on sampling basis and at laydown areas with reference to available stock register/inward material register of KMPCL to verify loss or damage of items, conditions of the materials (visual observations only). A metallurgical expert from L&T S&L also visited the site to perform the condition assessment of the erected components and other materials available at the site based on the visual inspection. Since such studies have their own inherent assumptions and challenges, to arrive at the cost to completion suitable considerations are made. Cost towards the supply, erection, testing & commissioning of balance items have been worked out considering the current status at site and in-house data / prevailing market data. Details pertaining to Cost To Complete are captured in **Section 10** of this report.

The estimated cost to complete the Unit # 2 & 5 and Unit# 1 & 6 is summarized below.

<b>Unit #</b>	<b>Estimated Cost of Completion (Rs. Crs.)<sup>^</sup></b>	<b>Details</b>
2*	35.26	Clause no. 10.1.2
5	1862.5	Clause no. 10.1.3
1& 6	4616.0	Clause no. 10.1.4

<sup>^</sup>Excluding taxes and duties

\*The major reason for the balance cost towards Unit # 2 is inadequate supply from SEPCO.

Cost estimation also covers the non –EPC works such as Transmission lines, fly ash silos and any other developmental work critical to the plant like roads & drains, stores building, administration building, canteen building, facilities building, etc.

The breakup of cost estimation of the balance work for the Railway and Water Infrastructure is tabulated in the Annexure 4 and 5 respectively.

Total cost for implementing the pollution abatement measures to meet the latest emission norms for SO<sub>x</sub> and SPM is estimated to be around Rs. 1884 Crs. for all the units. The cost is an indicative EPC cost. The detailed feasibility report shall be carried out for the Project specific cost estimate. The SC on July 8 relaxed limits for coal-fired power stations commissioned between December 2003 and 2016 — to 450 mg / Nm<sup>3</sup> from 300 mg / Nm<sup>3</sup>. The relaxation, however, will not affect the deadline to meet the December 2015 pollution norms, which is up till December 2022 for most units. Accordingly, cost towards meeting the NO<sub>x</sub> limits could be around 900 Crs.

Phase I which consists of Unit 3 & 4 were commissioned and in operation. Accordingly, a 100 % project progress is achieved. For Phase II, which consists of Unit 2 & 5, COD has

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been achieved for Unit 2. Since April 2018, construction of Unit 5 and Phase III which consists of Unit 1 & 6 was stopped. Practically no progress can be considered for supply and erection of BTG for Unit 1 & 6. BOP and other infrastructures required for all these units are estimated as 85% complete. Project progress for BTG of Unit 5 is estimated to be around 42.3 %. Refer **Section 11.0** of this report. The estimated project progress of unit under construction is tabulated below.

Unit #	BTG	Common BoP Systems
5	42.3 (Engg. – 90 %, Supply – 42 %, Erection – 25 %)	85 %
1 & 6	10.8 (Engg. – 90 %, Supply – 0 %, Erection – 0 %)	

A major milestone schedule consisting of reordering, supply, erection, commissioning etc. for completion of balance units has been drawn and included in **Section 12.0** of this report. The expected date of COD for Unit # 5, 1 and 6 is mentioned in table below. However,  $\pm$  3 months change in the estimated completion may be considered as optimistic and pessimistic scenario. Also, pre NTP activity period of 4 months has been considered.

Unit #	Expected COD (Months)
5	24
1	32
6	34

### **Assessment of Cost Incurred**


Details of Cost Incurred is tabulated below.

Particulars	Actual cost capitalized (in cr)		
	For unit commissioned i.e. units 3,4 and 2	For unit under construction i.e. unit 1,5 &6	Total
Land (Free hold and lease hold)	-	-	324
EPC cost*	9,445	2,139	11,584
Non EPC cost	924	35	959
IDC,ERV and Preoperative cost	5,676	2,399	8,075
<b>Total</b>	<b>16,045</b>	<b>4,573</b>	<b>20,942</b>

\*As per the records, Rs. 173.98 Cr. worth of material is in transit

Details of the Land cost is as tabulated below.

Particulars	Up to 31/03/2019	Up to 31/03/20	Increment Land Cost
Freehold*	173.50	173.50	Nil
Leasehold**	150.45	150.45	Nil
<b>Total</b>	<b>323.95</b>	<b>323.95</b>	<b>Nil</b>

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## 1.0 INTRODUCTION

A Corporate Insolvency Resolution Process ("CIRP") has been initiated in respect of KMPCL, by an order of Hon'ble National Company Law Tribunal ("NCLT"), Hyderabad Bench dated October 3, 2019 under the provisions of Insolvency and Bankruptcy Code, 2016 ("IBC"). The Resolution Professional ("RP") has been appointed under the provisions of IBC.

In order to facilitate the resolution process, RP has appointed L&T Sargent & Lundy Limited (L&T-S&L) as Agency to conduct Technical Study for operational and under construction units 6 X 600 MW Coal Based Thermal Power Plant, M/s. KSK Mahanadi Power Company Limited (KMPCL).

### 1.1 Objective of the Assignment

The objective of this assignment is to provide an assessment on the basis of technical evaluation by reviewing the various designs and engineering aspects of the project as per scope of work, so as to provide the Client the necessary insight into the current status of the Power Project Asset.

### 1.2 Scope of Work


Scope of the work as stipulated in the mandate letter reads as follows:

#### **Module A – Operational Plant Evaluation**

- a) Evaluation of usage of Land, Water and Rail works
- b) Evaluation of Fuel Handling plant and Evacuation arrangements
- c) Status of Special purpose vehicles of KSK Water Infrastructure (KWIPL) and Raigarh Champa Rail Infrastructure Private Ltd. (RCRIPL)
- d) Completion of Implementation arrangement
  - EPC Contract: offshore / onshore supply and service, construction
  - Balance of Plant
- e) Evaluation of BTG of Operational Units
- f) Evaluation of coal procurement process

#### **Module B – Assessment of cost to complete the 4th Unit – 600MW (including equipment and material required)**

- a) Land Cost: development as well as refilling
- b) EPC cost
  - Cost with respect to incomplete Unit (% of Completion)
    - Cost towards plant and machinery
    - Installation costs
  - Existing Dues to the EPC and Non - EPC contractor
  - Estimate of Balance works
    - Cost of Material and equipment required
    - Installation costs including Labor cost

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- Balance of civil works, common buildings
- Offshore / onshore supply and service contracts, construction contracts
- c) Non-EPC Costs
  - Works excluding Railway and Water Infrastructure
  - Water Infrastructure works, Rail infrastructure works

**Module C – Assessment of total cost incurred till date based on books of accounts and % of completion achieved in respect of the 4th unit**

- a) Land Cost: development as well as refilling
- b) EPC cost
  - Cost with respect to Work completed on the Unit (% of Completion)
    - Cost towards plant and machinery
    - Installation costs

**Module D – Assessment of cost to complete the 5th and 6th Unit – entire 3600MW (including equipment and material required) – in line with Module B**

Additionally to cover assessment given that Assets and cost (including expenditure incurred and projected cost) have been segregated into three phases namely:

Phase I: BTG of Unit 3&4 and BOP of entire plant essential for Unit 3&4

Phase II: BTG of Unit 2&5 and Balance BOP for these units


Phase III: BTG of Unit 1&6 and Balance BOP for these units

- a) Comments on the Phase wise status of Project progress and the Project schedule including mention of order status, schedule of placement of order for construction,
- b) Please provide status of completion/ cost to completion of Non EPC works like Water (reservoirs, connecting pipelines), Rail (inward yard, dispatch yard, outgoing line), Transmission installation (lines 1 & 2, bays at both injection end and receiving end), Fly ash silos (incomplete silo construction) and any other developmental work critical to the plant like roads/drains/ boundary wall / petrol bunk, third water reservoir in plant, stores building, administration building, canteen building, facilities building, etc.
- c) Supply – erection & commissioning, manufacturing and procurement schedule of all components for successful implementation of last phase.
- d) Realistic, pessimistic and optimistic implementation schedule with milestones achieved/ to be achieved for the last phase and corresponding financial progress achieved/ to be achieved.

**Module E – Assessment of total cost incurred till date based on books of accounts and % of completion achieved in respect of the 5th and 6th unit – in line with Module C**

**Module E<sup>^</sup> – Assessment of total time required for completion till 4th Unit**

**Module F – Assessment of total time required for completion till 6th Unit**

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### 1.3 Approach and Methodology

This report has been prepared based upon information, details, documents and workings shared by M/s. KMPCL / PWC / RP in various forms, during the several interactions at the offices, as well as observations made at site. Various aspects of the Project have been analyzed in detail and findings/ comments upon the same have been summarized in subsequent sections of this Report.

In working on this assignment, L&T-S&L assume that information provided by M/s. KMPCL is accurate, updated and complete. Accordingly, the said information is not warranted by L&T-S&L for its accuracy, completeness, or being up-to-date, and is subject to further verification. Wherever possible, L&T-S&L have validated the information through data available from secondary sources (information from public domain), site visit, L&T-S&L's in-house data bank and the experience level of the in-house team.

This report is not intended to be and nor considered as the detailed technical specification or a bidding document. This Report includes review of assessment and projections made by L&T-S&L which are based on the aforesaid sources. A variation in such assessment and projections is possible due to changes in the facts obtained and circumstances as they existed at the point of time this Report was finalized and the approach or methodology adopted in respect thereof. Differences between projected and actual results are possible, as events and circumstances, as anticipated or contemplated, may or may not occur and such differences may be material in nature. Further, such type of assignment involves inherent challenges such as restricted approach and accessibility to each areas / equipment etc. To overcome this limitations, suitable assumptions are made, which may have a bearing / impact on the cost and time estimates. However, L&T-S&L attempts to provide the most current, complete, and as accurate information as possible, within the limitations of available input / information, resources, time constraint and other practical difficulties relating thereto and arising as a consequence thereof.

While working on this assignment, it is presumed that neither L&T-S&L nor Individual associated with this report shall be required by reason of this report to provide any testimony or to appear in court or at other legal proceedings, unless specific arrangements to do so have been made by prior written permission of L&T-S&L.

Assessment of Railway Infrastructure and Water infrastructure has been covered in Annexure 4 & Annexure 5.

The report is prepared in three parts as below.

Part A: Technical Evaluation of Operational Units (Module A)

Part B: Assessment of Cost and Time to Complete of under construction units (Module B, D, E & F)

Part C: Assessment of Books of Accounts (Module C & E)



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#### 1.4 Site Visit

Consultants from L&T-S&L Office visited the Site for overall evaluation of the Plant during the month of Oct' 2020. M/s. KMPCL provided an overview of the project and arranged the site visit of the plant facilities. Technical aspects were discussed with M/s. KMPCL site team during site visit.

#### 1.5 Location and Access to Site

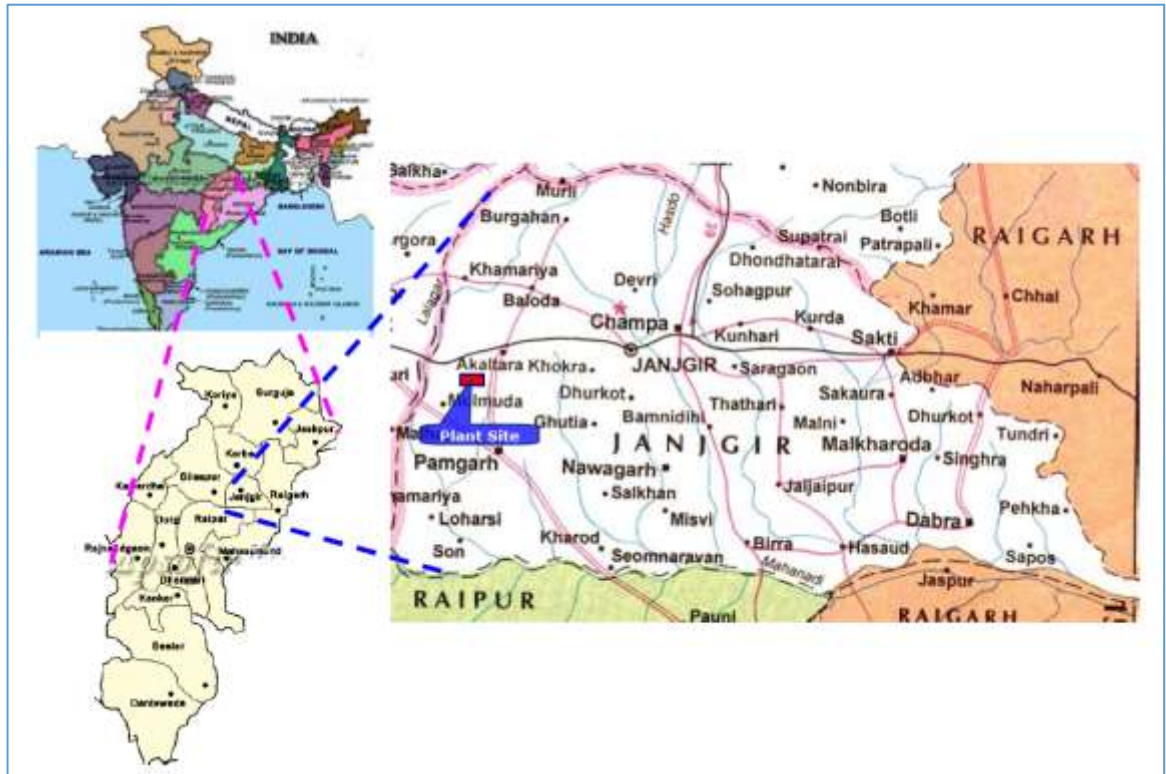
M/s. KSK Mahanadi Power Company Limited (“KMPCL”) is constructing a 6 x 600 MW coal fired thermal power plant at village Nariyara, district Janjgir-Champa in the state of Chhattisgarh. The nearest town to the project site is Akaltara which is 10 km north east by road from the site. The National Highway NH-200 runs 0.5 km from the site. The Bilaspur–Janjgir-Champa–Jharsugudha broad gauge railway line passes within a distance of 5 km from the site. The nearest airport is Raipur, about 150 km from the project site.

**Fig: KMPCL Power Station: Bird's eye view**



**Source: Google Map**

**Fig: Site Location on Map**



The meteorological data and Site conditions considered for the Plant Performance have been tabulated below.

**Table 1-1: Meteorological Data of Project Site**

<b>Latitude and Longitude</b>	Latitude: 21 deg.57 min. North
	Longitude: 82 deg.25 min. East
<b>Elevation above mean sea level</b>	275 m
<b>Design Ambient Dry Bulb Temperatures</b>	
<b>Maximum</b>	48.0 °C
<b>Minimum</b>	8.0 °C
<b>Used for Performance Calculation</b>	34.5 °C
<b>Ambient Wet Bulb Temperature for Performance</b>	28 °C
<b>Relative humidity</b>	60%
<b>Annual average rain fall</b>	1500 mm
<b>Seismic Data</b>	Zone II as per IS 1893

## 2.0 PLANT TECHNICAL DESCRIPTION

Each 600 MW units consists of coal fired Steam Generators with single reheat arrangement, connected to tandem compounded, condensing Steam Turbine and Generator with water cooled condenser and all other required auxiliaries to generate 600 MW at TMCR output based on sub-critical technology. The Boiler Maximum Continuous Rating (BMCR) is rated to generate 2069 TPH of Superheated Steam with pressure of 17.5 MPa at superheat temperature of 541°C.

### 2.1 Boiler & Auxiliaries

The steam generators are assisted circulation, drum type, double pass, water tube, direct pulverized coal fired, using coal as the principal fuel, single reheat, dry bottom type. The boilers are supplied by Shanghai Boiler Manufacture Ltd.

The Boiler details are as tabulated below:

**Table 2-1: Boiler Data**

Item	Unit	BMCR	TMCR
Superheated Steam flow	t/hr	2069	1878
Steam Pressure in Drum	MPa (g)	18.84	18.46
Steam pressure at superheater outlet	MPa (g)	17.47	17.31
Steam temperature at superheater outlet	°C	541	541
Reheated Steam flow	t/hr	1751	1598
Steam pressure at Reheater inlet (g)	MPa	3.97	3.69
Steam pressure at Reheater outlet (g)	MPa	3.76	3.50
Steam Temperature at Reheater inlet	°C	332	325
Steam Temperature at Reheater outlet	°C	541	541
Economizer inlet feed water temperature	°C	282	277
APH Inlet PA temperature	°C	44.5	44.5
APH Inlet SA temperature	°C	37.3	37.3
APH Outlet PA (hot) temperature	°C	302.0	298.5
APH Outlet SA (hot) temperature	°C	312.0	307.5
Preheater outlet Flue Gas temperature	°C	135	133

The steaming capacity of the boiler at Boiler Maximum Continuous Rating (BMCR) condition is 2069 TPH. At Turbine Maximum Continuous Rating (TMCR) condition, the boiler is capable to generate at 1878 TPH.

Each boiler is equipped with the following major auxiliary systems and equipment:

- Each boiler is equipped with 7 sets of HP1103/Dyn medium speed pulverizer with positive pressure direct coal pulverizing, 6W+1S with 90% loading in each mill,



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during BMCR condition with Worst coal; Lubrication system with 2x100% pump and 1x100% cooler, and duplex filter.

- Mill reject handling system (by hydraulic transmission system).
- Each boiler is provided with seven (7) electronic gravimetric belt coal feeders which transform coal to pulverizer from silo.
- Each boiler is provided with seven (7) raw coal silo made of steel. Each raw coal silo has a volume of 900 m<sup>3</sup> which can store coal to operate boiler at BMCR condition for 10 hours with design coal.
- Two (2) sealing fans with capacity of 100% (1 working, 1 standby),
- Two (2) Primary Air (PA) fans of 60% BMCR capacity
- Two (2) Forced Draft (FD) fans of 60% BMCR capacity
- Two (2) Induced Draft (ID) fans of 60% BMCR capacity
- Two (2) Centrifugal Seal Air Fans
- Two (2) Air Preheaters (APH) streams, each sufficient for 60% BMCR capacity.
- Two (2) Steam coil air preheater (SCAPH) for each unit on the secondary air path.
- Two (2) sets of [2 ESP + Fabric Filters], each section with two subsections.
- Two Chimneys each with Three (3) Flue Cane for 6 x 600 MW Units, of height 275m.

## 2.2 Turbine - Generator & Auxiliaries

The steam turbine is of sub-critical, single reheat, single rotor, three casings, four exhaust (i.e. two double flow low pressure casings), and condensing type. The turbine is manufactured by Dongfang steam turbine machinery Co. Ltd. The generator is 3 Phase; stator winding cooled by DM water, stator core and rotor winding cooled by Hydrogen, complying with IEC and manufactured by Dongfang electric machinery Co. Ltd. Technical details of the Turbine and auxiliaries are mentioned below.

**Table 2-2: Turbine Data**

Item	Specification
Manufacturer	Dongfang Turbine Corporation Limited
Rated Output	600 MW (TMCR)
Rated Operating Speed	3000 rpm
Working frequency	50 Hz
Condenser Vacuum	87.7 kPa
No. of Extraction Stages	08
Main Steam Flow (TMCR)	1877.9 TPH
Rated Pressure before Throttle Valve (TMCR)	16.67 MPa
Rated Temperature before Throttle Valve (TMCR)	538 degC
Rated temperature before reheat steam inlet valve (TMCR)	538 degC
Feed water temperature	277.3 degC

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#### **Turbine Lubricating Oil System**

- 1 x 100% Shaft Driven Main Oil Pump (MOP)
- 1 x 100% AC driven Auxiliary Oil Pump (AOP)
- 1 x 100% DC driven Emergency Oil Pump (EOP)
- 2 x 100% Oil Cooler
- 2 x 100% Vapour Extraction Fans
- Oil Cleaning Equipment
- 1 x 100% Reusable Oil Filter
- 1 x 100% Duplex Filter
- 1 x 100% AC driven Jacking Oil Pump (AC-JOP)
- 1 x 100% DC driven Jacking Oil Pump (DC-JOP)
- Main Oil Tank (MOT)
- Barring Gear

#### **Turbine Control Oil System**

- 2 x 100% Control Oil Pumps

#### **Turbine Auxiliary System**

- 2 x 100% mechanical type Vacuum Pumps
- 2 Pneumatic Operated Vacuum Breaker Valves
- 2 x 100% Condensate Extraction Pumps (CEP)
- Gland Steam Condenser (GSC)
- 2 x 100% AC driven GS Exhausters
- 3 x 50% Condensate Polishing Units (CPU)
- 4 Low Pressure (LP) Heaters
- 1 Deaerator
- 2 x 50% BMCR Capacity Turbine Driven Boiler Feed Water Pump (TDBFP)
- 1 x 50% BMCR Capacity Motor Driven Boiler Feed Water Pump (MDBFP)
- 3 High Pressure (HP) Feed Water Heaters
- Feed Control Station

#### **Closed Cycle Cooling Water (CCCW) System**

2 - sets of CCCW pump and two sets of CCCW heat exchanger (plate type), one in operation and one for stand-by.


#### **HP-LP Bypass System**

The unit is provided with steam turbine bypass system of capacity 60% BMCR to handle exigencies like load throw off situations and startup of the Unit.

### **2.3 Balance of Plant**

#### **2.3.1 Coal Handling Plant**

The coal handling system is provided with all necessary accessories between track hoppers and coal bunkers in boiler house. Coal handling system broadly consists of:

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- Coal unloading system (Wagon Tipplers and track hoppers for BOBR (Bottom Open Box Rakes)
- Coal storage yards (6 nos. of yards for the entire 6 x 600MW capacity, having a storage capacity of coal for around 15 days for 6 Units – BMCR condition)
- Stacking and reclaiming equipment (3 - Stacker Reclaimers for the 6 x 600MW Plant, Currently 2 - Stacker Reclaimers are commissioned & operational)
- Screening and Crushing system
- The conveying (currently 2 Conveying Belt System of 1800 TPH capacity each are commissioned and operational), conveying and handling of coal from track hoppers to coal bunkers in boiler house.
- Equipment for coal distribution on coal bunkers.

### 2.3.2 Ash Handling Plant

The fly ash and bottom ash are handled separately. Fly ash is transported by the negative pneumatic conveying system and delivered to the fly ash silos by positive pressure pneumatic conveying system. Then it is carried to users by train and tank truck or is carried to the Fly Ash yard by High Concentration Slurry Disposal System (HCSD).

Wet bottom ash handling system is adopted in this Plant. The wet bottom ash in bottom ash hopper is transported to ash slurry sump by jet pulsion pump, and Economizer ash is transported to ash slurry sump by jet pulsion pump, and further the ash slurry is transported to ash yard by ash slurry pump.


### 2.3.3 Circulating Water System

The circulating water system is a closed recycle cooling system. Independent circulating water system is adopted for each unit, and each system includes a dual-back-pressure condenser, two circulating water inlet steel pipe and two circulating water outlet steel pipe. Two (2) Circulating Water (CW) pipes are connected from outside the Main Power Building. After cooling the turbine exhaust steam in the main condenser, the CW is discharged to two (2) circulating water pipes outside the Main Power Building. Motor-driven butterfly valves are provided on the CW inlet and outlet pipes for isolating the main condenser. Two (2) sets of sponge ball cleaning system are provided for two (2) sets of main condenser for one unit. The water of the open cycle cooling water system is taken from the circulating cooling water inlet piping of the main condenser to all water users through one (1) set of motor driven filter, two (2) sets of 100% capacity OCCW pumps and then returned to the circulating water outlet piping of the main condenser.

### 2.3.4 Plant Water System

The raw water received from the external source is treated and used as required by the Plant Operation. The Plant Water System broadly consists of the following:

- Pre-treatment Plant
- Demineralizing Plant
- Reverse Osmosis (RO) Plant

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- Chemical Reagent & Regenerant Supply, Storage & Transfer System
- Cooling Water System
- Main Circulating Water Pumps and Pump House
- Control of Biological Growth, Fouling and Hygiene
- Auxiliary Cooling System
- Cooling Tower (Induced Draft Cooling Tower)
- Rain Water Harvesting System
- Chemical Dosing System
- Sampling & Monitoring System

#### **Condensate Transfer System**

The system is provided with a 800m<sup>3</sup> condensate storage tank and 2 x 100% condensate transfer pumps, which are used to supply make-up water to the main condenser and to fill water to the deaerator and boiler, and provide water to CCCW system for start-up filling and make-up.

#### **2.3.5 Compressed Air System**

One air compressor house is provided for three units. Separate compressor system for Instrument air and service air application is provided in each compressor house. Each Compressor house is provided with:

- 6 sets of air compressors (2 sets of 60Nm<sup>3</sup>/min for service air, 4 sets of 40Nm<sup>3</sup>/min for instrument air) - 4 for operation, 1 oil free screw compressor and 1 oil lubricated compressor for standby.
- 3 sets of 75 m<sup>3</sup> instrument air tanks.
- 1 set of 30m<sup>3</sup> service air tank.


#### **2.4 Electrical System**

##### **Electrical Transformers**

- Three (3) Nos. Single Phase 250MVA OFAF Generator Transformers (GT) for each unit - vector group YNd11.
- Three (3) nos. of ONAF Station Transformer (ST) - vector group YN/yn0/yn0
- Two (2) nos. ONAF Unit Transformers (UT) provided for each unit (rated capacity of UT is 40MVA) - vector group D/yn1.

##### **The rated capacity of LT (Low Tension) auxiliary transformers as follows:**

- Unit turbine PC transformer – 2 x 2000kVA (for each unit)
- Unit boiler PC transformer - 2 x 1600kVA (for each unit)
- Common PC transformer – 2 x 2000kVA (for each 3 units)
- Cooling tower PC transformer – 3 x 2500kVA (for each unit)
- ESP PC transformer – 2 x 1600kVA (for each unit)
- Relay building PC transformer: 2x1250kVA (for six units)
- Chemical water treatment PC transformer – 2 x 2500kVA (for six units)
- Raw water PC transformer - 2 x 2500kVA (for six units)

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- Ash handling PC transformer – 2 x 2000kVA (for six units)
- Coal handling PC transformer - 2 x 2500kVA (for six units)
- Administration building PC transformer – 2 x 800kVA (for six units)
- Start up boiler PC transformer – 2 x 1000kVA (for six units)

### **Diesel Generator (DG)**

The Units are furnished with 2 sets of 1500 KVA diesel generator.

### **220 V DC System**

220 V DC supplies is provided for essential functions such as protection, switchgear closing/tripping, alarms, control, emergency drives, emergency lighting etc. The batteries are complete with float and boost chargers which are high-Frequency Switch Module type. Each 220V DC system have its own full capacity 2 x 100% battery with 2 x 100% float and boost chargers. The 220V system battery for unit, station, switchyard systems are of lead acid Plante type, and the 220V DC system battery for CHP and cooling tower are maintenance free lead acid type. Station DC 220V system are provided for DC load of common to 6 units. Separate battery for DG set are provided.

### **UPS System**


AC uninterruptible power supplies (UPS) are provided for essential loads such as instrument, control and computer and includes load which are required for post-incident monitoring and recording following a unit trip and loss of station AC supplies. The system is designed such that the supplies could be maintained for a minimum period of 30 minutes. 240V UPS system is ungrounded system.

Each UPS system (except administrative building UPS) are supplied with 2 x 100% systems of on line type capable of supplying the total system load and complete with static transfer switch and maintenance bypass switch. 100% lead acid Plante type battery are supplied for unit UPS. The batteries are installed in single/double tier and single/double row arrangement.

## **2.5 Control System**

A boiler-turbine-generator centralized control mode is adopted in the Plant. Every three units share one Central Control Room (CCR). It is capable of performing monitoring, controlling and management etc. during the boiler-turbine-generator and its auxiliaries in start-up, shut-down and operation. A microprocessor-based Distributed Control System (DCS) by Ovation (Emerson) is adopted for monitoring, controlling and managing the BTG and its auxiliaries system in CCR to ensure the safety, reliability and economic operation of the units. Plant control system network consists of Plant MIS, Unit Monitoring and Controlling System, BOP Monitoring Network (BOP Network) and SCADA system.

The main BOP systems which are controlled and monitored via PLC (Programmable Logic Controller) are as follows:


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- Raw water pre-treatment system (including raw water pump, etc.)
- Demineralized water treatment plant (including RO plant, etc.)
- CCW dosing system
- Waste water treatment system
- Hydrogen generation station
- Fuel Oil Storage, Handling and Conditioning System
- Ash & slag handling system, including compressor air station of ash handling, mill reject handling system and slag conveying system, etc.
- HVAC system
- Condensate polishing unit, steam and water analysis and dosing system
- ESP system
- Coal handling system

## 2.6 Other Systems of the Plant

The other supporting systems provided for the Plant operation are:

- Fuel Oil Handling System
- Hydrogen Generation Plant
- Fire Protection System
- Air Conditioning & Ventilation System
- Waste Water Treatment System
- Sewage Treatment System

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### 3.0 PROJECT IMPLEMENTATION METHODOLOGY

#### 3.1 Major Contracts

The Project implementation was through EPC and Non EPC contracts.

The major Contracts awarded for the Project implementation are summarized below:

##### **EPC Contracts**

EPC Contract for the Power project awarded on turn-key basis to SEPCO Electric Power Construction Corporation (SEPCO), China through ICB on 26.2.2009. EPC contract is divided in five parts as below:

**Offshore supply** - Design, engineering, manufacture, procurement, assembling, shop testing, seaworthy packing, forwarding and delivery of the plant and equipment including commissioning spares, consumables on CFR basis. Contract price is 1946.644 USD (Mn) after 4<sup>th</sup> Amendment.

**Offshore services** - Basic engineering, design & engineering services, technical services including interfacing integration and demonstration of Performance Guarantee Values of Units as well as training of KMPCL's personnel. Contract price is 4.86 USD (Mn).

**Onshore supply** - Design, engineering, approval of drawings, manufacture, procurement, assembling, shop testing, packing, forwarding, transportation and delivery of the plant and equipment at the site including commissioning spares and consumables. Contract price is INR 358.56 Crores. after 1<sup>st</sup> Amendment.

**Onshore services** - Supervisory, Project Management and allied Services, customs clearance, inland transportation unloading, unpacking, erection, commissioning, trial run, reliability run test, performance guarantee test and complete insurance till plant handover ("On-shore Services") for and in relation to the setting up of the complete Power Plant. Contract price is INR 1139.9 Crores exclusive of Service Tax. The contract price would be Rs. 1163.3 Crs. including as on date tax.

**Construction Contract** - earthworks, dewatering during construction, grading and leveling, excavation, foundations, buildings, all other civil works, architectural- works, structural works, procurement services, project management services, procurement services, expediting, Site mobilization, supervising, co-ordination, inspection, Contractor's permits and clearances, expediting and such services as may be required from to time for timely Commissioning of the Complete Plant, as defined in Technical Specifications and Schedules to the Contract and as specified in detail in the Contract and hand over Complete Plant to the Owner. Contract price is INR 2880.5 Crores after 5<sup>th</sup> Amendment.

The amendments of the EPC Contracts are as follows:



#### Offshore Contract-

- First Amendment dated 16th May, 2009
- Second Amendment dated 19th January, 2010
- Third Amendment dated 30th December, 2011
- Fourth Amendment dated 30th March 2016

#### Onshore Supply -

- First Amendment dated 9th June, 2011
- Second Amendment dated 30th March 2016

#### Construction Contract

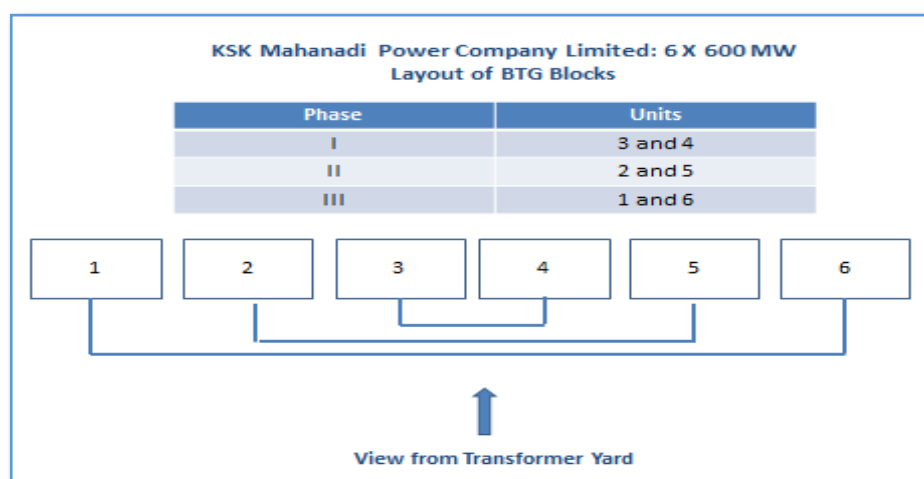
- First Amendment dated 16th May, 2009
- Second Amendment dated 19th January, 2010
- Third Amendment dated 9th June, 2011
- Fourth Amendment dated 30th December, 2011
- Fifth Amendment dated 30th March 2016

Below mentioned work has been covered under Non- EPC contracts, as informed by KMPCL

- River water Intake System up to the raw water reservoir within plant boundary – Separate SPV
- Rail infrastructure covering tracks for Coal, fuel oil system etc. - Separate SPV
- Wagon Tippler
- Training Simulator
- CCTV for plant Surveillance
- Development of Green belt area
- Transmission lines
- External Boundary Wall
- Peripheral Storm Drain

### 3.2 Philosophy of Construction Sequence of BTGS of 6 Units

The BTG layout of all the units is shown in the sketch below.





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According to the philosophy of construction in Phase-I, Phase-II and Phase-III, all Engineering, procurement, supply, construction, commissioning etc. including BOP, CHP, AHP, Switchyard, Rail infrastructure, Water infrastructure, Transmission lines etc. were planned and executed. Therefore, the 1<sup>st</sup> unit commissioned was Unit#3, then Unit# 4 and then Unit # 2. Supply, erection etc. of EPC contract scope as well as Non-EPC scope was under hold since April'2018.

### 3.3 List of Major Suppliers (OEMs)


The Project is supplied, erected and commissioned by EPC Contractor M/s SEPCO Electric Power Construction Corporation (SEPCO), China. Main Plant i.e. Boiler supplied by M/s Shanghai Boiler Manufacture Ltd, China and Turbine-Generator has been supplied by M/s Dongfang China. Other packages have also been supplied by various well-known and reputed Suppliers. In the following table, details of Contractors/Suppliers for various packages have been summarized.

**Table 3-1: List of the Major Suppliers (OEMs) for various packages in the Project**

Sr. No.	Package	Suppliers
1.	Turbine	M/s Dongfang steam turbine machinery Co. Ltd, China
2.	Boiler	M/s Shanghai Boiler Manufacture Ltd, China
3.	Generator	M/s Dongfang Electrical Machinery Co. Ltd, China
4.	Generator transformer	Xian XD transformer co. Ltd
5.	Station transformer	Shangdong Power Equipment Co. Ltd, China
6.	Unit auxiliary transformer	Shangdong Power Equipment Co. Ltd, China
7.	Dry type transformer:	Shangdong Luneng Mount Tai Electric Equipment co. Ltd.
8.	Condenser	Dongfang turbine corporation ltd.
9.	PLC	Allen-Bradley (Rockwell Automation)
10.	Wagon tippler plc	Siemens
11.	Air compressor motor	Wuxi Hwada Motor Co. Ltd.
12.	Seal air fan	Gexin Electric Co.Ltd.
13.	Turning gear	Dongfang Steam Turbines Company
14.	LP heater	Dongfang Steam Turbine Works
15.	Deaerator	Dongfang Boiler Group Co.Ltd
16.	Id fan hydraulic coupling	Voith, German
17.	Booster pump motor	Shanghai electric machinery co. Ltd./ Xiangtan Electric Motor Factory
18.	Lubricating oil pumps of feed water pump steam turbine	Beijing highstar pump co., Ltd., Sichuan Shengda Pump Industry Equipment Manufacture Co. Ltd., Zigong Dongfang Filter Manufacture Co. Ltd.

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<b>Sr. No.</b>	<b>Package</b>	<b>Suppliers</b>
19.	Open circulating water pump	Shandongboshan
20.	Shaft seal heater:	Dongfang Steam Turbine Works
21.	Shaft seal fan	Dongfang Steam Turbine Works
22.	Condenser	Dongfang steam turbine works
23.	Gland steam cooler	Dongfang steam turbine works
24.	Condensate pump	Shanghai KSB Pump Co. Ltd.
25.	Condensate makeup tank	Shanghai Shangdian Elec Machinery Co. Ltd.
26.	Vacuum pump	Shanghai Shangdian Elec Machinery Co. Ltd.
27.	Main oil pump	Dongfang Steam Turbine Co. Ltd.
28.	Ac startup oil pump	Chengdu Pump Research Institute
29.	Ac lubricating oil pump	Chengdu Pump Research Institute
30.	Dc emergency oil pump	Chengdu Pump Research Institute
31.	Main oil tank gas exhaust fan	Chengdu Fan Manufactory/Beijing Lad Enterprise/Zhejiang Yuhang Fan Co.Ltd.
32.	Oil purifying equipment:	Zigong High-Precision Filter Manufacturing Co. Ltd.
33.	Closed circulating water pump	Shandongboshan
34.	Closed circulating expansion tank	Shandong Fenghui Group Co. Ltd.
35.	Bucket-wheel stacker-reclaimer	Changchun Generating Equipment Group
36.	Conveyor transfer head	Mudanjiang Hengtian/ Mudanjiang Huarun
37.	Bag dust collector	State Grid Futong
38.	ash transport air compressor motor	Wuxi Hwada Motors
39.	nstrument air compressor	Ingersoll Rand
40.	Service air compressor	Ingersoll Rand
41.	Battary bank	Statcon
42.	Isolators	Xian XD High Voltage Apparatus Co. Ltd
43.	PLCC system switchyard	ABB
44.	Coal Mill	Shanghai Heavy Machinery Co. Ltd
45.	Coal Feeder	Stock China
46.	ID Fan	Shanghai Blower Works
47.	PA Fan	China Howden Hua Technology
48.	FD Fan	China Howden Hua Technology

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Sr. No.	Package	Suppliers
49.	MD BFP	Shanghai Motors and KSB Shanghai
50.	TD BFP	Hangzou Turbine Works and KSB Shanghai
51.	CEP	Shanghai Motors and KSB Shanghai
52.	MD BFP motor	Shanghai Electric Machinery Co. Ltd
53.	CEP motor	Xiangtan Electric Mfg. Co. Ltd. China.
54.	TD BFP booster pump motor	Shanghai Electric Machinery Co. Ltd
55.	Coal mill motor	Shanghai Electric Machinery Co. Ltd
56.	ID fan motor	Shanghai Electric Machinery Co. Ltd
57.	FD fan motor	Shanghai Electric Machinery Co. Ltd
58.	PA fan motor	Shanghai Electric Machinery Co. Ltd
59.	BCW	Torishima Pump Mfg. Co. Ltd
60.	Ash slurry pump motor	Xiangtan Electric Mfg. Co. Ltd. China.
61.	Crusher motor	Xiangtan Electric Mfg. Co. Ltd. China.
62.	Conveyor- motor	Xiangtan Electric Mfg. Co. Ltd. China.
63.	IDCT	Paharpur Cooling Towers Ltd.

**Source: Company**


### 3.4 Present status of all the 6 units

**Table 3-2: Present status of all the 6 units**

Unit No.	Status	Remarks
Unit#1	Construction stage	The construction activities were stopped since April'2018
Unit#2	Unit Synchronized on 27.12.2017 Commercial operation commenced on 28.02.2018 Final PG test balance	Unit is in operation
Unit#3	Commercial Operation Commenced on 14.08.2013 Performance Guarantee Test completed on 14.04.2015	Unit is in operation
Unit#4	Commercial Operation Commenced on 26.08.2014 Performance Guarantee Test completed on 24.01.2016	Unit is in operation
Unit#5	Construction stage	The construction activities were stopped since April'2018
Unit#6	Construction stage	The construction activities were stopped since April'2018

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## **Part A – Technical Evaluation of Operational Units (Unit # 2, 3 & 4)**

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#### 4.0 PROJECT DETAILS

The 600 MW units are using ‘Sub-critical technology’ for Power cycle. The Units –2, 3 & 4 are already into commercial operation, having achieved the COD of the Units as follows:

- Unit-3: 14<sup>th</sup> August, 2013
- Unit-4: 26<sup>th</sup> August, 2014
- Unit-2: 28<sup>th</sup> February, 2018

The balance three units (Units 1, 5 & 6) are under construction.

#### 4.1 Land Details

Total land acquired for the project is 2132.73 Acres for all required facilities for the power plant (For All Units-Under Operation/Construction/Development). Broad bifurcation is as below:

**Table 4-1: Land Details**

Village Name	Nariyara	Tarod	Amora	Rogda	Total
Classification Of Land	Area In Acre	Area In Acre	Area In Acre	Area In Acre	
Private Land (Lease)	111.46	58.29	138.86	125.43	434.04
Private Land Purchased	554.45	390.55	123.96	117.04	1186.00
Govt. Land (Lease)	284.71	66.83	72.33	88.83	512.70
Forest Land	0.00	0.00	0.00	0.00	0.00
<b>Total</b>	<b>950.62</b>	<b>515.67</b>	<b>335.15</b>	<b>331.3</b>	<b>2132.73</b>

**Source: Company**


A detailed breakup of the land requirement project component wise is tabulated below:

**Table 4-2: Land Details Project Component Wise**

Project Component	Actual acquired land (Acres)
Main Plant area with green belt	515
Coal yard with green belt	200
Ash Dyke with green belt	365
Labour Colony	390
Construction area	662
<b>Total power plant area</b>	<b>2132</b>

**(Source: “Report on cost to complete first 2400 MW” dated June 2018)**

No land disputes is reported by KMPCL. The plant has utilized 0.59 Acre/MW with considerable open area for future usage. 2132.73 Acres is sufficient for construction and operation of the power plant.

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## 4.2 Fuel and its Procurement

### 4.2.1 Coal procurement

The project was envisaged on domestic coal to be sourced from two coal blocks namely Gare Pelma-III and Morga-II. Post the de-allocation of the tied up coal blocks (Morga II and Gare Pelma III) as per the Supreme Court order dated September 24, 2014, KMPCL has been sourcing fuel from the open market including under the special forward e-auction for power sector by Coal India Limited (CIL) and coal imports. However, the company has secured fuel linkage for supply of ~6.8 MTPA through the first reverse auction held by CIL for allocation of coal linkages under the SHAKTI policy (Scheme for Harnessing and Allocating Koyala (Coal) Transparently in India). At present Coal is being purchased through FSA linkage coal, E-Auction or Market / Traders or Imported. The Coal is transported from Mines / Source / Port through Railways and Road as applicable.

**Table 4-3: Linkage Coal Available for Commissioned Capacity (MT) under ‘SHAKTI Scheme’,**


SHAKTI Linkage Sources	ACQ Qty ( MT) as per FSA for PPA of 2128 MW	ACQ Qty (MT) for 3 units 1800 MW
Talcher (MCL)	20,700	17509
IB Valley (MCL)	11,00,000	930451
Korea Rewa (SECL)	12,00,000	1015038
Korba & Mand-Raigarh (SECL)	45,00,000	3808391
<b>Total Coal Qty:</b>	<b>68,20,700</b>	<b>5771389</b>

### 4.2.2 Additional Allocation of Linkage Coal

KMPCL has received the LOA from MCL and LOI from SECL for additional allocation of coal through auction process. KMPCL informed that FSAs for these allocations are yet to be made.

**Table 4-4: Linkage Coal Allocated through LOA / LOI**

Source	LOA / LOI Reference	Allocated Qty. ( MT)	Coal Range	Remarks
IB Coalfields ( MCL)	No. MCL/SBP/GM(M&S)/Comm1./ 2019-20/ 3087 dated 12/03/2020	6,50,000	G12-G14 Grade	19.58 % of premium on Notified Price
Talcher Coalfield (MCL)	No. MCL/SBP/GM(M&S)/Comm1./ 2019-20/ 3087 dated 12/03/2020	2,00,00	G12-G14 Grade	12.24 % of premium on Notified Price
Korba & Mand-Raigarh (SECL)	No. SECL/BSP /M&S/FSA/ SHAKTI/LOI/B(iii)(R-3)/2/KSK/758 dated 10.07.2020	4,34,200	G10-G15 Grade	Levellised discount of 7 paise / kWh
		<b>12,84,200</b>		

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The allocation is for the specified end use plant of KMPCL. The LOA / LOI is only indicative of the quantity allocated and any entitlement to such quantities of coal is subject to execution of the FSA in accordance with the provisions of the Scheme Document and satisfaction of the conditions prescribed in the FSA.

#### 4.2.3 Coal Analysis and Indicative Consumption

The Coal Analysis considered for the Plant design is tabulated below.

**Table 4-5: Coal Analysis for Design Coal and Worst Coal**


Proximate Analysis	Design Coal	Worst Coal	Best Coal
Fixed Carbon (%)	31	27	42
Volatile Matter (%)	22	18	27.9
Ash (%)	36	40	21
Sulphur (%)	0.4	0.6	0.3
Total Moisture (%)	11	15	9.1
GCV (kcal/kg)	4200	3800	4900

Considering the factor of 1.05 as per CERC norms and design Gross Station Heat Rate of 2239.77 kcal/kWh, Gross Station Heat Rate would be 2351.76 kCal/ kWh. With design coal of 4200 kCal / kg, Sp. Coal consumption would be 0.56 kg /kWh. This translates to the coal requirement of 336 tph, 8063 tpd and 2.5 MTPA (85 % PLF) for one unit. The Coal requirement with worst coal GCV of 3800 kCal / kg would be 371 tph, 8911 tpd and 2.76 MTPA (85 % PLF) for one unit.

Calculated coal consumption for design coal and worst coal as per above assumption is tabulated below:

**Table 4-6: Coal Consumption for Design Coal and Worst Coal**

Coal Consumption	1x600MW	3x600MW	4x600MW	6x600MW
Hourly design coal consumption (t)	336	1008	1344	2016
Hourly worst coal consumption(t)	371	1114	1485	2228
Daily design coal consumption (t)	8063	24190	32253	48379
Daily worst coal consumption(t)	8912	26736	35648	53472
Annual design coal consumption(t) (100% PLF)	2943058	8829173	11772231	17658347
Annual worst coal consumption(t) (100% PLF)	3252853	9758560	13011413	19517120
Annual design coal consumption(t) ( 85% PLF)	2501599	7504797	10006396	15009595
Annual worst coal consumption(t) ( 85% PLF)	2764925	8294776	11059701	16589552

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#### 4.2.4 Coal Receipt, Sampling and Analysis at KMPCL

The coal is being transported to KMPCL site through rail and road mode. Coal receipts through Rail mode is unloaded at Track Hopper and Tippler, whereas coal received through road by trucks is unloaded at Coal Yard. Coal sampling contract at KMPCL site is awarded to QSS (Quality Services and solutions).

Following are the steps for receiving coal via Rail Mode

- Finalization of Monthly Scheduled Quantity
- Sanction & Release of Rake
- Allotment of Rake Programme
- Loading of Rakes
- Weighment of Rake by coal company
- RR Generation
- Sampling of Rake (from 6 wagons /Rake) as per third party (QCI/CIMFR) agreement
- Analysis of Sample (At authorized Lab of third party )
- Rake Arrival at Plant
- Rake placement at Track Hopper/Wagon tippler for unloading
- Sampling of coal and analysis of proximate, GCV and Sulphur carried out in KMPCL lab & Declaration of Sample analysis result within 72 Hrs
- Coal company issues debit/credit note as per result

Following are the steps for receiving coal via Road Mode

- Finalization of Monthly Scheduled Quantity
- Submission of DO along with documents at Area Office
- Deployment & Supervision of Truck Loading
- Sample Collection from loaded trucks at mines by third party agency as per the tripartite agreement
- Weighment of Truck at mines weigh bridge
- Dispatch of vehicles from the mines with all the documents
- Arrival of Trucks at Washery
- Processing of Coal at Washery as per contract & guaranteed GCV
- Deployment of Trucks at Washery for delivery & Supervision of Truck Loading by KMPCL representatives
- Tarpaulin Covering of vehicles
- Weighment of Trucks at washery
- Arrival of Trucks at KMPCL plant
- Truck details entry in MIS section at yard entry point and issue a slip for source wise unloading at coal yard



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- Sampling of coal and analysis of proximate, GCV and Sulphur carried out in KMPCL lab & Declaration of Sample analysis result within 72 Hrs
- Coal company issues debit/credit note as per result

KMPCL have engaged various agencies for liaisons works with coal companies (MCL/SECL/ other), Active mine management of linkage coal, Rail Movement, washing of coal Linkage coal, with transportation of linkage coal from various collieries of SECL & MCL to coal washery and further to KMPCL Power Plant.

Source wise month wise coal purchase details for the financial year 2018-19 is as below

**Table 4-7: Coal Purchase Details For FY 2018-19**

Month	Open market	Linkage	e-auction	Import	Total
	Qty- MT	Qty- MT	Qty- MT	Qty- MT	Qty- MT
Apr-18	53,357	3,07,395	30,369	7,488	3,98,609
May-18	40,262	4,10,218	18,526	11,341	4,80,347
Jun-18	25,045	2,76,704	21,866	-	3,23,616
Jul-18	9,987	3,85,173	20,177	17,106	4,32,443
Aug-18	67,932	3,15,413	18,866	18,417	4,20,629
Sep-18	84,517	3,02,665	20,219	1,674	4,09,074
Oct-18	1,59,362	3,52,998	-	-	5,12,360
Nov-18	60,346	3,67,200	1,230	-	4,28,776
Dec-18	72,750	3,58,230	2,629	8,068	4,41,677
Jan-19	15,565	3,10,224	-	-	3,25,789
Feb-19	36,718	3,40,077	15,172	60	3,92,027
Mar-19	45,028	4,14,463	37,615	-	4,97,106
<b>Total</b>	<b>6,70,869.66</b>	<b>41,40,760.58</b>	<b>1,86,668.74</b>	<b>64,154.69</b>	<b>50,62,453.67</b>

**Source: Company**

Source wise month wise coal purchase details for the financial year 2019-20 is as below

**Table 4-8: Coal Purchase Details For FY 2019-20**

Month	Open market	Linkage	e-auction	Import	Total
	Qty- MT	Qty- MT	Qty- MT	Qty- MT	Qty- MT
Apr-19	89,797	3,61,791	76,273	0	5,27,860
May-19	1,89,552	3,35,051	1,19,056	0	6,43,660
Jun-19	67,788	3,33,172	1,02,351	0	5,03,311
Jul-19	33,327	2,99,091	1,37,553	0	4,69,971
Aug-19	2,01,819	3,39,672	98,932	0	6,40,424
Sep-19	1,41,101	1,39,774	67,947	0	3,48,822
Oct-19	1,25,820	2,82,556	1,04,212	0	5,12,588
Nov-19	1,55,927	3,25,189	40,923	0	5,22,039
Dec-19	1,55,297	3,43,436	91,581	0	5,90,314
Jan-20	1,59,019	3,34,240	1,65,651	0	6,58,909
Feb-20	58,445	5,00,109	1,16,582	0	6,75,136
Mar-20	58,081	5,10,894	1,12,702	0	6,81,677
<b>Total</b>	<b>14,35,972</b>	<b>41,04,975</b>	<b>12,33,763</b>	<b>0</b>	<b>67,74,711</b>

**Source: Company**

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#### 4.2.5 Coal Handling in the plant

The coal handling plant is an integrated system designed to provide complete facilities within boundary of the Plant site for:


- Unloading of coal from bottom discharge wagons.
- coal processing including screening, crushing, detection and removal of ferrous tramp material, etc. to ensure that the coal is adequately prepared for handling, storage, milling and other plant requirement.
- conveying and handling of coal from the rail delivery and unloading system to an above ground coal stockyard.
- conveying and handling of coal from the rail delivery and unloading system to the main plant boiler bunkers.
- conveying and handling of coal from the above ground coal stockyard to the main plant boiler bunkers;

Coal handling plant is designed for 4x1800 TPH capacity (2x1800 TPH capacity for 3 units). Major equipment design capacity is as below:

Feeding Capacity System:	4x1800 TPH capacity (2x1800 TPH capacity for 3 units)
Unloading System Capacity:	2 X 1800TPH for each track hopper (total 2 nos track hoppers)
Crushers Capacity:	Minimum 4, each of 1800 TPH capacity
Stacker-cum-reclaimer:	03 nos reversible bucket wheel type, capacity each 1800 TPH
Open Yard Storage Capacity:	Fifteen (15) days BMCR coal requirement of the plant in six stock piles of crushed coal.
Bunker Storage Capacity:	Ten (10) hours capacity of each unit under BMCR coal requirement.

Coal handling plant is designed for 4x1800 TPH capacity (2x1800 TPH capacity for 3 units). Major Civil and Mechanical works of CHP is completed for phase 1 & 2. Stacker - cum reclaimer 02 nos (each 1800TPH) are in operational and erection is not completed third stacker -reclaimer. Out of four crushers, two Crushers (each 1800TPH) are in operational, other two Crusher are placed at position and however final boxup & Commissioning is balance. Two Nos. Wagon Tripler are in operational. Track Hoppers- 1 is operational with rail line completed for BOBR wagon. Track Hopper -2 also in operation however rail line is not completed and coal is directly dump through dumper. Rail lines for track hopper-1, Wagon Tripler1 & Wagon Tripler -2 are in operational. Coal from truck is directly unloading in coal yard or track hoppers as per requirements.

As reported in half yearly EC compliance by KMPCL, following provisions have been made to control the Fugitive emissions:

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- Pulse Jet type bag filters have been installed at all the Transfer points and on coal conveyor system meant for Coal transport from CHP area to boiler area.
- 44 Nos. of Rain guns with Water spraying system has been installed in the Coal yard area.
- 172 Nos. Dust Suppression System & 28 Nos. Dry Fog System has been working in different raw material transfer points and handling section to control fugitive emission at CHP area.

#### 4.2.6 Secondary Fuel

The fuel oil system consists of use of Light Diesel Oil (LDO) for start-up and Heavy Fuel Oil (HFO) for flame stabilization and low load operations. Fuel oil is envisaged to be supplied from nearest terminal by using road tankers to the site. HFO storage capacity of 4x2,000 m<sup>3</sup> tanks) and LDO storage of 2x1,000 m<sup>3</sup> Tanks is Commissioned & in service with truck unloading access facility.

#### 4.3 Rail works

The construction of Rail infrastructure work is being carried out by an SPV, Raigarh Champa Rail Infrastructure Private Ltd. (RCRIPL). The work comprises construction of Onward and return lines from Akaltara station up to plant boundary. Rail lines for track hopper-1, Wagon Tripper1 & Wagon Tripper -2 are in operational. For details of the present status refer **Annexure 4** of the report.

#### 4.4 Ash


KMPCL has constructed a Fly Ash Pond and a Bottom Ash Pond inside the Plant boundary to dump the excess Fly Ash not utilized and the entire bottom ash generated from the power plant.

The bottom ash collected in the Bottom Ash Hopper is sent to Bottom ash Pond through a slurry pump in lean slurry form from the plant. Bottom ash pond is provided for storage of bottom ash. This pond is provided with recovery water system to recover the water. Approximately 60-70% water is recovered to reuse in the Bottom Ash System.

The Fly ash generated from plant is sent to the Fly ash Silo through the pneumatic system and from the Fly ash Silos, the fly ash is offered to the ash users.

Separate Ash dykes have been constructed for dumping the bottom ash and fly ash. Fly ash is conveyed to the fly ash silos and disposed off in the dry form for the ash utilization. In case of non – off take of the fly ash in dry form, HCSD system is provided to dispose the fly ash in the lean slurry form to the Ash dyke

The capacity of the Dyke and storage space available is as below:

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**Table 4-9: Capacity of Ash Dyke**

S. No.	Description	Area	Actual Capacity	Filled Up Capacity/ Stock	Available Capacity	REMARKS
1	Fly Ash Pond	32.5 Hectares	25 lakh Metric Ton	9.2 Lakh MT	15.8 lakh MT	Horizontal Extension Envisaged
2	Bottom Ash Pond	33.5 Hectares	46.7 Lakh Metric Ton	9.67 Lakhs MT	37.03 lakh MT	Vertical & Horizontal Extension Envisaged

**Source: Company**

In addition to the above, area is available for extension of ash dyke / pond.

**Fly Ash System:** Out of four Ash Silos 2 nos silos designated for road transport are in operation. Two Nos Silo for rail transportation are under construction. All works of Silos are completed for Unit-2, 3 and 4. Fly ash is continuously filled through positive conveying system, ash evacuation and other regular operations are carried out on day to day basis. HCSD system is completed and in operation.

**Bottom Ash System:** Bottom ash disposal system for Unit # 2, 3 & 4 are completed and in operation.

**Ash Dyke:** All works are completed and dykes are in use.


**Ash Silos:** Four Nos of Ash Silos were envisaged, 2 nos is in operation (Road transport). Two Nos Silo for rail transportation under construction. Fly ash silo top is mounted with 2 Nos. of Bag filters to arrest fugitive dust.

KMPCL has made arrangements for the disposal / utilization of the Fly Ash generated from the power plant. KMPCL has made agreements with various companies to ensure the off-take of the Fly Ash.

As per the fly ash utilization statement send to regional office CECB by KMPCL for Jan 2020 month, cumulative fly ash utilization is 100% for Unit-3 & 4 (till Jan 2020 for the reporting year from Sep 2019 to Aug2020) and 72 % for Unit-2 (till Jan 2020 for reporting year from Feb 2019 to Jan-2020). Unutilized Fly ash is pumped to the Fly Ash Dyke from the Silo through a HCSD (High Concentrated Slurry Disposal) System.

#### **4.5 Water**

The Department of Water Resources, Government of Chhattisgarh vide their letter dated 23.06.2008 has approved the drawl of 73 MCM per year of water from River Mahanadi for the proposed Thermal power plant of 1750 MW. Further the project capacity was increased to 3600 MW and KMPCL applied for additional 27 MCM drawl permission. The Department of Water Resources, Government of Chhattisgarh vide their letter dated 01.12.2009 has approved the drawl of additional 27 MCM per year of water from River Mahanadi for the proposed Thermal power plant of 3600 MW.

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As per approval, company have to construct all necessary infrastructure (intake well, pump house, pipeline etc) for drawl and supply of water to the KMPCL plant on their own cost. Company has to install water metering arrangement at intake well. Land acquisition for water infrastructure shall be done by company at own cost and all land issues shall be addressed by company. Company has to follow R&R policy 2007 of Chhattisgarh state. Company have to pay for the quantity of water drawl as per water charges and commitment charges for industrial use of water published by Chhattisgarh Department of Water Resources.

Water required for the project is being drawn from Mahanadi River through intake pump house at Basantpur and Sheorinarayan Barrage, which is at a distance of approximately 60 km and 39 km respectively from the site.

The construction of water infrastructure work is being carried out by an SPV, KSK Water Infrastructure Pvt. Ltd. (KWIPL). The work comprises constructing an Intermediate Reservoir and three pumping stations one each at the Barrage sites and another at the Intermediate Reservoir. The Pumping stations are designated as PS-1, PS-2 & PS-3 for Basantpur, Sheorinarayan and Intermediate Reservoir, respectively. For details of the present status refer **Annexure 5** of the report.


Based on the WBD, the consumptive water requirement for the Power Project considering capacity of 6 x 600 MW with closed circulation type cooling with Induced Draft Cooling Towers is about 8257 m<sup>3</sup>/hr. KMPCL has total allocation of 100 MCM/year of water from WRD, Chhattisgarh. As per WBD, the water consumption of the plant is within the standard specified (3.5 m<sup>3</sup>/MWh) by the MoEF and Climate Change Notification dated 7th December, 2015. The raw water reservoir has been built inside the plant for a capacity of 12 lakh m<sup>3</sup>.

The Raw Water Analysis considered for the Plant design is tabulated below.

**Table 4-10: Design Raw Water Analysis**

Sr. No.	Parameter	Design
1	pH	8.4
2	Conductivity	600 µs/cm
3	Total Dissolved Solids (TDS)	400 mg/L
4	TH (As CaCO <sub>3</sub> )	185 mg/L
5	Ca - H (As CaCO <sub>3</sub> )	115 mg/L
6	Mg - H (As CaCO <sub>3</sub> )	70 mg/L
7	P - Alk (As CaCO <sub>3</sub> )	Nil mg/L
8	M - Alk (As CaCO <sub>3</sub> )	185 mg/L
9	Chloride (as Cl)	22 mg/L
10	SiO <sub>2</sub> (As SiO <sub>2</sub> )	8 mg/L (Non-reactive)
11	Turbidity	1000 (during Monsoon)

Note: 1 part per million (ppm) is equivalent to 1 milligram of the component per liter of water (mg/l)

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#### 4.6 Power Evacuation Arrangement

Power is stepped up from 22 kV (at Generator terminals) to 400 kV for evacuation through national grid. Each generator is connected to the 400 kV Switchyard through its associated step-up Generator Transformer (GT). One and half breaker scheme is envisaged at the switchyard. The power generated from this power station is fed to the grid through 400 kV 2xD/c Quad transmission system and connected to the PGCIL's 800 kV HVDC/765 kV/400 kV Champa pooling station at village Taga, Tehsil Akaltara.). At present all the power generated is being evacuated through KSK-Champa Ckt #3 and Ckt#4 line. Ckt#1 and #2 are under construction. The capacity of power transmission through these lines/bays is sufficient to cater to the power evacuation requirements of 3 Units in continuous operation.

##### Scheme envisaged for the entire Power Project:

'D' type configuration is envisaged for the switchyard. The substation will have the following feeders and one bus sectionalizer on each bus comprising breaker and isolator.


- Generator Transformer: 6 Nos.
- Station Transformer Bay: 3 Nos.
- Feeder Line: 5 Nos.

One switchyard control room is provided in switchyard. 400kV circuit breakers and isolators are controlled by DCS and/or SCADA. Electrically hard wired control panels are provided in switchyard control rooms. SCADA for switchyard control is located in switchyard control rooms for monitoring and control. Current, voltage, power, frequency are displayed at SCADA operation stations and also at DCS operator stations.

KMPCL has entered into Bulk Power Transmission Agreement (BPTA) with Power Grid Corporation of India Ltd. (PGCIL) on 24th February 2010

KMPCL has entered into Agreement for Long Term Access and with Power Grid Corporation of India Ltd. (PGCIL) as below:

- Long Term Access (LTA) for transfer of 1000 MW from generation project of KMPCL in Chhattisgarh to UP DISCOMs was granted on 29<sup>th</sup> July 2016 and valid upto 29<sup>th</sup> October 2041. Subsequently Agreement for Long Term Access was signed on 9th September 2016.
- Long Term Access (LTA) for transfer of 500 MW from generation project of KMPCL in Chhattisgarh to Tamil Nadu was granted on 22nd July, 2015 and valid upto 30<sup>th</sup> September 2028. Subsequently Agreement for Long Term Access was signed on 29th July, 2015.
- Medium Term Open Access granted on 10<sup>th</sup> December 2015( valid till 15/6/2019) for 14.5 MW, 19<sup>th</sup> August 2015 ( valid till 15/6/2019) for 347 MW and 08<sup>th</sup> September 2016 (valid till 31/12/2019) for 38.5 MW for transfer of power from generation project of KMPCL in Chhattisgarh to APSOCL & APEPDCL, AP.

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Subsequently Agreement for Medium Term Access was signed. MTOA is not valid at present.

Transmission Service Agreement (TSA) has been signed between PGCIL & KMPCL on 5<sup>th</sup> December 2012 for ISTS services.

KMPCL has entered into Power Supply Arrangements for selling power. Refer **Section 7.2** of this report for details of PPA.



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## 5.0 PLANT PERFORMANCE REVIEW

### 5.1 Performance Guarantee of the Project

In 6x600 MW Thermal Power Plant of M/s. KSK Mahanadi Power Company Limited, Boiler Turbine Generator (BTG) Island is supplied by SEPCO Electric Power Construction Corporation. KMPCL and SEPCO had agreed upon Various Performance Guarantee (PG) Parameters in supply contract. The unit performance guarantee of the Project is summarized below.

**Table 5-1 : Guaranteed Plant Performance Parameters**

Sr. no	Parameter description	Performance Guaranteed Value
1	Unit gross heat rate in kcal/kWh at rated steam parameters & 0.1 at a as exhaust pressure, with zero percent make up, at TMCR condition and at reference ambient parameters as per Technical Specifications	2239.77
2	Total auxiliary power consumption of all auxiliaries at TMCR condition (%)	7.017
3	SPM - mg/Nm <sup>3</sup> (with one field in each gas path out of service)*	50
4	Gross electrical power output at Generator terminals (MW)	600
5	Boiler steaming capacity at BMCR condition (tph)	2068
6	Unburnt Carbon in fly ash by weight (%) (Max)	1
7	Noise Level Guarantees-Average at 1m distance measured at 1.5m above ground in a free field condition*	85 dB(A)

\* No Liquidated damages

### 5.2 Plant Performance Test

Performance tests of Unit-3 & Unit-4 were conducted by SEPCO.

- Unit-3 Steam Performance test was carried out from 10/04/2015 to 15/04/2015, by SEPCO. Steam Generator Performance test were conducted as per the provisions of ASME PTC 4.0 (2008) Standard. Steam Turbine Performance test were conducted as per the provisions of ASME PTC 6 (2004) Standard.
- Unit-4 Steam Performance test was carried out from 14/01/2016 to 19/01/2016, by SEPCO. Steam Generator Performance test were conducted as per the provisions of ASME PTC 4.0 (2008) Standard. Steam Turbine Performance test were conducted as per the provisions of ASME PTC 6 (2004) Standard.

SEPCO had demonstrated various performance parameters are summarized below:

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**Table 5-2 : Performance Test Summary for Unit-3**

S. No.	Test description	Unit of measurement	Contractual Guarantees	Unit #3 Test result
1	Unit Gross Heat Rate at rated steam parameters and 0.1 ata as exhaust pressure, with zero percentage makeup, at TMCR condition and at reference ambient parameters as per technical specifications	kcal/kWh	2239.77	2170.7
2	Total Auxiliary Power Consumption of all auxiliaries at TMCR condition	%	7.017	6.1
3	SPM with one field in each gas path out of service	mg/Nm3	50	7.5
4	Gross electrical power at Generator output terminals	MW	600	602.8
5	Boiler steaming capacity at BMCR condition	tph	2069	2069.7
6	Unburnt carbon in fly ash( Max)	%	< 1	0.4

**Table 5-3 : Performance Test Summary for Unit-4**


S. No.	Test description	Unit of measurement	Contractual Guarantees	Unit #4 Test results
1	Unit Gross Heat Rate at rated steam parameters and 0.1 ata as exhaust pressure, with zero percentage makeup, at TMCR condition and at reference ambient parameters as per technical specifications	kcal/kWh	2239.77	2152.91
2	Total Auxiliary Power Consumption of all auxiliaries at TMCR condition	%	7.017	6.35
3	SPM with one field in each gas path out of service	mg/Nm3	50	13.04
4	Gross electrical power at Generator output terminals	MW	600	604.3
5	Boiler steaming capacity at BMCR condition	tph	2069	2081
6	Unburnt carbon in fly ash( Max)	%	< 1	0.41

### 5.3 Plant Operational Performance

The operational performance of the Station from FY 2018-19 to FY 2020-21 (till Sep'2020) is tabulated below:

**Table 5-4: Plant Performance Details from FY 2018 to FY 2021 (till Sep'2020)**

Sr. No.	Particulars	FY 2018**	FY 2019	FY 2020	FY 2021 (Till Sep'2020)
		Station *	Station *	Station *	Station *
1.	Scheduled Generation (MUs)	5306.53	7266.65	9538	5498
2.	Actual Generation - Gross (MUs)	5811.37	7872.33	10290	5939

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Sr. No.	Particulars	FY 2018**	FY 2019	FY 2020	FY 2021 (Till Sep'2020)
		Station *	Station *	Station *	Station *
3.	Net Dispatch (MUs)	5365.18	7278.81	9549	5512
4.	PAF (%)	76.6%	57.80%	80.10%	94.63%
5.	PLF (%)	53.6%	49.93%	65.08%	75.12%
6.	Auxiliary Power Consumption (%)	7.7%	7.54%	7.27%	7.21%
7.	Station Auxiliary Power Consumption (MUs)	449.11	593.52	747.78	427.95
8.	Station Heat Rate (kCal /kWh)	2411	2357	2403	2400
9.	Coal Consumption (Tonnes)	3737148	5018254	6574904	3908531
10.	Specific Coal Consumption (kg/kWh)	0.64	0.64	0.64	0.66
11.	Secondary Fuel Consumption (kL)	4284	3996.71	4356.64	1008.34
12.	Specific Secondary Fuel Oil Consumption (mL/kWh)	0.74	0.51	0.42	0.17
13.	Raw Water Consumption (m3)	12608733	15227337	19810371	13277384
14.	DM Water Consumption (Tonnes)	364785	338935	373657	189270
15.	Planned Outage (hrs)	933			38
16.	Forced Outage (hrs)	479	346	1598	345
17.	Reserve Shutdown (Plant available, power demand not available)	520	3350	-	-
18.	<b>Emission Details</b>				
	SOx (mg/Nm3)	659.16	590.85	1012.85	929.80
	NOx (mg/Nm3)	427.06	425.37	414.70	334.30
	SPM (mg/Nm3)	34.23	28.46	29.41	35.70
19.	<b>Stock</b>				
	Secondary Fuel Oil (kL)	1329	1021	1005	839
	Coal Stock (tonnes)	125702	169902	369708	104730
20.	<b>Ash</b>				
	Production (Tonnes)	1172338	1603065	2009021	1231854
	Utilization (Tonnes)	1051911	1634269	2200892	1334291

\* (Average / Summation -as applicable)

\*\* Unit-2 COD on 28<sup>th</sup> February, 2018

**Source: Company**

Unit wise performance for FY 2018, FY 2019, FY 2020 & FY 2021 (till Sep 2020) is captured in **Annexure -1** of the report.

#### 5.4 Generation Loss details

The factors caused generation loss is tabulated below. It can be inferred from the details that major generation loss is due to the Partial Loading and Unplanned Shutdown. Other factors for generation loss are tabulated below.

**Table 5-5 : Generation Loss details**

Particulars	YEAR 2017 - 18	YEAR 2018 - 19	YEAR 2019 - 20
Actual Generation(MUs)	5811	7872	10290
Planned Outages	12.24%	0.00%	0.05%
Forced Outages	5.89%	3.95%	18.14%
Partial Loading and Unplanned Shutdown	25.87%	46.12%	16.74%
Break Up of Forced Outages			
Boiler & Auxiliaries	0.00%	32.01%	0.00%
Boiler Tube Leakage	84.15%	62.79%	25.58%
Electrical	10.22%	0.51%	0.40%
Grid disturbance	0.00%	0.00%	0.00%
Turbine Generator	0.93%	1.05%	0.85%
Control & Instrumentation	0.00%	0.91%	0.30%
Operation	0.00%	0.22%	0.02%
Coal Handling	0.00%	0.00%	0.00%
Coal Shortage	4.33%	0.00%	36.65%
Transmission lines/Grid disturbance	0.38%	2.51%	0.13%
Local Unrest	0.00%	0.00%	36.06%

**Source: Company**

Refer Annexure -2 of the report for unit wise Generation Loss details for FY 2018, FY 2019 & FY 2020.


#### 5.5 Boiler Tube Leakage

Total 4 nos. of boiler tube leakages for Unit # 2, 16 nos. of boiler tube leakages for Unit # 3 and 14 nos. of boiler tube leakages for Unit # 4 have been occurred since commissioning till FY 2019-20. The incidents are tabulated below.

**Table 5-6 : Boiler Tube Leakage**

Serial No	Unit No	System Description	Year								Total no of tube leakage till date
			2013	2014	2015	2016	2017	2018	2019	2020	
1	U#2	Economiser	Unit #2 commissioned in 2018					-	-	-	0
2		LTSH						-	-	2	2
3		Water wall						1	-	-	1
4		SH System						-	-	-	0
5		RH System						1	-	-	1
Total											4
6	U#3	Economiser	2	-	-	-	1		-	-	3
7		LTSH		-	-	-		1	-	-	1
8		Water wall	1	-	1	2	2	3	-	-	9
9		SH System	-	-	-	-	-		1	-	1
10		RH System	-	1	-	-	-	1	-	-	2
Total											16
11	U#4	Economiser	Unit #4 commissioned in 2014	-	1		1	-	-	-	2
12		LTSH		-	-	-	-	-	-	-	0
13		Water wall		-	1	1	3	2	1	2	10
14		SH System		-	-	-	-	-	1	-	1
15		RH System		-	-	1	-	-	-	-	1
Total											14
Total no of tube leakage incident happened altogether in all 3 units											34

**Source: Company**

<b>Technical Study Report</b>	<b>6 X 600 MW Thermal Power Plant, M/s. KMPCL at Akaltara, Chhattisgarh.</b>	 <b>L&amp;T-S&amp;L</b> <b>L&amp;T – Sargent &amp; Lundy Limited</b>
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## 6.0 REVIEW OF O&M ARRANGEMENTS

O&M of plant is done in-house by KMPCL with the support of various O&M contractors.


### 6.1 O&M Contracts

To support the O&M of the plant various O&M contractors are engaged for carrying out the O&M activities of different areas. The list of the services for which O&M contractors are hired is tabulated below.

**Table 6-1: O&M Contracts**

<b>Sr. No.</b>	<b>Package Description</b>	<b>Agency Name</b>	<b>Contract Completion Date</b>
1	Ash Handling Plant (AHP)	Globus Engineers	31-Oct-21
2	Coal Handling Plant (CHP)	McNally Bharat	31-Oct-21
3	BTG & BOP (Non Water Block)-O&M Services	Power Mech Projects Limited	31-Jul-21
4	BOP-Chemistry O&M Services-Contract	Ion Exchange India Limited	31-Jul-21
5	Analysis of Coal & Ash Samples (outside Plant)	Therapeutics Chemical Research Corporation	30-Apr-21
6	Electrical and C&I Except CHP & AHP	Voltech O and M Services Pvt. Ltd	30-Jun-21
7	Coal and Ash Sampling (Inside Plant)	Quality Services and Solutions	31-Jul-21
8	Occupational Health Centre (OHC)	Renuka Diagnosis	31-Jul-21
9	Coal Yard Management, Coal Quality & Quality Management and Crushing of coal	Refex Industries Limited	30-Apr-21
10	O&M Special Services of BTG & it's Auxiliaries of 3 Units	Operational Energy Group India Ltd	30-Apr-21
11	O&M Special Services of BOP (Excluding CHP & AHP) of 3 Units	Operational Energy Group India Ltd	30-Apr-21
12	O&M Special Services of C&I systems of BTG & BOP (Excluding CHP & AHP) of 3 Units	Operational Energy Group India Ltd	30-Apr-21
13	O&M Special Services of Electrical systems of BTG & BOP (Excluding CHP & AHP) of 3 Units	Operational Energy Group India Ltd	30-Apr-21
14	Facility Management Services	Operational Energy Group India Ltd	30-Sep-21
15	O&M Services of PS-1, Plant end switchyard, pipeline and Transmission Line Electrical systems of BTG & BOP (Excluding CHP & AHP) of 3 Units	ACB(INDIA) Power Limited	31-May-21
16	Private Railway Siding	ACB(INDIA) Power Limited	31-May-21
17	O&M of 400kV Double Circuit Line (Water)	ACB(INDIA) Power Limited	31-May-21
18	Disposal of Fly Ash	Ramky Infrastructure Limited	31-May-21
19	Disposal of Pond Ash	Ramky Infrastructure Limited	31-May-21
20	Post Project Environmental Monitoring Studies	Vimta Labs Limited	31-Mar-21
21	Round the clock Security Services for Open Material Store Yard Area Inside Plant	Megha Security Services	30-Jun-21

**Source: Company**

<b>Technical Study Report</b>	<b>6 X 600 MW Thermal Power Plant, M/s. KMPCL at Akaltara, Chhattisgarh.</b>	 <b>L&amp;T-S&amp;L</b> <b>L&amp;T – Sargent &amp; Lundy Limited</b>
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## 6.2 Maintenance Practices

### 6.2.1 Plant Preventive Maintenance

KMPCL has implemented well laid out preventive maintenance schedule for the plant. The schedule is prepared covering the BTG and BoP area, Coal Handling Plant (CHP) and Ash Handling Plant (AHP). The PM schedule identifies the equipment and pertaining area, frequency (days, weekly, monthly, quarterly), planned date, responsible agency and whether the PM is to be carried out offline or online. Also online equipment checking list is prepared for the boiler and auxiliaries identifying the equipment and checking frequency.

The PM schedule is being maintained by the respective maintenance HODs and O&M contractors. Daily, the next day PM schedule is planned and communicated to the operation department for the required permits and isolation.

### 6.2.2 Condition Monitoring

In KMPCL, regular condition monitoring is being carried out in the following areas.

1. Vibration Measurement of rotating equipment
2. Lube Oil analysis
3. Turbine vibration
4. Thermography of Switch yard equipment
5. Coal heap temperature measurement at various locations and checking for the smoke from the heaps
6. Moisture level in the HFO and LDO Tanks
7. Temperature measurement of steam lines for the insulation effectiveness
8. Noise level of various equipment and at various places in the plant
9. Dissolved Gas Analysis (DGA) of Transformer Oil

### 6.2.3 Major Overhaul Plan

It is informed that no overhauling was carried out on any of the major equipment since commissioning. Equipment overdue for overhaul as per OEM recommendation is as below.

- Generator
- HT motors
- MV breakers
- Switchyard equipment
- Major LT motors

KMPCL informed that overhauling of Unit # 4 is planned in December 2020.



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### 6.3 In house repair /reclamation capabilities/ workshop

Workshop tools & tackles is not supplied by SEPCO. KMPCL has erected workshop equipment as per requirement. Small lathe machine, drilling and welding machine is available at workshop for small works. As per scope of supplies of SEPCO below are the major Workshop equipment.

- Lathes -03 Nos
- Drilling Machines-05 Nos
- Grinding Machines/ Milling Machines-05 Nos
- Bending and Shearing Machine-03 Nos
- Press- 02 Nos
- Hydraulic hacksaw-01 Nos
- Power hacksaw-01 Nos
- Pipe threading-01 Nos
- Balancing equipment- 01 Set
- Welding Machines- 06 Set
- Shaper-01 Nos
- Other general equipment for machine shop and paint shop

### 6.4 Documentation system

SAP system is not implemented in the plant. Simulator for training is not available in the plant. Engineering and other technical documents are maintained in soft and hard copies. O&M manuals are available for plant operators for training. SOP and other technical documents are available at KMPCL as on 12.09.20 is as below:

**Table 6-2: Documentation Availability Status**

S. No	Name of Document	Hard / Soft copy
1	Installation and O&M Manuals	Yes
2	Vendor Drawings (All packages)	Yes
3	A-Built Drawings (U#3 & #4)	Yes
4	RFC Construction Drawings	Yes
5	Design Change Notes (DCNs - Project)	Yes
6	Design Basis Reports (DBR)	Yes
7	Steel Structures Drawings	Yes
8	Commissioning Protocols	Yes
9	Erection Protocols	Yes
10	Systems Handing over Protocols	Yes
11	Statutory Drawings / Documents	Yes
12	SOP (English)	Yes
13	SMP (English)	Yes
14	Software CDs	Yes
15	O&M contracts documents	Yes
16	Contractor MIS Reports	Yes
17	Ordering specifications	Yes
18	Technical Books	Hard copy

**Source- Company**

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## 6.5 Review of Spares Management

### 6.5.1 Review of the Spares and Inventory

KMPCL is holding the spares inventory majorly for the regular and exigency spares covering following areas / departments.


1. Administration
2. Ash Handling Plant
3. Boiler
4. Balance of Plant
5. Control & Instrumentation
6. Chemistry
7. Coal handling Plant
8. Civil
9. Coal Logistics
10. Electrical
11. Horticulture
12. IT
13. Operation
14. Railway
15. Safety
16. Turbine Generator
17. Workshop

The reported value of the inventory spares as on 31.08.2020 is Rs. 50.06 Crore. Spares are categorized as Capital spares, Regular Spares, Common Spares and other Spares / material.

Dependence of Chinese/overseas suppliers for operation of plant and possibility of procurement of spare parts from various other/ indigenous suppliers is to be explored for BTG equipment. KMPCL has identified alternate indigenous suppliers for Electrical equipment. For AHP, KMPCL have identifies most of the equipment spares, which can be developed in India subject to development of detail drawing by vendor/KMPCL. For CHP, KMPCL have identified alternate probable vendors for most of the equipment. However, procurement of spare parts from indigenous suppliers is to be explored for CHP equipment.

## 6.6 Major Equipment Non Availability

Major plant equipment not available for Unit-2, 3 & 4 and Phase-1 & 2 BoP is summarized below:

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**Table 6-3: Major equipment non availability**

Sr. no.	Equipment not available	Remarks
<b>Unit-2</b>		
1	BCP- B	Sent for repairing to M/s : Torishima pump Pvt. Ltd., Bangalore
<b>Phase-1</b>		
	ECO HP pump Pump A	Pump is under maintenance.
2	TAC (04 no's out of 12 Nos for each Phase)	Cannibalize for smooth operation of Unit 2&3 TAC
<b>Phase-2</b>		
3	Service air compressor A	Spares awaited
4	Service air drier A	Spares awaited


**Source: Company**

Below is the list of major C&I systems/ software which are not commissioned/ obsolete and need to be upgraded

**Table 6-4: Major C&I system Issues**

Sno.	Description	Remarks
1	UNIT #3 DCS system running on Windows XP	Obsolescent, need to Up-Grade system
2	PHASE-1 Common System DCS system running on Windows XP	Obsolescent, need to Up-Grade system
3	UNIT #4 DCS System running on windows 7 for which support has ended	Obsolescent, need to Up-Grade system
4	PHASE-2 Common System DCS System running on windows 7 for which support has ended	Obsolescent, need to Up-Grade system
5	DCS network switches CISCO-2960 AND CISCO 3560 are obsolete	Obsolescent, need to Up-Grade system
6	All BOP systems running on windows XP	Obsolescent, need to Up-Grade system
7	BOP PLC controllers ( L61,62,63,64) are obsolete	Obsolescent, need to Up-Grade system
8	UNIT#3 & UNIT#4 ETS system (GE FANUC 90-70) is obsolete	Obsolescent, need to Up-Grade system
9	CPU AND SWAS analyser controller 9100 IS obsolete	Obsolescent, need to Up-Grade system
10	CCR LED display software system running on Windows XP which is obsolete	Obsolescent, need to Up-Grade system
11	MIS system	Not Commissioned
12	UNIT#2 TDBFP-B (MEH System-DROP 44) not commissioned since TDBFP-B not available	Not Commissioned
13	UNIT#2 COLTCS & COLTD system not commissioned	Not Commissioned
14	Unit#2 TDM system not commissioned	Not Commissioned


**Source: Company**

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### 6.6.1 Details of balance work and punch points for Operational Units

List of balance work which needs to be completed for smooth functioning of operational units and common systems under Offshore Supply Contract and Onshore service contract is listed below:

- Offshore Supply Contracts Unit-2 equipment not available
  - Boiler feed water pump sets with Hydraulic Coupling
  - BFP Turbine including Discharge pipe and Valves
  - Circulating Water Pump (Common standby for Unit #4, 5 & 6)
  - GT, ST, UT (pending is one single phase GT)
  - Bull Dozer(5 balance out of 11 no's), Fork lifts (CHP)
  - Workshop tools & tackles (Work shop tools)
- Onshore service contract balance works for Unit-2 Boiler area
  - Approach Platform for Boiler Unit #2. Around 42 platforms at different locations needs to be completed.
  - Boiler Insulation Punch Points
  - Insulation punch points ESP and Ducts
  - Auxiliary Structure Balance Punch points
  - Pressure Parts and piping related punch points
  - ESP Punch Points
  - Painting Punch points
  - Boiler Structure Punch points
- On shore service contract balance works for Unit-2 Turbine
  - LPMP Piping
    - Support Missing
    - Spring Hanger to be Installed in 31.5 Mtr
    - Drain Line Support Pending
    - Valve Spindle Cover not Installed
    - Pegging Steam Line Valve Motor Not Available
    - Aux Hdr All Connected line Vent lines to be extended up to floor
    - Aux Hdr Safety Valve Exhaust Line Drain Line not done
    - Drain Line Modification required as it is fouling with J1008 MOV.
    - Balance 16 Nos Main Joints to be completed.
    - Balance 7 Nos Main Joints to be completed.
    - Balance 4 Nos Main Joints to be completed.
    - Spray Line to TDBFP B to be completed
    - OCCW Line to TDBFP B Lube Oil Cooler Balance
    - Balance Support Erection.
    - All N2 Filling Lines needs to be erected.
    - Gland Steam Piping & Drainage pipe of TDBFP B balance
  - Critical Piping
    - BFD Balance Work
    - Rh Spray Line
  - CPU
    - Sluice Water Header Extension to Unit#1
  - Auxiliaries

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- Hoist hook erection work
- TDBFP-B Erection
- On shore service contract balance works for Unit-2 C&I
  - TDBFP B MTSI sensors installation pending
  - COLTCS Erection completed , commissioning pending
  - Condenser leak detection system Panel Erection to be done (Material not available) & Mechanical pipe line completion required.
  - TSI to TDM system communication establishment not done
  - Unit-2 communication with AMS PC not done
  - DMZ switch to OPC unit-2 cable connection not done
  - MOV (2/156 Balance)Erection and commissioning pending
  - PCV (1/52 Balance) Erection and commissioning pending
  - ON/OFF Valves (13/104 Balance) Erection and commissioning pending
  - Eco Ash Hopper cable dressing pending
- On shore service contract balance works for Unit-2 BoP
  - DM Plant & CW Pump
    - MHRSCC Erection 70T x 25000 per T.
    - ETP Clarifier Erection 30T x 25000 per T.
    - CW Stand by Pump for Unit# 2 (Pump House No. 1)
  - Fire Fighting System Unit #2 & common area
    - IGS System Balance work & commissioning in ECB 18.4 Mtrs EL (Boiler Distribution room and Electrical room) + EER 7.9 Mtrs TG Building room 2
    - DV House for Unit # 2
    - Hydrant system balance work in IDCT# 2
  - Cooling Tower
    - Fill Pack Replace (Complete)
    - Fill Pack (partial)
    - Tie Rod damaged (7 Cell @250 Nos.)
    - Fan Blade Damages (5 Nos.) Hoist
    - RC Duct Door (2 Nos.)
    - Piping sludge pump to Drain 150 dia
  - HVAC
    - Smoke fans commissioning
    - Supply & erection of auto Air vent
  - balance civil work at Main Plant Area for flooring, doors, window, handrail, painting, plaster, drain works, Roof treatment, connecting road etc
  - Balance works in Chimney # 2
    - Erection& commissioning of elevator including fixing door at all levels.
    - Brick work completed and finishing balance inside
    - Fixing of doors, windows & ventilators.
    - Erection of external platforms as per drawing.
    - RCC shell outside painting lvl 0.00 to lvl.220.00
    - Screeding with CC1:2:4
    - Glass fiber reinforced plastic (5 layer construction)- 90% completed.


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- 50mm Acid resistant unglazed tile and acid resistant colloidal cement caulking-90% completed.
- Inside floor finishing.
- Entrance column, brickwork and door fixing.
- Repairs of insulation in all flue cans.
- Balance Plant buildings and works
  - Admin Building
  - Canteen Building
  - Cycle Shed
  - Car Shed
  - Plant Service Building
  - Bull Dozer Shed
  - Loco Shed
  - Toilet Block
  - External painting works for all building
  - Sewage line works (50% balance)
  - Rail Unloading Pump House & pipe rack

Major balance Non – EPC works

- The water reservoir inside the plant is completed and the construction work of intermediate reservoir with balance minor works are pending by SPV.
- Second DC Transmission line (Ckt#1 and #2) from Power Plant to PGCIL Champa is under construction.
- Railway Siding by SPV



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Sl. No.	Equipment / system	Present status	
<b>Equipment Non Availability Unit-2 &amp; Common Area</b>			
1	BCP- B	BCP Motor Sent for repairing not available at site.	
2	TDBFP -B	BFP Turbine including accessories not supplied at site. Erection pending.	
3	CW Pump (Common standby for Unit #1, 2 & 3)	CW Pump (Common standby for Unit #1, 2 & 3) not available at site	
4	Boiler Lift	Not erected	
5	ECO HP Pump A	Eco HP water Pump 2A commissioned & it was in operational .Now Pump & motor are under maintenance.	



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Sl. No.	Equipment / system	Present status	
6	TAC (Each Phase 12 Nos.) Ph. 1	All 12 Nos. Compressors Commissioned, cannibalize for smooth operation of Unit 2&3	
7	APH water washing pump-A & B Ph 1 & Ph 2	2 Nos APH Wash Pump Erection completed with piping, Commissioning pending for Ph1. 2 Nos. Supplied. Yet to be erected for Ph 2.	
8	Slurry pump C for Ph2 common (Unit - 4,5,6)	Pump Erection completed. Not yet commissioned	
9	TAC (Each Phase 12 Nos.) Ph -2	4 Nos Compressor commissioned, 5 to 12 Compressor installed commissioning pending.	

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## 7.0 REVIEW OF PROJECT COMMERCIAL AGREEMENTS


### 7.1 Review of Fuel Supply Arrangements

#### 7.1.1 Fuel Supply Agreement (Coal Source - IB Valley)

KSK Mahanadi Power Company Limited (KMPCL) has signed Fuel Supply Agreement (FSA) with Mahanadi Coalfields Limited (MCL) on March 10, 2018.


The Salient features of FSA are as below:

Annual Contracted Quantity (ACQ)	The Annual Contracted Quantity of Coal agreed to be supplied by the Seller and undertaken to be purchased by the Purchaser shall be 11,00,000 (Eleven Lakh) tonnes per year.									
Delivery Point	Any of the collier sidings or Colliery Loading Point, as the case may be, in the designated Coal mines of the Seller as per Schedule I of CSA.									
Period of Agreement	This Agreement shall, unless terminated in accordance with the terms hereof, remain in force till the balance maximum life of the Specified End Use Plant or the date of expiry or the date of termination of the Amended PPA, whichever is earlier.									
Mode of Transport	Rail / Road / Captive									
Sources of Supply	IB (Ib Valley & Basundhara)									
Quarterly Quantity (QQ)	1 <sup>st</sup> Quarter (Apr-Jun) – 25% of ACQ 2 <sup>nd</sup> Quarter (Jul-Sep) – 22% of ACQ 3 <sup>rd</sup> Quarter (Oct-Dec) – 25% of ACQ 4 <sup>th</sup> Quarter (Jan-Mar) – 28% of ACQ									
Schedule Quantity (SQ)	The monthly Scheduled Quantity (SQ) shall be one third (1/3 <sup>rd</sup> ) of the QQ.									
End-use of Coal	The total quantity of Coal supplied pursuant to this Agreement is strictly meant for use and consumption by KSK Mahanadi Power Company Limited located at Nariyara, Tehsil- Akaltara, Dist- Janjgir-Champa, Chhattisgarh.									
Compensation for short delivery / lifting	Percentage of Penalty for failed quantity (at the rate of weighted average of Notified Prices of Grades of coal supplied) is as below: <table><tr><th>Level of Delivery / Lifting of Coal in a Year</th><th>Percentage Penalty</th></tr><tr><td>Below 75% but up to 65% of ACQ</td><td>0 – 10</td></tr><tr><td>Below 65% but up to 50% of ACQ</td><td>10 – 40</td></tr><tr><td>Below 50% of ACQ</td><td>40</td></tr></table>		Level of Delivery / Lifting of Coal in a Year	Percentage Penalty	Below 75% but up to 65% of ACQ	0 – 10	Below 65% but up to 50% of ACQ	10 – 40	Below 50% of ACQ	40
Level of Delivery / Lifting of Coal in a Year	Percentage Penalty									
Below 75% but up to 65% of ACQ	0 – 10									
Below 65% but up to 50% of ACQ	10 – 40									
Below 50% of ACQ	40									
Performance Incentive	If the Seller delivers Coal to the Purchaser in excess of ninety (90%) of the ACQ in a particular year, the purchaser shall pay the Seller an incentive for the excess coal supplied: <table><tr><th>Percentage of Actual deliveries</th><th>Percentage of Incentive</th></tr><tr><td>Above 90% but up to 95% of ACQ</td><td>0 -10</td></tr><tr><td>Above 95% but up to 100% of ACQ</td><td>10 – 20</td></tr></table>		Percentage of Actual deliveries	Percentage of Incentive	Above 90% but up to 95% of ACQ	0 -10	Above 95% but up to 100% of ACQ	10 – 20		
Percentage of Actual deliveries	Percentage of Incentive									
Above 90% but up to 95% of ACQ	0 -10									
Above 95% but up to 100% of ACQ	10 – 20									
Price of Coal	Sum of Notified Price, Other Charges and Statutory Charges as applicable at the time of delivery of Coal									

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	<ul style="list-style-type: none"> <li>- The Purchaser shall pay the Notified Price in accordance with the provisions of this Agreement.</li> <li>- Transportation charges: Where coal is transported by the Seller from the Pithead to the Delivery Point, the purchaser shall pay transportation charges.</li> <li>- Sizing / Crushing charges: Where Coal is crushed / sized for limiting the top-size, the purchaser shall pay sizing / crushing charges.</li> <li>- Rapid Loading charges: Where coal is loaded through rapid loading system, the purchaser shall pay rapid loading charges.</li> <li>- Any other applicable charges: Any other applicable charges as notified by CIL / Seller from time to time.</li> <li>- Statutory Charges: The statutory charges shall become effective and payable by the Purchaser from date as notified by the relevant Government / Statutory Authority.</li> </ul> <p>In all cases, the entire freight charges, irrespective of the mode of transportation of the Coal supplied, shall be borne by the purchaser.</p>
Compensation – Excess Surface Moisture	<ul style="list-style-type: none"> <li>• In the event that Monthly weighted average Surface Moisture in Coal exceeds seven percent (7%) during the Months from October to May and nine percent (9%) during the Months from June to September, the Seller shall give credit note on account of quantity equivalent to excess Surface Moisture, calculated at the rate of the weighted average Notified Price of analyzed Grade(s) of Coal and Other Charges.</li> <li>• The said compensation shall not include railway freight and Statutory Charges.</li> </ul>
Quality of Coal	Indicative rage of Grade(s) – G12 to G14.
Termination in Event of Default	<p>Major Event of Default events are as below:</p> <ul style="list-style-type: none"> <li>• In the event that the Level of Delivery (LD) falls below thirty percent (30%) or the Level of Lifting (LL) falls below thirty percent (30%), the Purchaser or the Seller as the case may be, shall have the right to terminate this Agreement.</li> <li>• In the event that either Party suffers insolvency, appointment of liquidator (provisional or final), appointment of receiver of any of material assets, levy of any order of attachment of the material assets, or any order or injunction restraining the Party from dealing with or disposing of its assets and such order having been passed is not vacated within sixty (60) days, the other Party shall be entitled to terminate this Agreement.</li> </ul>

*Note: The total capacity of the plant as per the documents submitted by M/s KSK Mahanadi Power Company Limited is 3600 MW (6X600 MW). However, as per the amended PPA and approval by CERC, the PPA capacity considered for grant of linkage under SHAKTI B (ii) policy is 2128 MW. So, supply of coal under this FSA will be made accordingly to Unit 3, Unit 4, Unit 2 & Unit 5 as stated in CEA's letter no. CEA/TPM-11/WR/CHH/10/2018/12 dated 08.01.2018.*


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### 7.1.2 Fuel Supply Agreement (Coal Source - Talcher)

KSK Mahanadi Power Company Limited (KMPCL) has signed Fuel Supply Agreement (FSA) with Mahanadi Coalfields Limited (MCL) on March 10, 2018.

The Salient features of FSA are as below:

Annual Contracted Quantity (ACQ)	The Annual Contracted Quantity of Coal agreed to be supplied by the Seller and undertaken to be purchased by the Purchaser shall be 20,700 (Twenty Thousand Seven Hundred) tonnes per year.								
Delivery Point	Any of the collier sidings or Colliery Loading Point, as the case may be, in the designated Coal mines of the Seller as per Schedule I of CSA.								
Period of Agreement	This Agreement shall, unless terminated in accordance with the terms hereof, remain in force till the balance maximum life of the Specified End Use Plant or the date of expiry or the date of termination of the Amended PPA, whichever is earlier.								
Mode of Transport	Rail / Road / Captive								
Sources of Supply	Talcher								
Quarterly Quantity (QQ)	1 <sup>st</sup> Quarter (Apr-Jun) – 25% of ACQ 2 <sup>nd</sup> Quarter (Jul-Sep) – 22% of ACQ 3 <sup>rd</sup> Quarter (Oct-Dec) – 25% of ACQ 4 <sup>th</sup> Quarter (Jan-Mar) – 28% of ACQ								
Schedule Quantity (SQ)	The monthly Scheduled Quantity (SQ) shall be one third (1/3 <sup>rd</sup> ) of the QQ.								
End-use of Coal	The total quantity of Coal supplied pursuant to this Agreement is strictly meant for use and consumption by KSK Mahanadi Power Company Limited located at Nariyara, Tehsil- Akaltara, Dist- Janjgir-Champa, Chhattisgarh.								
Compensation for short delivery / lifting	Percentage of Penalty for failed quantity (at the rate of weighted average of Notified Prices of Grades of coal supplied) is as below: <table border="1"> <thead> <tr> <th>Level of Delivery / Lifting of Coal in a Year</th><th>Percentage Penalty</th></tr> </thead> <tbody> <tr> <td>Below 75% but up to 65% of ACQ</td><td>0 – 10</td></tr> <tr> <td>Below 65% but up to 50% of ACQ</td><td>10 – 40</td></tr> <tr> <td>Below 50% of ACQ</td><td>40</td></tr> </tbody> </table>	Level of Delivery / Lifting of Coal in a Year	Percentage Penalty	Below 75% but up to 65% of ACQ	0 – 10	Below 65% but up to 50% of ACQ	10 – 40	Below 50% of ACQ	40
Level of Delivery / Lifting of Coal in a Year	Percentage Penalty								
Below 75% but up to 65% of ACQ	0 – 10								
Below 65% but up to 50% of ACQ	10 – 40								
Below 50% of ACQ	40								
Performance Incentive	If the Seller delivers Coal to the Purchaser in excess of ninety (90%) of the ACQ in a particular year, the purchaser shall pay the Seller an incentive for the excess coal supplied: <table border="1"> <thead> <tr> <th>Percentage of Actual deliveries</th><th>Percentage of Incentive</th></tr> </thead> <tbody> <tr> <td>Above 90% but up to 95% of ACQ</td><td>0 -10</td></tr> <tr> <td>Above 95% but up to 100% of ACQ</td><td>10 – 20</td></tr> </tbody> </table>	Percentage of Actual deliveries	Percentage of Incentive	Above 90% but up to 95% of ACQ	0 -10	Above 95% but up to 100% of ACQ	10 – 20		
Percentage of Actual deliveries	Percentage of Incentive								
Above 90% but up to 95% of ACQ	0 -10								
Above 95% but up to 100% of ACQ	10 – 20								
Price of Coal	Sum of Notified Price, Other Charges and Statutory Charges as applicable at the time of delivery of Coal <ul style="list-style-type: none"> <li>- The Purchaser shall pay the Notified Price in accordance with the provisions of this Agreement.</li> <li>- Transportation charges: Where coal is transported by the Seller from the Pithead to the Delivery Point, the purchaser</li> </ul>								

<b>Technical Study Report</b>	<b>6 X 600 MW Thermal Power Plant, M/s. KMPCL at Akaltara, Chhattisgarh.</b>	 <b>L&amp;T-S&amp;L</b> <b>L&amp;T – Sargent &amp; Lundy Limited</b>
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	<p>shall pay transportation charges.</p> <ul style="list-style-type: none"> <li>- Sizing / Crushing charges: Where Coal is crushed / sized for limiting the top-size, the purchaser shall pay sizing / crushing charges.</li> <li>- Rapid Loading charges: Where coal is loaded through rapid loading system, the purchaser shall pay rapid loading charges.</li> <li>- Any other applicable charges: Any other applicable charges as notified by CIL / Seller from time to time.</li> <li>- Statutory Charges: The statutory charges shall become effective and payable by the Purchaser from date as notified by the relevant Government / Statutory Authority.</li> </ul> <p>In all cases, the entire freight charges, irrespective of the mode of transportation of the Coal supplied, shall be borne by the purchaser.</p>
Compensation – Excess Surface Moisture	<ul style="list-style-type: none"> <li>• In the event that Monthly weighted average Surface Moisture in Coal exceeds seven percent (7%) during the Months from October to May and nine percent (9%) during the Months from June to September, the Seller shall give credit note on account of quantity equivalent to excess Surface Moisture, calculated at the rate of the weighted average Notified Price of analyzed Grade(s) of Coal and Other Charges.</li> <li>• The said compensation shall not include railway freight and Statutory Charges.</li> </ul>
Quality of Coal	Indicative range of Grade(s) – G12 to G14.
Termination in Event of Default	<p>Major Event of Default events are as below:</p> <ul style="list-style-type: none"> <li>• In the event that the Level of Delivery (LD) falls below thirty percent (30%) or the Level of Lifting (LL) falls below thirty percent (30%), the Purchaser or the Seller as the case may be, shall have the right to terminate this Agreement.</li> <li>• In the event that either Party suffers insolvency, appointment of liquidator (provisional or final), appointment of receiver of any of material assets, levy of any order of attachment of the material assets, or any order or injunction restraining the Party from dealing with or disposing of its assets and such order having been passed is not vacated within sixty (60) days, the other Party shall be entitled to terminate this Agreement.</li> </ul>

*Note: The total capacity of the plant as per the documents submitted by M/s KSK Mahanadi Power Company Limited is 3600 MW (6X600 MW). However, as per the amended PPA and approval by CERC, the PPA capacity considered for grant of linkage under SHAKTI B (ii) policy is 2128 MW. So, supply of coal under this FSA will be made accordingly to Unit 3, Unit 4, Unit 2 & Unit 5 as stated in CEA's letter no. CEA/TPM-11/WR/CHH/10/2018/12 dated 08.01.2018.*



<b>Technical Study Report</b>	<b>6 X 600 MW Thermal Power Plant, M/s. KMPCL at Akaltara, Chhattisgarh.</b>	 <b>L&amp;T-S&amp;L</b> <b>L&amp;T – Sargent &amp; Lundy Limited</b>
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### 7.1.3 Fuel Supply Agreement (Coal Source: Korea Rewa)

KSK Mahanadi Power Company Limited (KMPCL) has signed Coal Supply Agreement (CSA) with South Eastern Coalfields Limited (SECL) on March 12, 2018.

The Salient features of FSA are as below:

Annual Contracted Quantity (ACQ)	12,00,000 tonnes per year.								
Delivery Point	Any of the colliery sidings or Colliery Loading Point, as the case may be, in the designated Coal mines of the Seller.								
Period of Agreement	This Agreement shall, unless terminated in accordance with the terms hereof, remain in force till the balance maximum life of the Specified End Use Plant or the date of expiry or the date of termination of the Amended PPA, whichever is earlier.								
Mode of Transport	Road / Rail / Captive								
Sources of Supply	Korea Rewa								
Quarterly Quantity (QQ)	1 <sup>st</sup> Quarter (Apr-Jun) – 25% of ACQ 2 <sup>nd</sup> Quarter (Jul-Sep) – 22% of ACQ 3 <sup>rd</sup> Quarter (Oct-Dec) – 25% of ACQ 4 <sup>th</sup> Quarter (Jan-Mar) – 28% of ACQ								
Schedule Quantity (SQ)	The monthly Scheduled Quantity (SQ) shall be one third (1/3 <sup>rd</sup> ) of the QQ.								
End-use of Coal	The total quantity of Coal supplied pursuant to this Agreement is strictly meant for use and consumption by KSK Mahanadi Power Company Limited, 3600 MW (6x600 MW), located at Village Nariyara, Dist- Janjgir-Champa, Chhattisgarh.								
Compensation for short delivery / lifting	Percentage of Penalty for failed quantity (at the rate of weighted average of Notified Prices of Grades of coal supplied) is as below: <table border="1"> <thead> <tr> <th>Level of Delivery / Lifting of Coal in a Year</th><th>Percentage Penalty</th></tr> </thead> <tbody> <tr> <td>Below 75% but up to 65% of ACQ</td><td>0 – 10</td></tr> <tr> <td>Below 65% but up to 50% of ACQ</td><td>10 – 40</td></tr> <tr> <td>Below 50% of ACQ</td><td>40</td></tr> </tbody> </table>	Level of Delivery / Lifting of Coal in a Year	Percentage Penalty	Below 75% but up to 65% of ACQ	0 – 10	Below 65% but up to 50% of ACQ	10 – 40	Below 50% of ACQ	40
Level of Delivery / Lifting of Coal in a Year	Percentage Penalty								
Below 75% but up to 65% of ACQ	0 – 10								
Below 65% but up to 50% of ACQ	10 – 40								
Below 50% of ACQ	40								
Performance Incentive	If the Seller delivers Coal to the Purchaser in excess of ninety (90%) of the ACQ in a particular year, the purchaser shall pay the Seller an incentive for the excess coal supplied: <table border="1"> <thead> <tr> <th>Percentage of Actual deliveries</th><th>Percentage of Incentive</th></tr> </thead> <tbody> <tr> <td>Above 90% but up to 95% of ACQ</td><td>0 -10</td></tr> <tr> <td>Above 95% but up to 100% of ACQ</td><td>10 – 20</td></tr> </tbody> </table>	Percentage of Actual deliveries	Percentage of Incentive	Above 90% but up to 95% of ACQ	0 -10	Above 95% but up to 100% of ACQ	10 – 20		
Percentage of Actual deliveries	Percentage of Incentive								
Above 90% but up to 95% of ACQ	0 -10								
Above 95% but up to 100% of ACQ	10 – 20								
Price of Coal	<ul style="list-style-type: none"> <li>- Sum of Notified Price, Other Charges and Statutory Charges as applicable at the time of delivery of Coal</li> <li>- The Purchaser shall pay the Notified Price in accordance with the provisions of this Agreement.</li> <li>- Transportation charges: Where coal is transported by the Seller from the Pithead to the Delivery Point, the purchaser shall pay transportation charges.</li> <li>- Sizing / Crushing charges: Where Coal is crushed / sized for</li> </ul>								

<b>Technical Study Report</b>	<b>6 X 600 MW Thermal Power Plant, M/s. KMPCL at Akaltara, Chhattisgarh.</b>	 <b>L&amp;T-S&amp;L</b> <b>L&amp;T – Sargent &amp; Lundy Limited</b>
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	<p>limiting the top-size, the purchaser shall pay sizing / crushing charges.</p> <ul style="list-style-type: none"> <li>- Rapid Loading charges: Where coal is loaded through rapid loading system, the purchaser shall pay rapid loading charges.</li> <li>- Any other applicable charges: Any other applicable charges as notified by CIL / Seller from time to time.</li> <li>- Statutory Charges: The statutory charges shall become effective and payable by the Purchaser from date as notified by the relevant Government / Statutory Authority.</li> </ul> <p>In all cases, the entire freight charges, irrespective of the mode of transportation of the Coal supplied, shall be borne by the purchaser.</p>
Compensation – Excess Surface Moisture	<ul style="list-style-type: none"> <li>• In the event that Monthly weighted average Surface Moisture in Coal exceeds seven percent (7%) during the Months from October to May and nine percent (9%) during the Months from June to September, the Seller shall give credit note on account of quantity equivalent to excess Surface Moisture, calculated at the rate of the weighted average Notified Price of analyzed Grade(s) of Coal and Other Charges.</li> <li>• The said compensation shall not include railway freight and Statutory Charges.</li> </ul>
Quality of Coal	Indicative range – G5 to G7
Termination in Event of Default	<ul style="list-style-type: none"> <li>• In the event that the Level of Delivery (LD) falls below thirty percent (30%) or the Level of Lifting (LL) falls below thirty percent (30%), the Purchaser or the Seller as the case may be, shall have the right to terminate this Agreement.</li> <li>• In the event that either Party suffers insolvency, appointment of liquidator (provisional or final), appointment of receiver of any of material assets, levy of any order of attachment of the material assets, or any order or injunction restraining the Party from dealing with or disposing of its assets and such order having been passed is not vacated within sixty (60) days, the other Party shall be entitled to terminate this Agreement.</li> </ul>

*Note: (#)As per the Order dated 21.02.2018 of Central Electricity Regulatory Commission (CERC), M/s KSK Mahanadi Power Company Limited (KMPCL) has qualified for the total contracted capacity of 2128 MW (Gross quantum) under SHAKTI B(ii) Scheme. Further, CEA vide their letter No. 262/SHAKTI-B(ii)/CEA/TPPD/02 dated 02.0/2018 has provided the information of COD and balance life of the Power Plant for the 4 units out of 6x600 MW of KMPCL. Therefore, it has been considered that M/s KMPCL will supply the aforesaid contracted capacity i.e. 2128 MW (gross quantum) from the 4 units of KMPCL consisting of 600 MW each i.e. Unit- 3 (old name unit/), Unit- 4 (old name unit-2), Unit- 2 (old name unit-3) & Unit- 5 (old name unit-4) and the coal will be released to the extent of 100% capacity of the unit for which the LOI holder has achieved the Purchaser 's Condition Precedent (CP) as per the provisions of this FSA within the overall ACQ, in accordance with the clarification received from CIL vide feller No. CIL/M&SISHAKTI B(ii)/26 dated 11.01.2018.*



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#### 7.1.4 Fuel Supply Agreement (Coal Source: Korba & Mand-Raigarh)

KSK Mahanadi Power Company Limited (KMPCL) has signed Coal Supply Agreement (CSA) with South Eastern Coalfields Limited (SECL) on March 12, 2018.


The Salient features of FSA are as below:

Annual Contracted Quantity (ACQ)	45,00,000 tonnes per year.								
Delivery Point	Any of the colliery sidings or Colliery Loading Point, as the case may be, in the designated Coal mines of the Seller.								
Period of Agreement	This Agreement shall, unless terminated in accordance with the terms hereof, remain in force till the balance maximum life of the Specified End Use Plant or the date of expiry or the date of termination of the Amended PPA, whichever is earlier.								
Mode of Transport	Road / Rail / Captive								
Sources of Supply	Others (Korba & Mand-Raigarh)								
Quarterly Quantity (QQ)	1 <sup>st</sup> Quarter (Apr-Jun) – 25% of ACQ 2 <sup>nd</sup> Quarter (Jul-Sep) – 22% of ACQ 3 <sup>rd</sup> Quarter (Oct-Dec) – 25% of ACQ 4 <sup>th</sup> Quarter (Jan-Mar) – 28% of ACQ								
Schedule Quantity (SQ)	The monthly Scheduled Quantity (SQ) shall be one third (1/3 <sup>rd</sup> ) of the QQ.								
End-use of Coal	The total quantity of Coal supplied pursuant to this Agreement is strictly meant for use and consumption by KSK Mahanadi Power Company Limited, 3600 MW (6x600 MW), located at Village Nariyara, Dist- Janjgir-Champa, Chhattisgarh.								
Compensation for short delivery / lifting	Percentage of Penalty for failed quantity (at the rate of weighted average of Notified Prices of Grades of coal supplied) is as below: <table border="1"> <thead> <tr> <th>Level of Delivery / Lifting of Coal in a Year</th><th>Percentage Penalty</th></tr> </thead> <tbody> <tr> <td>Below 75% but up to 65% of ACQ</td><td>0 – 10</td></tr> <tr> <td>Below 65% but up to 50% of ACQ</td><td>10 – 40</td></tr> <tr> <td>Below 50% of ACQ</td><td>40</td></tr> </tbody> </table>	Level of Delivery / Lifting of Coal in a Year	Percentage Penalty	Below 75% but up to 65% of ACQ	0 – 10	Below 65% but up to 50% of ACQ	10 – 40	Below 50% of ACQ	40
Level of Delivery / Lifting of Coal in a Year	Percentage Penalty								
Below 75% but up to 65% of ACQ	0 – 10								
Below 65% but up to 50% of ACQ	10 – 40								
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Performance Incentive	If the Seller delivers Coal to the Purchaser in excess of ninety (90%) of the ACQ in a particular year, the purchaser shall pay the Seller an incentive for the excess coal supplied (at the rate of weighted average of Notified Prices of Grades of coal supplied): <table border="1"> <thead> <tr> <th>Percentage of Actual deliveries</th><th>Percentage of Incentive</th></tr> </thead> <tbody> <tr> <td>Above 90% but up to 95% of ACQ</td><td>0 -10</td></tr> <tr> <td>Above 95% but up to 100% of ACQ</td><td>10 – 20</td></tr> </tbody> </table>	Percentage of Actual deliveries	Percentage of Incentive	Above 90% but up to 95% of ACQ	0 -10	Above 95% but up to 100% of ACQ	10 – 20		
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Above 90% but up to 95% of ACQ	0 -10								
Above 95% but up to 100% of ACQ	10 – 20								
Price of Coal	Sum of Notified Price, Other Charges and Statutory Charges as applicable at the time of delivery of Coal <ul style="list-style-type: none"> <li>- The Purchaser shall pay the Notified Price in accordance with the provisions of this Agreement.</li> <li>- Transportation charges: Where coal is transported by the Seller from the Pithead to the Delivery Point, the purchaser shall pay transportation charges.</li> </ul>								

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	<ul style="list-style-type: none"> <li>- Sizing / Crushing charges: Where Coal is crushed / sized for limiting the top-size, the purchaser shall pay sizing / crushing charges.</li> <li>- Rapid Loading charges: Where coal is loaded through rapid loading system, the purchaser shall pay rapid loading charges.</li> <li>- Any other applicable charges: Any other applicable charges as notified by CIL / Seller from time to time.</li> <li>- Statutory Charges: The statutory charges shall become effective and payable by the Purchaser from date as notified by the relevant Government / Statutory Authority.</li> </ul> <p>In all cases, the entire freight charges, irrespective of the mode of transportation of the Coal supplied, shall be borne by the purchaser.</p>
Compensation – Excess Surface Moisture	<ul style="list-style-type: none"> <li>• In the event that Monthly weighted average Surface Moisture in Coal exceeds seven percent (7%) during the Months from October to May and nine percent (9%) during the Months from June to September, the Seller shall give credit note on account of quantity equivalent to excess Surface Moisture, calculated at the rate of the weighted average Notified Price of analyzed Grade(s) of Coal and Other Charges.</li> <li>• The said compensation shall not include railway freight and Statutory Charges.</li> </ul>
Quality of Coal	Indicative range – G10 to G15
Termination in Event of Default	<ul style="list-style-type: none"> <li>• In the event that the Level of Delivery (LD) falls below thirty percent (30%) or the Level of Lifting (LL) falls below thirty percent (30%), the Purchaser or the Seller as the case may be, shall have the right to terminate this Agreement.</li> <li>• In the event that either Party suffers insolvency, appointment of liquidator (provisional or final), appointment of receiver of any of material assets, levy of any order of attachment of the material assets, or any order or injunction restraining the Party from dealing with or disposing of its assets and such order having been passed is not vacated within sixty (60) days, the other Party shall be entitled to terminate this Agreement.</li> </ul>

*Note: (#) As per the Order dated 21.02.2018 of Central Electricity Regulatory Commission (CERC), M/s KSK Mahanadi Power Company Limited (KMPCL) has qualified for the total contracted capacity of 2128 MW (Gross quantum) under SHAKTI B(ii) Scheme. Further, CEA vide their letter No. 262/SHAKTI-B(ii)ICEA/TPPD/02 dated 02.0/2018 has provided the information of COD and balance life of the Power Plant for the 4 units out of 6x600 MW of KMPCL. Therefore, it has been considered that M/s KMPCL will supply the aforesaid contracted capacity i.e. 2128 MW (gross quantum) from the 4 units of KMPCL consisting of 600 MW each i.e. Unit- 3 (old name unit/), Unit- 4 (old name unit-2), Unit- 2 (old name unit-3) & Unit- 5 (old name unit-4) and the coal will be released to the extent of 100% capacity of the unit for which the LOI holder has achieved the Purchaser 's Condition Precedent (CP) as per the provisions of this FSA within the overall ACQ, in accordance with the clarification received from CIL vide feller No. CIL/M&SISHAKTI B(ii)/26 dated 11.01.2018.*

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## 7.2 Power Purchase Agreement and Evacuation Arrangement

KMPCL has signed power purchase agreements to sell power from its 6x600 MW Coal Fired Thermal Power Station as below:

KMPCL has entered into following Power Supply Arrangement for selling power.

- PPA signed with GUVNL for 1010 MW of power on 3rd June, 2010 (under sub judice with GSERC).
- PPA signed for 400 MW with APCPDCL on 31st July 2012.
- PPA signed for 5% net power generated from power project with Chhattisgarh State Power Trading Company Limited (CSPTTradeCo) on 18th October 2013.
- PPA signed for 500 MW with Tamil Nadu Generation and Distribution Company Limited (TANGEDCO) on 27th November 2013.
- PPA signed for 1000 MW with Uttar Pradesh Power Corporation Ltd. (UPPCL) on 26th February, 2014.

**Table 7-1: Power Supply Arrangements**


Sr. No.	Counter Party	Contracted Capacity	Original PPA Date	PPA Term / Expiry Date
1	GUVNL (under sub judice with GSERC).	1010 MW	3 <sup>rd</sup> June, 2010	25 years
2	APCPDCL	400 MW	31 <sup>st</sup> July, 2012	March 31, 2021
3	CSPTTradeCo	~90 MW (5% aggregate capacity of the Unit or the Power Station; 90 MW considering 3 units in operation)	18 <sup>th</sup> October, 2013	Perpetual existence without termination or determination by efflux of time or otherwise by any notice by either party till the operation of the Power Station.
4	TANGEDCO	500 MW	27 <sup>th</sup> November, 2013	15 years
5	UP Discom	1000 MW	26 <sup>th</sup> February, 2014	25 years

### 7.2.1 PPA – Gujarat Urja Vikas Nigam Limited (GUVNL)


KSK Mahanadi Power Company Limited (KMPCL) has entered into power purchase agreement with Gujarat Urga Vikas Nigam Limited (GUVNL) on 3<sup>rd</sup> June, 2010 to sell 1010 MW power.

Salient Features of the Power Purchase Agreement:


Terms	Description
<b>Aggregate Contracted Capacity</b>	Aggregate capacity of 1010 MW Contracted with Procurer for supply at the Interconnection Point from the Power Station's

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<b>Terms</b>	<b>Description</b>
	Net Capacity.
<b>Power Station</b>	KSK Mahanadi Power Company Limited power generation facility of installed capacity of 1800 MW, located at Nariyara Village in Akaltara Tehsil in Janjgir-Champa district in Chhattisgarh
<b>Power Station Net Capacity</b>	<ul style="list-style-type: none"> <li>1683 MW, being Installed Capacity of the Power Station measured at the bus-bar, reduced by the normative auxiliary power consumption as prescribed by CERC from time to time;</li> <li>In case of a dedicated transmission line connecting the bus-bar and the Interconnection Point, the Power Station's Net Capacity shall be 1616 MW, being the Installed Capacity of the Power Station measured at the Interconnection Point and reduced by the normative auxiliary power consumption and losses, if any, of such dedicated transmission line;</li> </ul>
<b>Allocation of Generation Capacity</b>	The Seller shall at all times provide 60.62% of the Power Station's Net Capacity to the Procurer
<b>Delivery Point</b>	CTU interface at the proposed 400/765 kV PGCIL pooling station to be located at District Jhanjgir-Champa in the State of Chhattisgarh
<b>Expiry Date</b>	Twenty fifth (25th) anniversary of the Delivery Date or such extended period as mutually agreed upon by both Parties
<b>Term of PPA</b>	This Agreement shall be valid for a term commencing from the Effective Date until the Expiry Date ("Term of Agreement"), unless terminated earlier pursuant to Article 2.3 (Early Termination). Upon the occurrence of the Expiry Date, this Agreement shall, subject to Article 2.4 (Survival), automatically terminate, unless mutually, extended by all the Parties on mutually agreed terms and conditions.
<b>Normative Availability</b>	Eighty five percent (85%) Availability of the Aggregate Contracted Capacity at the Interconnection Point on Contract Year basis.
<b>Interconnection Point</b>	Point where the power from the Power Station switchyard bus of the Seller is injected into the interstate/intrastate transmission system (including the dedicated transmission line connecting the Power Station with the interstate/intrastate transmission system)
<b>Injection Point</b>	Injection Point PGCIL 765/400 KV Champa Pooling Station in Chhattisgarh
<b>Minimum Offtake Guarantee</b>	Seventy (70%) percent of the Aggregate Contracted Capacity for the Procurer, during a Contract Year.

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<b>Terms</b>	<b>Description</b>
<b>Condition Subsequent by Seller</b>	<ul style="list-style-type: none"> <li>shall have executed the Fuel Supply Agreement and have provided a copy of the same to the Procurer(s)</li> <li>Seller shall have obtained all the necessary permission for the long term open access for the intrastate transmission system from the Power Station bus bar to the Injection Point</li> <li>shall have obtained the necessary permission for medium term open access for the transmission system from the Injection Point up to the Delivery Point</li> <li>shall have obtained all Consents, Clearances and Permits</li> </ul>
<b>Contract Performance Guarantee</b>	The Performance Guarantee furnished under this Agreement shall be for guaranteeing the commencement and continuity of the supply of power up to the Contracted Capacity within the time specified in this Agreement
<b>Major Obligations of the Seller</b>	<p>Major obligations of Seller are as below:</p> <ul style="list-style-type: none"> <li>obtaining all Consents, Clearances and Permits</li> <li>the commencement of supply of power, up to the Aggregated Contracted Capacity</li> <li>obtaining all the necessary permissions for the long term open access for the intrastate transmission system for evacuation of power</li> <li>Obtaining open access for transmission of Aggregated Contracted Capacity of power from the Injection Point to the Delivery Point</li> </ul>
<b>Seller's Event of Default</b>	<p>Seller's major Event of Defaults are as below:</p> <ul style="list-style-type: none"> <li>the failure to commence supply of power to the Procurer up to the Contracted Capacity</li> <li>after the Delivery Date, the interruption of power supply by the Seller for a continuous period of two (2) Months and such default is not rectified within thirty (30) Days from the receipt of first notice from the Procurer in this regard,</li> <li>After the Delivery Date, the Seller fails to achieve Normative Availability for a period of twelve (12) consecutive or Non-consecutive Months within any continuous period of thirty six (36) Months</li> <li>the Seller becomes voluntarily or involuntarily the subject of any bankruptcy or insolvency or winding up proceedings</li> </ul>
<b>Transmission / Wheeling Charges and RLDC / SLDC Charges</b>	<ul style="list-style-type: none"> <li>The payment of Transmission Charges I Wheeling Charges to the CTU/ STU, from the Injection Point to the Delivery Point shall be paid by the Seller and would be</li> </ul>

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<b>Terms</b>	<b>Description</b>
	reimbursed by the Procurer. <ul style="list-style-type: none"> <li>The payment of the RLDC/ SLDC charges shall be the responsibility of the Procurer.</li> </ul>
<b>Transmission Losses</b>	Transmission losses from the Interconnection Point onwards would be borne by the Procurer, and power lost on account of transmission loss would be to the account of the Procurer.
<b>Tariff</b>	<ul style="list-style-type: none"> <li>Tariff comprising the sum of Capacity Charge and Energy Charge.</li> <li>Quoted Tariff includes, Quoted Non Escalable Capacity Charges, Quoted Non Escalable Energy Charges and Quoted Non Escalable Inland Transportation Charges</li> </ul>
<b>Penalty for Availability below the 70%</b>	In case the Availability for a Contract Year is less than seventy percent (70%), the Seller shall pay a penalty at the rate of twenty (20%) percent of the simple average Capacity Charge (in Rs.lkWh) for all months in the Contract Year applied on the energy (in kWh) corresponding to the difference between the seventy percent (70%) and Availability during such Contract Year.

### 7.2.2 PPA – Andhra Pradesh DISCOMs

KSK Mahanadi Power Company Limited (KMPCL) has entered into power purchase agreement with Central Power Distribution Company of Andhra Pradesh Limited (APCPDCL), Eastern Power Distribution Company of Andhra Pradesh Limited (APEPDCL), Southern Power Distribution Company of Andhra Pradesh Limited (APSPDCL) and Northern Power Distribution Company of Andhra Pradesh Limited (APNPDCL) on 31<sup>st</sup> July, 2012 to sell 400 MW power.

KMPCL has been selected by the Authorized Representative under Competitive Bidding process.

Salient Features of the Power Purchase Agreement:

<b>Terms</b>	<b>Description</b>
<b>Aggregate Contracted Capacity</b>	Aggregate capacity of 400 MW Contracted with Procurer(s) for supply at the Interconnection Point from the Power Station's Net Capacity.
<b>Power Station</b>	KSK Mahanadi Power Company Limited power generation facility of installed capacity of 3,600 MW, located at Nariyara Village in Akaltara Tehsil in Janjgir-Champa district in Chhattisgarh
<b>Power Station Net Capacity</b>	<ul style="list-style-type: none"> <li>Installed Capacity of the Power Station measured at the bus-bar, reduced by the normative auxiliary power</li> </ul>



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<b>Terms</b>	<b>Description</b>
	<p>consumption as prescribed by CERC from time to time.</p> <ul style="list-style-type: none"> <li>In case of a dedicated transmission line connecting the bus-bar and the Interconnection Point, the Power Station's Net Capacity shall be 3,243 MW, being the Installed Capacity of the Power Station measured at the Interconnection Point and reduced by the normative auxiliary power consumption and losses, if any, of such dedicated transmission line;</li> </ul>
<b>Allocation of Generation Capacity</b>	The Seller shall provide Twelve point thirty three percent (12.33%) of the Power Station's Net Capacity to the Procurer(s)
<b>Delivery Point</b>	APTRANSCO Periphery
<b>Expiry Date</b>	15th June 2016 or such extended period as mutually agreed upon by both Parties.
<b>Term of PPA</b>	This Agreement shall be valid for a term commencing from the Effective Date until the Expiry Date ("Term of Agreement"), unless terminated earlier pursuant to Article 2.3 (Early Termination). Upon the occurrence of the Expiry Date, this Agreement shall, subject to Article 2.4 (Survival), automatically terminate, unless mutually, extended by all the Parties on mutually agreed terms and conditions.
<b>Normative Availability</b>	Eighty five percent (85%) for thermal power station. Availability of the Aggregate Contracted Capacity at the Interconnection Point on Contract Year basis.
<b>Interconnection Point</b>	Point where the power from the Power Station switchyard bus of the Seller is injected into the interstate/intrastate transmission system (including the dedicated transmission line connecting the Power Station with the interstate/intrastate transmission system)
<b>Injection Point</b>	Injection Point PGCIL 765/400 KV Champa Pooling Station in Chhattisgarh
<b>Minimum Offtake Guarantee</b>	Not applicable since the power station is not based on linkage-based coal/imported coal/domestic gas/imported LNG.
<b>Condition Subsequent by Seller</b>	<ul style="list-style-type: none"> <li>shall have executed the Fuel Supply Agreement and have provided a copy of the same to the Procurer(s)</li> <li>Seller shall have obtained all the necessary permission for the medium term open access for the intrastate transmission system from the Power Station bus bar to the Injection Point</li> <li>shall have obtained the necessary permission for medium term open access for the transmission system</li> </ul>



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<b>Terms</b>	<b>Description</b>
	<p>from the Injection Point up to the Delivery Point</p> <ul style="list-style-type: none"> <li>shall have obtained all Consents, Clearances and Permits</li> </ul>
<b>Contract Performance Guarantee</b>	The Performance Guarantee furnished under this Agreement shall be for guaranteeing the commencement and continuity of the supply of power up to the Contracted Capacity within the time specified in this Agreement
<b>Major Obligations of the Seller</b>	<p>Major obligations of Seller are as below:</p> <ul style="list-style-type: none"> <li>obtaining all Consents, Clearances and Permits</li> <li>the commencement of supply of power, up to the Aggregated Contracted Capacity</li> <li>obtaining all the necessary permissions for the long term open access for the intrastate transmission system for evacuation of power</li> <li>Obtaining open access for transmission of Aggregated Contracted Capacity of power from the Injection Point to the Delivery Point</li> <li>Execution of the Fuel Supply Agreement and providing the copy of the same to the Procurer(s) atleast 18 months prior to the Scheduled Delivery Date</li> </ul>
<b>Seller's Event of Default</b>	<p>Seller's major Event of Defaults are as below:</p> <ul style="list-style-type: none"> <li>the failure to commence supply of power to the Procurer(s) up to the Contracted Capacity</li> <li>after the Delivery Date, the interruption of power supply by the Seller for a continuous period of fifteen (15) Days and such default is not rectified within five (05) Days from the receipt of first notice from the Procurer(s) in this regard,</li> <li>After the Delivery Date, the Seller fails to achieve Normative Availability for a period of Six (6) consecutive or Non-consecutive Months within any continuous period of twelve (12) Months</li> <li>the Seller becomes voluntarily or involuntarily the subject of any bankruptcy or insolvency or winding up proceedings</li> </ul>
<b>Transmission / Wheeling Charges and RLDC / SLDC Charges</b>	<ul style="list-style-type: none"> <li>[In case the Seller is responsible for Open Access] The payment of Transmission Charges I Wheeling Charges to the CTU/ STU, from the Injection Point to the Delivery Point shall be paid by the Seller and would be reimbursed by the Procurer(s).</li> <li>The payment of the RLDC/ SLDC charges shall be the responsibility of the Procurer(s).</li> </ul>

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Terms	Description
<b>Transmission Losses</b>	Transmission losses from the Interconnection Point onwards would be borne by the Procurer(s), and power lost on account of transmission loss would be to the account of the Procurer(s).
<b>Tariff</b>	<ul style="list-style-type: none"> <li>Tariff comprising the sum of Capacity Charge and Energy Charge.</li> <li>The full Capacity Charges shall be payable based on the Contracted Capacity at Normative Availability and Incentive shall be provided for Availability beyond Normative Availability.</li> <li>Quoted tariff is as per Schedule 8 of PPA.</li> </ul>

Subsequent to the above PPA, KMPCL has entered into Agreement with APEPDCL and APSPDCL on December 19, 2014 for additional terms and conditions for the sale of power.


- As per this Agreement, the Expiry Date shall mean March 31, 2021 or such extended period as mutually agreed upon by both Parties.
- The Procurers appointed and authorized Southern Power Distribution Company of Andhra Pradesh Limited [as the "Lead Procurer"] to represent all the Procurers for discharging the rights and obligations of the Procurers under this Agreement which are required to be undertaken by all the Procurers and specifically with respect to inter se distribution of the Aggregate Contracted Capacity between the Procurers, with effect from 16 June 2016.
- The Quoted tariff includes, Quoted Non Escalable Capacity Charges and Quoted Non Escalable Energy Charges as mentioned at Annexure – 1 of this Agreement.

Further, Amendment to PPA has been entered between APEPDCL, APSPDCL and KMPCL on 23<sup>rd</sup> January 2018.

- KMPCL, having concluded PPA, participated in the coal linkage auction under the Shakti Policy ("Shakti Auction") and the Coal Companies namely Mahanadi Coalfields Limited (MCL) and South Eastern Coalfields Limited (SECL) have issued Letter of intent(s) on 21.12.2017, declaring KMPCL as Provisional Successful Bidder and allocated provisional quantity of coal subject to execution of the FSA from following sources:

**Table 7-2: FSA Coal Details**

Sr. No.	Source	Grade	Quantity allocated per Annum (MT)	Offered discount Rate (Paise/kWh)	LOI Reference No.
1	MCL Ib Valley and Basundhara, Odisha	G13	1100000	2.0	MCL/SBP/COMM/HOD(M&S)/2017-18/1993 dated 21.12.2017
2	MCL Talcher,	G13	20700	1.0	MCL/SBP/COMM/HOD(

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Sr. No.	Source	Grade	Quantity allocated per Annum (MT)	Offered discount Rate (Paise/kWh)	LOI Reference No.
	Odisha				M&S)/2017-18/1992 dated 21.12.2017
3	SECL Korea Rewa, Chhattisgarh	G6	1200000	2.0	SECL/BSP/M&S/FSA SHAKTI/LOI/7/85635/K MPCL/2843 dated 21.12.2017
4	SECL Others Korba and Mand Raigarh, Chhattisgarh	G12	4500000	4.0	SECL/BSP/M&S/FSA SHAKTI/LOI/8/85635/K MPCL/2844 dated 21.12.2017


- In accordance with Shakti Policy, Independent Power Producers ("IPPs") who have already concluded the Long Term Power Purchase Agreements ("PPAs") based on domestic coal are eligible to participate in the bidding process. The grant of coal linkage from each source will be based on the discount offered on the existing tariff (in paise / kWh) for the balance period of the PPA.
- As per the Shakti Policy, the discount offered by the generating companies would be adjusted from the gross amount of the monthly bill to be raised under PPA, based on approval of the Appropriate Authority. The discount would be computed with reference to linkage coal supplied and received under the Shakti Policy.
- As per Shakti Policy, each PPA is required to be amended or supplemented to pass on the aforesaid discount to the Procurer by adjustment from the bill raised thereunder, and further required to be approved by Appropriate Commission.
- This Agreement shall cease to be in effect, till 31<sup>st</sup> March, 2021 or till if there is, for any reason Whatsoever, a cessation or suspension of coal supply from all of the sources of coal listed under this Agreement in lieu of the aforementioned Shakti Scheme. However, the provisions of the concluded PPA entered into by the Parties shall continue to remain in effect up to contracted period.

Southern Power Distribution Company of Andhra Pradesh Limited has sent Notice of Termination dated 27.08.2020 to KMPCL for termination of PPA. Southern Power Distribution Company of Andhra Pradesh Limited asked KMPCL to submit reasons within 30 days for default in power supply as to why further steps towards termination of agreement should not be taken at the end of APDISCOMS.

### 7.2.3 PPA – Chhattisgarh State Power Trading Company Limited

KSK Mahanadi Power Company Limited (KMPCL) has entered into power purchase agreement with Chhattisgarh State Power Trading Company Limited (CSPTTradeCo) on 18<sup>th</sup> October, 2013 to sell 5% net power generated from power project.

KMPCL is setting up a coal based thermal Power Station of the Installed Capacity of 3600 MW (consisting of 600 MW x 6 Nos. of Units) at village Nariyara of Tehsil Akaltara in Janjgir-Champa District in Chhattisgarh.

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In the event of captive block located within Chhattisgarh is allocated to the Company then the Company shall supply additional 2.5% (over and above 5% power indicated) of the power generated by using coal from the captive coal block allotted to the Company.

Contracted Capacity of the plant in Mega Watt using coal supply of Coal linkage is 90 MW. The Contracted Capacity of the plant using supply of Captive Coal Block is 135 MW.


The Company has entered into Memorandum of Understanding (MOU) on 15.02.2008 with State Government of Chhattisgarh (GOCG) and erstwhile CSEB.

Pursuant to the provisions of the MOU, an Implementation Agreement (IA) has been entered with State Government of Chhattisgarh, CSPHCL (a successor company of CSEB) and KMPCL on 13.08.2009.


CSEB Transfer Scheme Rules-2010 has authorized CSPTradeco to act as authorized representative of the State Govt. and to execute the power purchase agreement with the developers of coal based thermal power projects coming under MoU route in Chhattisgarh.

Salient Features of the Power Sale Agreement with CSPTradeco:

<b>Terms</b>	<b>Description</b>
<b>Seller</b>	KSK Mahanadi Power Company Limited
<b>Procurer</b>	Chhattisgarh State Power Trading Company Limited (CSPTradeco)
<b>Date of PPA</b>	18th October, 2013
<b>Contracted Capacity</b>	5% or 7.5% (five / seven point five percent) of the aggregate capacity of the Unit or the Power Station.
<b>Contracted Energy</b>	kWh available ex-bus bar equivalent to 5% or 75% (five / seven point five percent) of the Electrical Output of the Unit or the Power Station.
<b>Delivery Point</b>	Outgoing gantry of the 400 kV bus of Power Station Switchyard. For Transmission of the Contracted Energy from the bus bar of Power Station of the Company upto connecting point of CTU, the wheeling charges for utilization of Company's transmission line shall be payable by CSPTradeco to the Company.
<b>Term of PPA</b>	Perpetual existence without termination or determination by efflux of time or otherwise by any notice by either party till the operation of the Power Station including any expanded, or increased capacity, additional units that may be established from time to time and continued to be operated through Renovation or Modernization or otherwise or till the resumption of the facilities by the GoCG for default or reasons attributable to the Company as provided in Agreement.

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<b>Terms</b>	<b>Description</b>
<b>Right to Contracted Energy</b>	The Contracted Energy to be provided at Energy Charge shall be computed based on scheduled generation of the Power Station. The quality of such power shall be firm power and at no time the Company shall be supplying such power less than ninety percentage (90%) of the percentage of the Contracted Energy. Further such percentage shall not be more than one hundred and ten percentage (110%) during the off-peak periods.
<b>Interconnection Point</b>	Physical point or points of the outgoing gantry of the Generating Station where the transfer of electrical power occurs for fulfilling the obligation of the Company to deliver the Contracted Capacity and Contracted Energy to CSPTrodcco
<b>Interface Metering Point</b>	The meters for measurement of Contracted Energy for the purpose of energy accounting and/or billing shall be provided at the Inter-connection Point(s) of the Company's Generating Station.
<b>RLDC / SLDC Charges</b>	The applicable RLDC / SLDC charges for the Scheduled Energy shall be in accordance with the CERC Regulations as amended from time to time and shall be payable by the CSPTTradeco to RLDC / SLDC.
<b>Payment Security Mechanism</b>	CSPTTradeco shall establish an unconditional irrevocable and revolving Letter of Credit (LC) in favour of the Company.
	LC has term equal to twelve (12) months and shall be renewed annually.
	LC be of a value equivalent to one hundred and five percent (105%) multiplied by one (1) month estimated I average billing (The average billing shall be computed on the basis of estimated energy supply at 85% load factor by the Company.
<b>Transmission Charges</b>	Transmission charges and Transmission losses as applicable to the Generator in accordance with the CERC Regulations shall be borne by the CSPTTradeco in addition to the transmission charges and losses applicable beyond Delivery Point.
<b>Transmission Loss</b>	All applicable transmission losses associated with the supply of Contracted Energy by the Company under this Agreement shall be borne by CSPTTradeco including the transmission losses.
	As Dedicated Transmission Line of the Company shall be utilized for transmission of CSPTTradeco power from point of supply to pooling sub-station of PGCIL, the transmission losses between the outgoing gantry of Power Station of the Company & pooling sub-station of PGCIL shall be shared by the Company and CSPTTradeco in the ratio of their share of power being transmitted.
<b>Seller Event of Default</b>	Major Seller Event of Default events are as below:
	After COD of all the Units of the Power Station, the Company fails to achieve Nonnative Availability for a period of twelve (12) consecutive Months or within a non-consecutive period of twelve (12) Months

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Terms	Description
	within any continuous aggregate period of thirty six (36) Months.
	After the COD of the Power Station the interruption in power supply, either in part or in full of the Contracted Capacity, by the Company for a continuous period of two (2) Months and such default is not rectified within thirty (30) days from the receipt of first notice from the CSPTadeco.
	In case Contracted Energy is not made available in full or part thereof by the Company as per the terms of this Agreement to CSPTadeco for reasons attributable to the Company for a period of equal to or more than Two (2) continuous months or four (4) non-continuous months in a Financial Year.
<b>Tariff</b>	Tariff means the Energy Charge / Variable Charge as determined in accordance with CERC Regulations.
	The Tariff determined in accordance with CERC Resolutions does not include any Electricity Duty / Cess or other such levy by the State Government. Currently applicable on the generation and/or sale of electricity and shall, if levied, be payable by CSPTadeco to the Company.

Supplemental Agreement is made and entered into at Raipur (Chhattisgarh) on this the 19<sup>th</sup> January 2018 between KMPCL and CSPTadeco.

- the Ministry of Coal, Government of India on 22.05.2017 announced a new coal allocation policy viz "Scheme for Harnessing and Allocating Koyla (Coal) Transparently in India" ("Shakti Policy") for the power sector for allocation of coal linkages by fading away the existing regime of LOA-FSA under New Coal Distribution Policy dated 18.10.2007 (NCDP).
- In accordance with Shakti Policy, Independent Power Producers ("IPPs") who have already concluded the Long Term Power Purchase Agreements ("PPAs") based on domestic coal are eligible to participate in the bidding process. The grant of coal linkage from each source will be based on the discount offered on the existing tariff (in paise / KWh) for the balance period of the PPA.
- As per the Shakti Policy, the discount offered by the generating companies would be adjusted from the gross amount of the monthly bill to be raised under the PPA, based on approval of the Appropriate Commission. The discount would be computed with reference to linkage coal supplied and received under the Shakti Policy.
- As per Shakti Policy, each PPA is required to be amended or supplemented to pass on the aforesaid discount to the Procurer by adjustment from the bill raised thereunder, and further required to be approved by Appropriate Commission.
- KMPCL, having existing PPAs, participated in the coal linkage auction under the Shakti Policy ("Shakti Auction") and the Coal Companies namely Mahanadi Coalfields Limited (MCL) and South Eastern Coalfields Limited (SECL) have issued



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Letter of Intent(s) on 21.12.2017, declaring KMPCL as Provisional Successful Bidder and allocating coal as indicated in Table 7.2 above.

#### 7.2.4 PPA – Tamil Nadu Generation and Distribution Corporation Limited

KSK Mahanadi Power Company Limited (KMPCL) has entered into power purchase agreement with Tamil Nadu Generation and Distribution Corporation Limited (TANGEDCO) on 27<sup>th</sup> November, 2013 to sell 500 MW power for a period of 15 years. This 500 MW PPA capacity was allotted to KMPCL under Case – 1 Tariff Based Competitive Bidding process.

Salient Features of the Power Sale Agreement with TANGEDCO:

<b>Terms</b>	<b>Description</b>
<b>Seller of Power</b>	KSK Mahanadi Power Company Limited
<b>Buyer of Power</b>	Tamil Nadu Generation and Distribution Corporation Limited
<b>Date of PPA</b>	27 <sup>th</sup> November, 2013
<b>Aggregate Contracted Capacity</b>	400 MW for supply at the Interconnection Point from Power Station's Net Capacity
<b>Contracted Capacity</b>	Shall mean the Aggregate Contracted Capacity; 500 MW
<b>Delivery Point</b>	TANGEDCO Periphery
<b>Delivery Date</b>	Date on which the Seller commences the supply of the Aggregate Contracted Capacity to the Procurer
<b>Expiry Date</b>	30 <sup>th</sup> September, 2028 (15 <sup>th</sup> ) Anniversary of the Delivery Date
<b>Term of PPA</b>	15 years
<b>Injection Point</b>	765/400 kV PGCIL Champa Pooling S/S at Chhattisgarh
<b>Primary Fuel</b>	Domestic Coal
<b>Interconnection Point</b>	765/400 kV PGCIL Champa Pooling S/S at Chhattisgarh
<b>Minimum Off take Guarantee</b>	65% of the Aggregate Contracted Capacity during the Contract Year.
<b>Normative Availability</b>	85% Availability of the Aggregate Contracted Capacity at the Interconnection Point on Contract Year basis.
<b>Power Station's Net Capacity</b>	3294 MW (3600 MW-8.5% of Auxiliary Consumption)
<b>Wheeling Charges or Transmission Charges and RLDC / SLDC Charges</b>	<ul style="list-style-type: none"> <li>Charges to be paid by the Seller and reimbursed by the Procurer as transmission tariff for usage of intervening CTU networks for the transmission of power from the Injection Point up to the Delivery Point.</li> <li>The payment of POC and Non POC Charges to the CTU, from the Injection Point to the Delivery Point shall be paid by the</li> </ul>



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Terms	Description
	<p>Seller and would be reimbursed by the Procurer.</p> <ul style="list-style-type: none"> <li>The payment of the RLDC/SLDC charges shall be the responsibility of the Procurer.</li> </ul>
<b>Major Obligations of the Seller</b>	<ul style="list-style-type: none"> <li>Obtaining all Consents, Clearances and Permits (other than those obtained under Article 3,1.1) and maintaining all Consents, Clearances and Permits in full force and effect during the Term of this Agreement;</li> <li>The commencement of supply of power, up to the Aggregated Contracted Capacity, to the Procurer not later than the Scheduled Delivery Date or the Revised Scheduled Delivery Date, as the case may be, such that as much of the Contracted Capacity as can be made available through the use of Prudent Utility Practices will be made available reliably to meet the Procurer's scheduling and dispatch requirements throughout the Term of the Agreement.</li> <li>Obtaining all the necessary permissions for the long term open access for the intrastate transmission system for evacuation of power from the Power Station bus bar to the Injection Point (except In case of dedicated transmission lines) and execute all necessary agreements for such transmission access and provide a copy of the same to the Procurer.</li> <li>Obtaining open access for transmission of the Aggregated Contracted Capacity of power from the Injection Point to the Delivery Point.</li> <li>Fulfilling all obligations undertaken by the Seller under the Agreement.</li> <li>Execution of the Fuel Supply Agreement and providing a copy of the same to the Procurer prior to the Scheduled Delivery Date.</li> </ul>
<b>Transmission Losses</b>	<p>Transmission losses from the Interconnection Point onward would be borne by the Procurer, and power lost on account of transmission loss would be to the account of the Procurer.</p>
<b>Seller Event of Default</b>	<p>Major Seller Event of Default events are as below:</p> <ul style="list-style-type: none"> <li>the failure to commence supply of power to the Procurer up to the Contracted Capacity, relevant to the Revised Scheduled Delivery Date(s) or the Scheduled Delivery Date, as the case may be, by the end of 6 months.</li> <li>The interruption of power supply by the Seller for a continuous period of "two (2) Months" and such default is not rectified within "thirty (30) Days" from the receipt of first notice from the Procurer in this regard.</li> <li>Fails to achieve Normative Availability for a period of "twelve (12)" consecutive or non-consecutive Months within any continuous period of 'thirty six (36) months'.</li> </ul>

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<b>Terms</b>	<b>Description</b>
<b>Tariff</b>	Tariff includes, Quoted Non Escalable Capacity Charges, Quoted Non Escalable Energy Charge, Quoted Escalable Energy Charges and Quoted Escalable Inland Transportation Charges.
<b>Incentive Payment</b>	Incentive at the rate of forty percent (40%) of the Quoted Non-Escalable Capacity Charges (in Rs./kWh) for such Contract Year subject to a maximum of twenty five (25) paise /kWh, shall be allowed on the energy (in kWh) corresponding to the Availability in excess of Eighty Five (85%).
<b>Penalty</b>	In case the Availability for a Contract Year is less than Eighty percent (80%), the Seller shall pay a penalty at the rate of twenty percent (20%) of the simple average Capacity Charge (in Rs./kWh) for all months in the Contract Year applied on the energy (in kWh) corresponding to the difference between Eighty (80%), and Availability during such Contract Year.


#### 7.2.5 PPA with Uttar Pradesh DISCOMs

KSK Mahanadi Power Company Limited (KMPCL) has entered into power purchase agreement with Paschimanchal Vidyut Vitran Nigam Limited, Purvanchal Vidyut Vitran Nigam Limited, Madhyanchal Vidyut Vitran Nigam Limited and Dakshinanchal Vidyut Vitran Nigam Limited on 26<sup>th</sup> Feb, 2014 to sell 1000 MW power.


KMPCL has been selected by the Authorized Representative under Competitive Bidding process.

Salient Features of the Power Purchase Agreement:

<b>Terms</b>	<b>Description</b>
<b>Aggregate Contracted Capacity</b>	Aggregate capacity of 1000 MW Contracted with Procurer(s) for supply at the Interconnection Point from the Power Station's Net Capacity. <ul style="list-style-type: none"> <li>• Paschimanchal Vidyut Vitran Nigam Limited – 350 MW</li> <li>• Purvanchal Vidyut Vitran Nigam Limited – 216.67 MW</li> <li>• Madhyanchal Vidyut Vitran Nigam Limited - 216.67 MW</li> <li>• Dakshinanchal Vidyut Vitran Nigam Limited - 216.67 MW</li> </ul>
<b>Power Station Net Capacity</b>	<ul style="list-style-type: none"> <li>• 3600 MW, being Installed Capacity of the Power Station measured at the bus-bar, reduced by the normative auxiliary power consumption as prescribed by CERC from time to time.</li> <li>• In case of a dedicated transmission line connecting the bus-bar and the Interconnection Point, the Power Station's Net Capacity shall be 3,294 MW, being the Installed Capacity of the Power Station measured at the Interconnection Point and reduced by the normative auxiliary power consumption and</li> </ul>

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<b>Terms</b>	<b>Description</b>
	losses, if any, of such dedicated transmission line;
<b>Allocation of Generation Capacity</b>	The Seller shall provide Thirty point thirty three five eight percent (30.358%) of the Power Station's Net Capacity to the Procurer(s)
<b>Delivery Point</b>	As mentioned in Schedule I of PPA
<b>Expiry Date</b>	Twenty fifth (25th) anniversary of the Delivery Date or such extended period as mutually agreed upon by both Parties.
<b>Normative Availability</b>	Eighty five percent (85%) Availability of the Aggregate Contracted Capacity at the Interconnection Point on Contract Year basis.
<b>Interconnection Point</b>	Point where the power from the Power Station switchyard bus of the Seller is injected into the interstate/intrastate transmission system (including the dedicated transmission line connecting the Power Station with the interstate/intrastate transmission system)
<b>Injection Point</b>	Injection Point PGCIL 765/400 KV Champa Pooling Station in Chhattisgarh
<b>Minimum Offtake Guarantee</b>	Sixty Five percent (65%) of the Aggregate Contracted Capacity for all Procurer taken together
<b>Condition Subsequent by Seller</b>	<ul style="list-style-type: none"> <li>Seller shall have obtained all the necessary permission for the long term open access for the transmission system from the Injection Point up to the Delivery Point</li> <li>shall have obtained the necessary permission for long term open access for the intrastate transmission system from the Power Station bus bar to the Injection Point (except in case of dedicated transmission lines)</li> <li>shall have obtained all Consents, Clearances and Permits</li> </ul>
<b>Contract Performance Guarantee</b>	The Performance Guarantee furnished under this Agreement shall be for guaranteeing the commencement and continuity of the supply of power up to the Contracted Capacity within the time specified in this Agreement
<b>Major Obligations of the Seller</b>	<p>Major obligations of Seller are as below:</p> <ul style="list-style-type: none"> <li>obtaining all Consents, Clearances and Permits</li> <li>the commencement of supply of power, up to the Aggregated Contracted Capacity</li> <li>obtaining all the necessary permissions for the long term open access for the intrastate transmission system for evacuation of power</li> <li>Obtaining open access for transmission of Aggregated Contracted Capacity of power from the Injection Point to the Delivery Point</li> <li>Execution of the Fuel Supply Agreement and providing the copy of the same to the Procurer(s) at least 18 months prior to</li> </ul>

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<b>Terms</b>	<b>Description</b>
	the Scheduled Delivery Date
<b>Seller's Event of Default</b>	<p>Seller's major Event of Defaults are as below:</p> <ul style="list-style-type: none"> <li>the failure to commence supply of power to the Procurers up to the Contract Capacity</li> <li>after the Delivery Date, the interruption of power supply by the Seller for a continuous period of two (2) Months and such default is not rectified within thirty (30) Days from the receipt of first notice from the Procurers in this regard,</li> <li>After the Delivery Date, the Seller fails to achieve Normative Availability for a period of twelve (12) consecutive or Non-consecutive Months within any continuous period of thirty six (36) Months</li> <li>the Seller becomes voluntarily or involuntarily the subject of any bankruptcy or insolvency or winding up proceedings</li> </ul>
<b>Transmission / Wheeling Charges and RLDC / SLDC Charges</b>	<ul style="list-style-type: none"> <li>The payment of Transmission Charges / Wheeling Charges to the CTU / STU from Injection Point to the Delivery Point shall be paid by the Seller and would be reimbursed by the Procurers.</li> <li>The payment of the RLDC/ SLDC charges shall be the responsibility of the Procurers.</li> </ul>
<b>Transmission Losses</b>	Transmission losses from the Interconnection Point onwards would be borne by the Procurers, and power lost on account of transmission loss would be to the account of the Procurers.
<b>Tariff</b>	<ul style="list-style-type: none"> <li>Tariff comprising the sum of Quoted Non Escalable Capacity Charge, Quoted Escalable Capacity Charge, Quoted Non Escalable Energy Charge, Quoted Escalable Energy Charge and Quoted Escalable Inland Transportation Charge</li> </ul>
<b>Contract Year Penalty for Availability</b>	<p>Contract Year Penalty for Availability below Eighty percent (80%) during Contract Year:</p> <ul style="list-style-type: none"> <li>In case the Availability for a Contract Year is less than eighty percent (80%), the Seller shall pay a penalty at the rate of twenty percent (20%) of the simple average Capacity Charge (in Rs./kWh) for all months in Contract Year applied on energy (in kWh) corresponding to the difference between eighty percent (80%) and Availability during such Contract Year</li> </ul>

Subsequent to the above PPA, KMPCL has entered into supplementary power purchase agreement with Paschimanchal Vidyut Vitran Nigam Limited, Purvanchal Vidyut Vitran Nigam Limited, Madhyanchal Vidyut Vitran Nigam Limited and Dakshinanchal Vidyut Vitran Nigam Limited on 23<sup>rd</sup> Jan, 2018.

- The Ministry of Coal, Government of India on 22.05.2017 announced a new coal allocation policy viz "Scheme for Harnessing and Allocating Koyla (Coal)

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Transparently in India" ("Shakti Policy") for the power sector for allocation of coal linkages by fading away the existing regime of LOA-FSA under New Coal Distribution Policy dated 18.10.2007 (NCDP).

- In accordance with Shakti Policy, Independent Power Producers ("IPPs") who have already concluded the Long Term Power Purchase Agreements ("PPAs") based on domestic coal are eligible to participate in the bidding process. The grant of coal linkage from each source will be based on the discount offered on the existing tariff (in paise / KWh) for the balance period of the PPA.
- As per the Shakti Policy, the discount offered by the generating companies would be adjusted from the gross amount of the monthly bill to be raised under the PPA, based on approval of the Appropriate Commission. The discount would be computed with reference to linkage coal supplied and received under the Shakti Policy.
- As per Shakti Policy, each PPA is required to be amended or supplemented to pass on the aforesaid discount to the Procurer by adjustment from the bill raised thereunder, and further required to be approved by Appropriate Commission.
- KMPCL, having existing PPAs, participated in the coal linkage auction under the Shakti Policy ("Shakti Auction") and the Coal Companies namely Mahanadi Coalfields Limited (MCL) and South Eastern Coalfields Limited (SECL) have issued Letter of Intent(s) on 21.12.2017, declaring KMPCL as Provisional Successful Bidder and allocating coal as indicated in Table 7.2 above.
- Since, the quantity of coal allocated mentioned above is with respect to Total Power Purchase Agreements signed with the following Discoms and net capacity:
  - PPA 1 UP Discoms : 1000 MW
  - PPA 2 AP Discoms : 400 MW
  - PPA 3 CSPTTrCL : 40 MW\*
  - PPA 4 TANGEDCO : 500 MW
  - Total: 1940 MW


*\*This is as mentioned in the Supplementary Agreement*

Thus, the treatment to coal received and discount to be passed on to procurer(s) for each of the LOIs will be proportionated against the total Power Purchase Agreement Capacity alive at the time of respective Monthly Bills/ Financial Years.

- Pursuant to clause B(ii) of the SHAKTI Policy and as described in Scheme Document dated 16.08.2017 for Auction of Coal Linkages KSK Mahanadi Power Company Limited (KMPCL) had provided year-on-year discount stream for the remaining term of each of its concluded PPA(s) from the date of completion of the Auction

### **7.3 Bulk Power Transmission Agreement (BPTA)**

Bulk Power Transmission Agreement between Power Grid Corporation Of India Ltd. ("POWERGRID") and 12 power generation projects including KMPCL and Chhattisgarh

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State Power Trading Co. Ltd(CSEB) executed on 24th February 2010. Long term open access was provided as per below details.

Summary of Bulk Power Transmission Agreement is as below

- As per BPTA Long Term Transmission Customers are R.K.M Powergen Pvt Ltd. , Athena Chhattisgarh Power Pvt. Ltd., Jindal Power Ltd., Jindal Power Ltd.(Existing and Dongah Mahua) , SKS Power Generation (Chhattisgarh) Ltd. ,Korba West Power Co.Ltd., DB Power Ltd., KSK Mahanadi Power Company Ltd., Bharat Aluminium Co.Ltd., Vandana Vidhyut Ltd., Lanco Amarkantak Power Ltd., Chhattisgarh Steel & Power Ltd., and Chhattisgarh State Power Trading Co. Ltd. (erstwhile CSEB) respectively.
- The transmission system required for direct evacuation of power from respective generating units to the pooling points of POWER GRID has been finalized in consultation with CEA, developers and Constituents and shall be built, owned, operated and maintained by respective Long Term Transmission Customers as indicated at Annexure-2 of the BPTA.
- The common transmission system to evacuate and dispatch power to respective beneficiaries from the generation projects, has been finalized in consultation with CEA, developers and Constituents and shall be built, owned, operated and maintained by POWERGRID as indicated at Annexure- 3 of the BPTA.
- Each of the project developers i.e. the Long term transmission customer has agreed to share and bear the applicable transmission charges as decided by Central Electricity Regulatory Commission of the total transmission scheme from the scheduled date of commissioning of respective generating units.
- Long term transmission customers have agreed to share and pay all the transmission charges of POWERGRID in accordance with the regulation/tariff order issued by Central Electricity Regulatory Commission from time to time for the use of its Transmission System.
- Long-Term Transmission customer would provide security in the form of in-evocable Bank Guarantee (BG), in favor of POWERGRID, equivalent to two months estimated average monthly billing, three months prior to the scheduled date of commissioning of generating unit, in addition to opening of LC for 105% of estimated average monthly billing for charges.
- The estimated average transmission charges would be reviewed every six months and-accordingly the amount of security would be enhanced/ reduced by long term transmission customers.
- In case the long term transmission customer defaults in payment of the monthly charges of POWERGRID bills then, POWERGRID shall be entitle to encash /adjust the BG immediately.
- In case of encashment /adjustment of BG by POWERGRID against nonpayment of monthly charges by long-term transmission customer, the same should be immediately replenished / recouped by long-term transmission customers before the next billing cycle.
- In case any of the developers fail to construct the generating station /dedicated transmission system or makes an exit or abandon its project, POWERGRID shall have the right to collect the transmission charges and/or damages as the case may



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be in accordance with the notification/ regulation issued by CERC from time to time. The developer shall furnish a Bank guarantee from a nationalized bank for an amount which shall be equivalent to Rs.5 (five) Lakhs/MW to compensate such damages.

- In the event of delay in commissioning of concerned transmission system from its schedule, as indicated at Annexure-A- of BPTA, POWERGRID shall pay proportionate transmission charges to concerned Long Term Access Customer(s) proportionate to its commissioned capacity (which otherwise would have been paid by the concerned Long Term Access Customer (s) to POWERGRID) provided generation is ready and POWERGRID fails to make alternate arrangement for dispatch of power.
- This Agreement shall be valid from the date of signing of this agreement till the validity of open access subject to its revision as may be made by the parties to this Agreement provided that this Agreement may be mutually extended, renewed or replaced by another Agreement on such terms and for such further period as the parties may mutually agree. In case Long Term Transmission Customers continue to get transmission services from the POWERGRID even after expiry of this Agreement without further renewal or formal extension thereof then all the provisions of this Agreement shall continue to operate till this Agreement is formally renewed extended or replaced.



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## 8.0 PERMITS & CLEARANCES

The status of the permits and clearances is tabulated below.

**Table 8-1 : Permits and Clearances**

Sr. No.	Clearance / Approval	Approving Authority	Status and Validity
1	Environmental Clearance	Ministry of Environment and Forest (MoEF )	Available, Validity Lapsed, Validity was till 18/10/2019
2	Consent To Operate - Air and Water	Chhattisgarh Environment Conservation Board (CECB)	Available Valid till 17/05/2022
3	Approval under Hazardous waste Rules 2008	Chhattisgarh Environment Conservation Board (CECB)	Available, Valid till 02.01.2021
4	Boiler License / Renewal Certificate	Chhattisgarh Boiler Inspection Department Government of Chhattisgarh	Aux Boiler: Certificate valid till 22/09/2021 Unit-2: Certificate valid till 22/09/2021 Unit-3: Certificate valid till 13/07/2021 Unit-4: Certificate valid till 04/03/2021
5	Energisation of the electrical apparatus	CEA, under CEA Regulation (Measures relating to Safety and Electric Supply Regulations, 2010)	Available Unit-2: Certificate valid two years from 10.11.2017 Unit-3: Certificate valid two years from 26.08.2016 Unit-4: Certificate valid two years from 26.08.2016
6	Water Allocation Certificate/ Water Drawl Permission	Water Resource Department, GOCC	Accorded vide letter dated 30/07/2009 for withdrawing 100 MCM of water annually.
7	NOC for Ground water withdrawal	Central Ground Water Authority, GoI	Available, Validity laps, Valid for three years from 02.06.2016 to extract 85 m3/day of ground water
8	NOC for Chimney height clearance	Airports Authority of India	Available NOC letter dated 20/04/2011 is available.
9	License to storage compressed gas in cylinders	Petroleum & Explosives Safety Organization (PESO)	Available Valid till 30/09/2023
10	License to storage of petroleum products	Petroleum & Explosives Safety Organization (PESO)	Available Valid till 31/12/2022
11	License to work a factory	Dy. Chief Inspector of Factories, Chhattisgarh	Available License is valid till 31/12/2020
12	Rail Transport Clearance for construction of private Railway siding	Jt. Director Transport, railway Board	Available, Clearance dated 04.09.2009.
13	'No Objection' from Fire Department		Not available


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<b>Sr. No.</b>	<b>Clearance / Approval</b>	<b>Approving Authority</b>	<b>Status and Validity</b>
14	Registration under the Provident Funds Act, 1925	EPFO	Available
15	Registration under the State Employees Insurance Act 1948	E.S.I. Corporation	Available

Environmental Clearance for the project was issued by MOEF on 19.10.2009. Corrigendum was issued for correction in the Company's name vide Ministry's letter dated 19.11.2009. EC was transferred in the name of M/s KSK Mahanadi Power Company Ltd. instead of M/s Wardha Power Company Ltd. vide Ministry's letter dated 27.12.2010. Further amendment in EC was issued for tapering coal linkage from SECL for first three units vide Ministry's letter dated 24.1.20 12. Further amendment was issued vide Ministry's letter dated 23.9.2015 regarding increase in project area and the change in budget earmarked for CSR activities. Further amendment in EC was issued vide Ministry's letter dated 26.5.2016 regarding change in coal source for using blended coal as linkage coal (71.55%), E-auction coal (10%) and imported coal (18.45%). MOEFCC vide letter dated 19.01.2018 has extended the validity of EC dated 19.10.2009 up to 18.10.2019 to commence operations by all units and amended the EC for transportation of coal by road for 3.54 MTPA (domestic coal).

As per “Note on Environmental Clearance for Balance 3 units-KSK Mahanadi Power plant”;

- Ministry of Environment, Forests & Climate Change , New Delhi issued Environmental Clearance Letter No.J-13012-44/8-IA-II (T) dated 19.10.2009 to ‘KSK Mahanadi Power Company Limited’ to establish 6 X 600 MW coal based Thermal Power plant near Nariyara vill., Janjgir-Champa District, CG and it was valid up to 18.10.2019.
- Out of 6 units as conceptualized, so far, only 3 units are put in operation and balance 3 units are at various stages of construction.
- As per Environmental Impact assessment Notification, 2006 and subsequent amendments, the environmental clearance was valid for 7 years and further extendable up to max. 3 more years on the basis of progress of balance construction activity (total 10 years Period).
- Existing ‘Environmental clearance’ (EC) expired on 17.10.2019 and thereafter no construction activity of balance units is permitted.
- To keep the project construction alive, it is mandatory to get the extension of EC for 3 to 4 years to complete entire construction activity (so far, MOEF&CC has not extended the EC to any industry beyond 10 years) or apply for fresh Environmental clearance (EC) for the balance units which grants permission for establishment of balance 3 Units. It means that entire EC process has to be done afresh.

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- To apply for fresh Environmental clearance, the procedure includes obtaining fresh 'Terms of Reference' (TOR) to carry out Environmental Impact assessment (EIA) study, Public consultation which includes conducting 'Public Hearing' and submission of final Environmental Impact assessment report to obtain final Environment Clearance.
- While receiving TOR to carry out EIA study, request can be made to 'Environmental Appraisal committee' (EAC) of Thermal Power to exempt KMPCL from Public Hearing process on the basis of current status of project like no variance in pollution loads, capacity and overall area of site.
- To apply for fresh Environmental Clearance for balance 3 Units, EIA consultant has been appointed in this regard and following documents under preparation and will be submitted shortly to statutory body and time required to complete the activity is 6-9 months period.
  - Feasibility report of 3x600 MW coal based power plant
  - Form-I to be submitted to MOEFCC to obtain Terms of Reference to Carry out Environmental Impact assessment studies
- These above documents is expected to be submitted to MOEFCC by 31.12.2020

## 8.1 Compliance of Environment Norms


An Environment Management cell has been setup at plant, headed by Sr. General Manager. Continuous online monitoring system for stack emissions is already installed & working w.r.t operational Units No. 3, 4 & 2. Online monitoring data is showing at main gate display board and website-portal of KMPCL. 4 nos CAAQMS have been installed inside the plant premises.

As per the MoEFCC Notification dated 7<sup>th</sup> December, 2015; pollutants limits are revised and to fulfill the MoEFCC new emission standards KMPCL require installation of additional pollutant abatement measures.

As per the MoEFCC Notification dated 7<sup>th</sup> December, 2015 the revised limits of pollutants is as below.

**Table 8-2 : Revised Applicable Emission Limits**

<b>Pollutants</b>	<b>TPP (Units) installed after 1st January, 2003, up to 31st December, 2016*</b>	<b>TPPs ( units) to be installed from 1st January, 2017**</b>
	<b>Applicable for unit 3 &amp; 4</b>	<b>Applicable for other units</b>
Particulate Matter (PM)	50 mg/Nm <sup>3</sup>	30 mg/Nm <sup>3</sup>
Sulphur Dioxide (SO <sub>2</sub> )	600 mg/Nm <sup>3</sup> (Units Smaller than 500MW capacity units) 200 mg/Nm <sup>3</sup> (for units having capacity of 500 MW and above)	100 mg/Nm <sup>3</sup>
Oxides of Nitrogen (NO <sub>x</sub> )*	300 mg/Nm <sup>3</sup>	100 mg/Nm <sup>3</sup>
Mercury (Hg)	0.03 mg/Nm <sup>3</sup>	0.03 mg/Nm <sup>3</sup>

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*\*The Supreme Court on July 8, 2020 relaxed limits for coal-fired power stations commissioned between December 2003 and 2016 — to 450 mg / Nm<sup>3</sup> from 300 mg / Nm<sup>3</sup>*

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

### Stack Emission Data

The Stack Emission data for the plant as per Environmental Statement Report for FY2019, the performance test result (at ESP outlet) and the new Rules from the Climate Change Notification (dated 07<sup>th</sup> December, 2015) has been tabulated below.

**Table 8-3 : Stack Emission Data**

Sr. No .	Particulars of Stack Emission	For the TPPs installed after 1st Jan'2003 up to 31st Dec'2016, having capacity of 500 MW & above *	PG Test Result for Unit-3 (ESP outlet)	PG Test Result for Unit-4 (ESP outlet)	Average for Unit-3 FY 19**	Average for Unit-4 FY 19**	Average for Unit-2 FY 19**#
1	SO <sub>2</sub> (mg/Nm <sup>3</sup> )	200 mg/Nm <sup>3</sup> (nearly = 70ppm)	-	-	619.3	608.4	568.4
2	NO <sub>x</sub> (mg/Nm <sup>3</sup> )	300 mg/Nm <sup>3</sup> (nearly = 146 ppm)	178.99 ppm (nearly = 367 mg/Nm <sup>3</sup> )	164.39 ppm (nearly = 337 mg/Nm <sup>3</sup> )	410	435.3	418.2
3	SPM (mg/Nm <sup>3</sup> )	50 mg/Nm <sup>3</sup>	7.57 mg/Nm <sup>3</sup>	13.04 mg/Nm <sup>3</sup>	37.9	34.9	20.4
4	Mercury - Hg (mg/Nm <sup>3</sup> )	0.03 mg/Nm <sup>3</sup>	-	-	-	-	-

\* This is as per the Environment (Protection) Amendment Rule from Ministry of Environment, Forest and Climate Change, New Delhi, Notification dated 07th December, 2015.


\*\* Source- Environmental Statement Report for FY2019 Submitted to Chhattisgarh Environment Conservation Board Chhattisgarh

# refer table 5-6 for Revised Applicable Emission Limits for Unit-2

### Latest Half Yearly compliance report

Half yearly compliance report of 6x600MW KMPCL TPP for the period April 2019 to September 2019 is available at company website. All conditions of Environment Clearance are complied.

As per half yearly compliance report for April to Sep 2019 “Complied for Particulate Matter emission and specific water consumption for all operational Units has been achieved within in the prescribed standard. For achievement of SO<sub>2</sub> & NO<sub>x</sub> limit, FGD installation design and planning is in the line of requirement. The dead line of completion of project has been assigned by CPCB is up to 31 March 2022.”

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As per half yearly compliance report, Fly Ash has been utilized by operational units with following manner:

- For 7th Year operation of Unit#3, 100% of Fly Ash has been utilized against the target of 100%.
- For 6th year of operation of Unit#4, 100% of Fly Ash has been utilized against the target of 100%
- For 2nd year of operation of Unit#2, 70% of Fly Ash has been utilized against the target of 70%

## 8.2 CAPEX Required For Meeting the Environment Norms

KMPCL have floated a bid for FGD installation of 3 operational units on Jan 2020, as can be seen on the company's website. DESEIN Private Limited has been appointed as Owner's Engineering for this project.


- Tentative cost for implementation of pollution abatement measures is captured in the Cost to Complete section of the report.

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### ANNEXURE-1: Plant Operational Performance

Sr. No.	Particulars	YTD FY'18			
		Unit-2	Unit-3	Unit-4	Station *
1	Declared Capacity (MUs)				
2	Scheduled Generation (MUs)				5306.53
3	Backing Down (MUs)				
4	Actual Generation - Gross (MUs)	133.54	2611.29	3131.28	5811.37
5	Net dispatch (MUs)				<b>5365.18</b>
6	PAF (%)	12.7%	70.9%	82.3%	76.6%
7	PLF (%)	7.7%	49.7%	59.6%	53.6%
8	Auxiliary Power Consumption (%)	11.3%	7.9%	7.4%	7.7%
9	Station Auxiliary Power Consumption (MUs)	15.10	207.47	233.03	449.11
10	Turbine Heat Rate (kCal / kWh)				
11	Boiler Efficiency (%)				
12	Station Heat Rate (kCal / kWh)		2394	2425	2411
13	Coal Consumption (Tonnes)	83481	1614524	1971537	3737148
14	Specific Coal Consumption (kg/kWh)	0.63	0.62	0.63	0.64
15	Secondary Fuel Consumption (kL)	4068	2459	1826	4284
16	Specific Secondary Fuel Oil Consumption (mL/kWh)	30.47	0.94	0.58	0.74
17	Raw Water Consumption (m3)				12608733
18	DM Water Consumption (Tonnes)				364785
19	Planned Outage (hrs)		1290	828	933
20	Forced Outage (hrs)		437	581	479
21	Reserve Shutdown (Plant available, power demand not available)	594	824	141	520
22	<b>Emission Details</b>				
	SOx (mg/Nm3)	575.5	639.2	665.75	659.16
	NOx (mg/Nm3)	588.5	402	432.25	427.06
	SPM (mg/Nm3)	12.7	33.8	34.8	34.23
23	<b>Stock</b>				
	Secondary Fuel Oil (kL)				1329
	Coal Stock (tonnes)				125702
24	<b>Ash</b>				
	Production (Tonnes)	511596	635348	25394	1172338
	Utilization (Tonnes)	511596	503066	37249	1051911
	Stock (Tonnes)	0	132282	-11855	120427
25	<b>Coal Analysis (ARB Basis)</b>				
	Fixed Carbon (%)	37.94	33.98	34.40	33.67
	Total Moisture (%)	10.53	10.77	10.64	10.50
	Inherent Moisture (%)				
	Volatile Matter (%)	22.70	22.33	22.17	21.85
	Ash (%)	28.84	32.91	32.77	32.15
	Sulphur (%)				

\* (Average / Summation -as applicable)

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Sr. No.	Particulars	YTD FY'19			
		Unit-2	Unit-3	Unit-4	Station *
1	Declared Capacity (MUs)				
2	Scheduled Generation (MUs)				7266.65
3	Backing Down (MUs)				243.53
4	Actual Generation - Gross (MUs)	3628.36	638.58	3605.38	7872.33
5	Net dispatch (MUs)				<b>7278.81</b>
6	PAF (%)	77.67%	13.84%	81.89%	57.80%
7	PLF (%)	69.03%	12.15%	68.60%	49.93%
8	Auxiliary Power Consumption (%)	7.86%	9.77%	6.83%	7.54%
9	Station Auxiliary Power Consumption (MUs)	285.24	62.42	245.86	593.52
10	Turbine Heat Rate (kCal / kWh)				
11	Boiler Efficiency (%)				
12	Station Heat Rate (kCal /kWh)	2315	2343	2398	2357
13	Coal Consumption (Tonnes)	2266054	392836	2354513	5018254
14	Specific Coal Consumption (kg/kWh)	0.62	0.62	0.65	0.64
15	Secondary Fuel Consumption (kL)	1810.95	1055.57	1130.19	3996.71
16	Specific Secondary Fuel Oil Consumption (mL/kWh)	0.50	1.65	0.31	0.51
17	Raw Water Consumption (m3)				15227337
18	DM Water Consumption (Tonnes)				218345
19	Planned Outage (hrs)				338935
20	Forced Outage (hrs)	677	267	94	346
21	Reserve Shutdown (Plant available, power demand not available)	1280	7280	1492	3350
22	<b>Emission Details</b>				
	SOx (mg/Nm3)	568.4	619.3	608.4	590.85
	NOx (mg/Nm3)	418.2	410	435.3	425.37
	SPM (mg/Nm3)	20.4	37.9	34.9	28.46
23	<b>Stock</b>				
	Secondary Fuel Oil (kL)				1021
	Coal Stock (tonnes)				169902
24	<b>Ash</b>				
	Production (Tonnes)	133023	743481	727552	1603065
	Utilization (Tonnes)	133023	738833	763404	1634269
	Stock (Tonnes)	0	4648	-35852	-31204
25	<b>Coal Analysis (ARB Basis)</b>				
	Fixed Carbon (%)	32.50	33.24	32.24	32.40
	Total Moisture (%)	11.55	9.91	11.57	11.42
	Inherent Moisture (%)				
	Volatile Matter (%)	22.54	22.98	22.31	22.45
	Ash (%)	33.41	33.86	33.88	33.63
	Sulphur (%)				

\* (Average / Summation -as applicable)



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Sr. No.	Particulars	YTD FY'20			
		Unit-2	Unit-3	Unit-4	Station *
1	Declared Capacity (MUs)				
2	Scheduled Generation (MUs)				9538
3	Backing Down (MUs)				1399
4	Actual Generation - Gross (MUs)	4344	1951	3995	10290
5	Net dispatch (MUs)				<b>9549</b>
6	PAF (%)	95.62%	56.27%	88.41%	80.10%
7	PLF (%)	82.43%	37.02%	75.81%	65.08%
8	Auxiliary Power Consumption (%)	7.60%	7.74%	6.67%	7.27%
9	Station Auxiliary Power Consumption (MUs)	330.11	151.09	266.59	747.78
10	Turbine Heat Rate (kCal / kWh)				
11	Boiler Efficiency (%)				
12	Station Heat Rate (kCal /kWh)	2337	2460	2401	2403
13	Coal Consumption (Tonnes)	2721588	1267439	2536059	6574904
14	Specific Coal Consumption (kg/kWh)	0.63	0.65	0.63	0.64
15	Secondary Fuel Consumption (kL)	647.59	2334.67	1374.38	4356.64
16	Specific Secondary Fuel Oil Consumption (mL/kWh)	0.15	1.20	0.34	0.42
17	Raw Water Consumption (m3)				19810371
18	DM Water Consumption (Tonnes)				373657
19	Planned Outage (hrs)				
20	Forced Outage (hrs)	384	3836	575	1598
21	Reserve Shutdown (Plant available, power demand not available)				
22	<b>Emission Details</b>				
	SOx (mg/Nm3)	994	989.6	1044.7	1012.85
	NOx (mg/Nm3)	452.8	381.9	389.3	414.70
	SPM (mg/Nm3)	21.8	34.3	35.3	29.41
23	<b>Stock</b>				
	Secondary Fuel Oil (kL)				1005
	Coal Stock (tonnes)				369708
24	<b>Ash</b>				
	Production (Tonnes)	388342	773108	847571	2009021
	Utilization (Tonnes)	388342	773108	1039442	2200892
	Stock (Tonnes)	0	0	-191871	-191871
25	<b>Coal Analysis (ARB Basis)</b>				
	Fixed Carbon (%)	29.70	30.10	30.14	29.72
	Total Moisture (%)	11.85	11.78	11.76	11.72
	Inherent Moisture (%)				
	Volatile Matter (%)	21.88	22.19	21.99	21.82
	Ash (%)	36.57	35.92	36.10	35.99
	Sulphur (%)				

\* (Average / Summation -as applicable)


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Sr. No.	Particulars	YTD FY'21 (Till Sep'20)			
		Unit-2	Unit-3	Unit-4	Station *
1	Declared Capacity (MUs)				
2	Scheduled Generation (MUs)				5498
3	Backing Down (MUs)				1152
4	Actual Generation - Gross (MUs)	1798	2025	2116	5939
5	Net dispatch (MUs)				<b>5512</b>
6	PAF (%)	92.43%	96.35%	95.11%	94.63%
7	PLF (%)	68.25%	76.85%	80.28%	75.12%
8	Auxiliary Power Consumption (%)	8.19%	6.52%	7.02%	7.21%
9	Station Auxiliary Power Consumption (MUs)	147.24	132.13	148.58	427.95
10	Turbine Heat Rate (kCal / kWh)				
11	Boiler Efficiency (%)				
12	Station Heat Rate (kCal /kWh)	2385	2403	2385	2400
13	Coal Consumption (Tonnes)	1173208	1336563	1383260	3908531
14	Specific Coal Consumption (kg/kWh)	0.65	0.66	0.65	0.66
15	Secondary Fuel Consumption (kL)	415.55	293.70	299.10	1008.34
16	Specific Secondary Fuel Oil Consumption (mL/kWh)	0.23	0.15	0.14	0.17
17	Raw Water Consumption (m3)				13277384
18	DM Water Consumption (Tonnes)				189270
19	Planned Outage (hrs)			115	38
20	Forced Outage (hrs)	330	160	545	345
21	Reserve Shutdown (Plant available, power demand not available)				
22	<b>Emission Details</b>				
	SOx (mg/Nm3)	907.3	956.7	902.8	929.80
	NOx (mg/Nm3)	299.5	349.7	318.8	334.30
	SPM (mg/Nm3)	22.3	34.4	37.1	35.70
23	<b>Stock</b>				
	Secondary Fuel Oil (kL)				839
	Coal Stock (tonnes)				104730
24	<b>Ash</b>				
	Production (Tonnes)	370103	425905	435846	1231854
	Utilization (Tonnes)	464908	425905	443478	1334291
	Stock (Tonnes)	-94805	0	-7632	-102437
25	<b>Coal Analysis (ARB Basis)</b>				
	Fixed Carbon (%)	28.44	28.30	28.35	28.25
	Total Moisture (%)	12.12	12.03	12.18	12.06
	Inherent Moisture (%)				
	Volatile Matter (%)	21.98	21.94	21.97	21.88
	Ash (%)	37.46	37.72	37.51	37.42
	Sulphur (%)	0.39	0.39	0.39	0.39


\* (Average / Summation -as applicable)

**ANNEXURE-2: Generation Loss details**

Generation Loss Data												
Year	YEAR 2017 - 18				YEAR 2018 - 19				YEAR 2019 - 20			
Particulars (in MUs)	Unit-2	Unit-3	Unit-4	Total	Unit-2	Unit-3	Unit-4	Total	Unit-2	Unit-3	Unit-4	Total
Actual Generation	134	2611	3131	<b>5811</b>	3628	639	3605	<b>7872</b>	4344	1951	3995	<b>10290</b>
Planned Outages		773.97	496.71	<b>1271</b>						7.35		<b>7.35</b>
Forced Outages		262.49	348.82	<b>611</b>	406.02	160.32	56.64	<b>622.97</b>	230.22	2292.2	344.962	<b>2867.37</b>
Partial Loading and unplanned Shutdown		1608	1279.2	2685	1221.62	4457	1594	<b>7273</b>	695.96	1019.9	930.187	2646.045
<b>Forced Outages</b>												
Boiler & Auxiliaries					197.01		2.4	<b>199.4</b>				
Boiler Tube Leakage		235.01	279.42	<b>514.43</b>	190.13	154.56	46.48	<b>391.17</b>		614.66	118.84	<b>733.50</b>
Electrical		5.31	57.138	<b>62.45</b>	3.18			<b>3.178</b>	10.06		1.472	<b>11.53</b>
Grid disturbance												
Turbine Generator		5.67		<b>5.67</b>	1.16	5.37		<b>6.527</b>		24.406		<b>24.41</b>
Control & Instrumentation					5.68			<b>5.679</b>	5.70	2.95		<b>8.65</b>
Operation					0.96	0.39		<b>1.35</b>	0.64			<b>0.64</b>
Coal Handling												
Coal Shortage		14.18	12.261	<b>26.44</b>						1037.26	13.723	<b>1050.98</b>
Transmission lines/Grid disturbance		2.32		<b>2.32</b>	7.91		7.76	<b>15.66</b>		3.69		<b>3.69</b>
Local Unrest									213.82	609.23	210.927	<b>1033.97</b>

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## **Part B – Assessment of Cost and Time to Complete of under construction units**

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## 9.0 PRESENT STATUS OF 6X600MW KSK MAHANADI POWER COMPANY LIMITED (KMPCL)

The total scope of the power plant is divided in two parts – EPC and Non-EPC. KMPCL awarded the complete EPC scope to SEPCO, China and the Non-EPC part was kept in the scope of KMPCL. The broad scope of EPC and Non-EPC is mentioned in the table below.


**Table 9-1 : Broad Scope of EPC and Non-EPC**

Sl. No.	Scope Head	Description of scope
1.	EPC	<ol style="list-style-type: none"> <li>1. Supply, erection, commissioning and performance testing of 6X600MW coal based power plant as per the detail EPC scope such as BTG, BOP, CHP, AHP, raw water pump house, raw water reservoir, mandatory spares</li> <li>2. Other non-plant structures such as inner boundary wall, miscellaneous building - administrative building, service building, canteen, Fire station, Medical center, main gate, security building, workshop including T&amp;P, approach road, silos, petrol pump, area grading, stores, labour camps, plant road, gourd pond</li> </ol>
2.	Non-EPC	<ol style="list-style-type: none"> <li>1. Two double circuit 400 KV Transmission line (each line capacity 1200MW) from plant switchyard to TAGA pooling station of PGCL. The approx. length of TL is 27 KM from plant switchyard to TAGA pooling station.</li> <li>2. Wagon Tippler</li> <li>3. Outer boundary wall</li> <li>4. Roads and drain for areas outside the inner boundary wall</li> <li>5. Entry gate</li> <li>6. Watch towers</li> <li>7. Training center</li> <li>8. CCTV</li> <li>9. Horticulture (green belt) and rain water harvesting</li> </ol>

Railway infrastructure and Water Infrastructure was envisaged to be set up through two separate SPVs. Details of the same is captured under Annexure 4 & 5.

### 9.1 Present Status of EPC Scope of Unit#1, 5 And 6 – BTG and Related BOP Packages

KMPCL awarded EPC Contract to SEPCO, China. SEPCO has sourced more than 95% of materials from China and sourced re-bar, cement, sand, some structural materials etc. from India. The have deployed Indian sub-contractors for execution of Civil, Mechanical, Electrical and C&I packages. All the Units are in initial phases of construction. Though boiler structure and some pressure parts (including boiler drum) of Unit#5 are erected, but substantial construction activities are balance. For Unit#1 & 6, major portion of BTG work is incomplete from supply, erection and commissioning point of view. The BOP

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systems such as DM Plant, Chlorination plant, Dosing plant, ETP, Sewage treatment plant, CHP, AHP, Raw water system, CAS, FOPH, H<sub>2</sub> generation, HVAC etc., Chimney are ready and in operation, these systems are common for all 6 units. However, the required ducting, piping, cabling, hooks-up etc. with the BTG packages are yet to be completed. Electrical and C&I work for Unit # 1, 5 and 6 in BTG system, CW system, AHP & CHP systems, DCS etc. are balance. The brief status of the three Units, it's associated BOPs and other related packages are summarized in table below. The details of balance activities with site photos of Unit# 1, 5 and 6 are covered in later part of the report.

## 9.2 Design Philosophy of BOP and Readiness of BOPs

The BOP systems as mentioned below are designed as common for all 6 units of KMPCL plant. Each BOP systems are having standalone PLC based control systems. They are being operated by respective standalone PLCs and no operational provision is kept in DCS. However, the status can be seen in operating stations of DCS in the control rooms.

- DM plant with RO + UF system
- Mechanically high rated solid contact clarifier(MHRSCC)
- Dosing systems
- Raw water intake systems from plant reservoir
- Fire Fighting system
- HVAC systems
- CHP and AHP
- Compressed Air system (CAS) – Instrument Air(IA) and Service Air(SA)
- Fuel Oil handling system
- CCW system

The BOP systems are operational and catering to the operating Units # 2, 3 and 4. Hooking up of the BOP systems with under construction Units # 1, 5 and 6 is balance. Two CW pumps/Unit is considered with 2 Stand-by pumps (one each is located in CW Pump House 1 and 2 respectively) i.e 12 W + 2S for all 6 units. There are two CW pump houses and in each pump house 6 working and one stand by pumps are configured. Each CW pump house is designed to supply Cooling Water to three unit's i.e Unit# 1, 2 and 3 and Unit# 4, 5 and 6. There are two 275 Meter height Chimneys, each one caters for three units, Chimney-1 is for Unit#1,2 and 3 and Chimney-2 is for Unit# 4, 5 and 6. Both the chimneys are ready except finishing, painting, area paving, aviation light (not working) etc. Hooking up of under construction units (1, 5 and 6) with the flue can is balance.


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All the common BOP systems are in operation and feeding the requirement of Unit# 2, 3 and 4 which are in operation. Hook-up between BOP systems and BTG & related system of Unit# 1, 5 and 6 are balance due to non-availability/erection of the systems. Based on the site visit and assessment, present status of the under construction units and non-EPC works has been captured and attached as **Annexure 3** to this report. Summary of the same has been presented below.

Important and critical issues are mentioned below.


- Obsolescence of DCS and hence upgradation is required
- Non-Commissioning of MIS System
- Non-Commissioning of TDBFP of Unit#2
- Non-Commissioning of COLTS of Unit#2
- Deterioration of exposed CW pipe (Unit1, 5 and 6) wrapping & coating materials due exposure to atmosphere. Need replacement before backfilling
- Water stagnation inside the underground CW pipelines of Unit 1, 5 and 6 may cause internal rusting/corrosion of the pipes. Removal of stagnated water and end blanking is required




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**Table 9-2 : Summary of Present Status of Under Construction Units (Unit # 1, 5 & 6)**


Unit No.		Package Description	Status of Supply	Status of Erection	Remarks	% Progress supply	% Progress Construction
#1	1.	<b>BTG:</b>					
		Steam Turbine and Auxiliaries	Not received	-	-	0	0
		Generator and auxiliaries	Not received	-	-	0	0
		Condenser, CEP, BFP, De-aerator, Critical piping, LP piping, Vacuum pump, CPU, HP/IP/LP heaters, PHE	Not received	-	-	0	0
		Boiler and auxiliaries	Not received except few structure materials	Structures up-to 2 Tier erected	Partial boiler structures received	1	1
		ESP	Not received	-	-	0	0
	2.	<b>E&amp;I Package:</b>					
		Electrical panels, DCS panels, operating stations, Engineering stations, TSI, Relay panels, Cables, cable trays, ESP control panels, Battery, Battery charger, UPS etc.	Not received	-	-	0	0
		Transformers – Generator Transformer, UAT, Auxiliary TRF, Bus-duct	Not received	-	-	0	0
#5	1.	<b>BTG:</b>					
		Steam Turbine and Auxiliaries	Not received	-	LP casings received	0	0
		Generator and auxiliaries	Not received	-	-	0	0
		Condenser, CEP, BFP, De-aerator, Critical piping, LP piping, Vacuum pump, CPU, HP/IP/LP heaters,	Partial materials received	Condenser shells erected partially	Few parts of condenser, de-aerator, 3 HP heaters, 4 nos. LP	5	0

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Unit No.		Package Description	Status of Supply	Status of Erection	Remarks	% Progress supply	% Progress Construction
					heaters received		
		Boiler and auxiliaries	Partial materials received	Boiler Drum is placed in its position	Some parts of Boiler structures, Boiler drum, pressure parts, APH	67	32
		ESP	Majority of materials received	All the four pass major structures including electrodes etc. erected	Insulation, Panels etc. not received	91	70
	<b>2.</b>	<b>E&amp;I Package:</b>					
		Electrical panels, DCS panels, operating stations, Engineering stations, TSI, Relay panels, Cables, cable trays, ESP control panels etc.	Partial materials received- DCS panels, Turbine panels, cables received	DCS panels placed in location only (Modules used in operational units)		15	0
		Transformers – Generator Transformer, UAT, Auxiliary TRF, Bus-duct	Not received	-	-	0	0
<b>#6</b>	<b>1.</b>	<b>BTG:</b>					
		Steam Turbine and Auxiliaries	Not received	-	-	0	0
		Generator and auxiliaries	Not received	-	-	0	0
		Condenser, CEP, BFP, De-aerator, Critical piping, LP piping, Vacuum pump, CPU, HP/IP/LP heaters, PHE	Not received	-	-	0	0
		Boiler and auxiliaries	Not received	-		0	0

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Unit No.		Package Description	Status of Supply	Status of Erection	Remarks	% Progress supply	% Progress Construction
		ESP	Not received	-	-	0	0
	<b>2.</b>	<b>E&amp;I Package:</b>					
		Electrical panels, DCS panels, operating stations, Engineering stations, TSI, Relay panels, Cables, cable trays, ESP control panels, Battery, Battery charger, UPS etc.	Not received	-	-	0	0
		Transformers – Generator Transformer, UAT, Auxiliary TRF, Bus-duct	Not received	-	-	0	0
<b>#1,5 &amp; 6</b>		<b>STG building Structure and Civil of BTG and other areas:</b>					
		Unit # 5					
	1.	STG building structures	Major items received	Unit#5 major structures erected.		95	90
	2.	Civil of TG, Boiler, ESP and TRF yard area	-	TG deck slab and floor (EL 13.9M) of Unit#5, TRF foundation & Fire wall, Unit#5 mill foundations etc. completed	Floor finish, GF slab, IPS, panel room, and other finishing activities not done	-	70
	3.	Roads & drain, area paving, plinth protection, finishing, painting	-	Partially done	-	-	20
		<b>Unit # 1 &amp; 6</b>					
		STG building structures	Partially received for Unit # 1 No Supply for Unit#6	Unit#1 partial structure erected. Unit#6- no work done		10	10

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Unit No.		Package Description	Status of Supply	Status of Erection	Remarks	% Progress supply	% Progress Construction
		Civil of TG, Boiler, ESP and TRF yard area		Unit # 1 Partial work done Unit# 6 almost No work done		-	10
		Roads & drain, area paving, plinth protection, finishing, painting				-	0
<b>#1,5 &amp; 6</b>		<b>BOP Packages:</b>					
	1.	CW Pump and Piping (total 14 CW pumps for all the 6 Units (6W+2S))	7 nos. not received	-	-	0	0
	2.	CW Piping	All received	For Unit#1,5 and 6, laying & connection with CW pumps and Condensers balance	Exposed portion of wrapping & coating of laid CW pipes (near CW pump house) is damaged. Need replacement. Also CW piping near condenser is submerged in water and needs to evaluate for reusability.	100	70
	2.	Cooling Tower	For Unit#1 and 6 not received	Civil structure of Unit#1 & 6 in advanced stage, Unit#5 nearly completed		60	50
	3.	Interconnection with pipes/cable between	-	Not done	-	0	0

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Unit No.		Package Description	Status of Supply	Status of Erection	Remarks	% Progress supply	% Progress Construction
		BTG packages, TRF packages , WTP, Fuel oil, CAS, FF, HT/LT panels, DCS, Switchyard, CHP, AHP etc.					
#1,5 & 6		<b>CHP and AHP::</b>					
		CHP	Majority of materials received	CD line from TT0 to TT6 and TT7, Bunker floor balance, Erection of Stacker Reclaimer rails (approx. 120 meters), conveyor belts. Work for Unit 1, 5 and 6 balance		95	85
		AHP	Majority of materials received	Work for Unit 1, 5 and 6 balance	Paving around ash silo balance (100M radius), 2 nos. Silos	75	70
Common		<b>Balance Non-Plant Structures:</b>					
		Administrative Building, Canteen, Service building, Security building, Main gate, Petrol pump, Car & scooter sheds, training center, Rain water harvesting etc.	Not yet constructed.				


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### 9.3 Present Status of Non-EPC Scope

- Railway Infrastructure – Scope 44 KM
- Water Infrastructure – 2 nos. Anicut, 3 Pump houses, one Intermediate reservoir, lattice TL, Raw water piping up to plant reservoir
- Transmission Line – Two(2) four circuit TL from plant Switchyard to TAGA Pooling station, Approx. 27 KM
- Other Non-plant structures


**Table 9-3 : Present Status of Non-EPC Scope**


Sl. No.	Description	Status	Photo
1	<b>Railway Infrastructure: Refer Annexure 4</b>		
2.	<b>Water Infrastructure: Refer Annexure 5</b>		
3.	<b>Transmission Line:</b>		
	Two double circuit 400 KV Transmission line (each line capacity 1200MW) from plant switchyard to TAGA pooling station of PGCL. The approx. length of TL is 27 KM from plant switchyard to TAGA pooling station.	Line1 double circuit tower is ready and the power generated by Unit 2, 3 and 4 is being evacuated through this line. Line2 double circuit tower under construction. Balance work: Total 83 towers per line. Foundation of 65 towers ready. 54 tower erection completed. 11 KM stringing completed	
	<b>Non-Plant structures:</b>		
4.	Residential Colony	Not envisaged in KMPCL project. Refer KMPCL /PWC mail dated 20.10.2020	

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Sl. No.	Description	Status	Photo
5.	Outer boundary wall – 26KM length, Brick construction with barbed wire fixed on Y angle	Complete boundary wall was constructed as per scope. However, many places, the boundary walls are damaged including peripheral moorum roads. KMPCL has taken up repair/re-doing the broken /damaged boundary wall from O&M budget	
6.	Roads and drain for areas outside the inner boundary wall	Incomplete	
7.	Entry gate	Temporary structure made	
8.	Watch towers	Not made	
9.	Training center	Not made	



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Sl. No.	Description	Status	Photo
10.	CCTV	Completed	
11.	Silos for evacuation of fly ash through Railways – 2 nos. (earlier it was a part of EPC contract scope)	Roof of one silo balance. Column erected for other Silo is balance	
12.	Horticulture (green belt) and rain water harvesting	Rain water harvesting pond/ well not made. Green belt balance for areas around incomplete structure/building	

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## 10.0 ASSESSMENT OF COST TO COMPLETE OF UNDERCONSTRUCTION UNITS 1, 5 & 6 AND OPERING UNIT-2

In order to arrive at the hard Cost to Completion (CTC) of the project from its present status up to COD, a team of experts of L&T-S&L visited site to assess the physical status of balance supplies (both off-shore and on shore), civil buildings and structures, and erection progress of mechanical, Electrical, C&I and other misc. packages/equipment/ items. The team also made random audit of materials lying at stores and at laydown areas (inside and outside the plant boundary) with reference to available stock register/inward material register of KMPCL to verify loss or damage of items, conditions of the materials (visual observations only. Since such studies have their own inherent assumptions and challenges, to arrive at the cost to completion, the following considerations are made.

- The survey / verification of the existing power plant have been done based on the inputs shared by RP/KMPCL. Appropriate assumptions have been made as regards to the cost, adequacy and time based on L&T-S&L's experience and best engineering practices wherever information and /or data are inadequate.
- During site visit, it has been observed that the storage of materials was maintained appropriately. However, main open storage yard need cleaning and repositioning/ rearrangement of some of the items/equipment to restrict the deterioration of the materials like some of the structural materials/pipes etc. lying on the ground which may cause soil corrosion of the material. Due to prolong storage of materials mainly in outdoor storage yards, might have caused damage/deterioration of the metallic materials/electrical items like motors, panels, actuators, pump materials, rotating parts, pipes, rubber parts, rubber lined tanks/pipes etc. It was difficult to ascertain the exact extent of damage by visual observations due to poor access as there was highly dense grass. Based on the visual inspection of the stored items where access was available, it appears that there is no significant damage to the metallic materials and can be reused with either minor rectification or overhaul of equipment. Therefore, refurbishment cost for such item are considered in the cost estimate but replacement of the equipment or part thereof are not included in the cost estimate.
- It is assumed that the materials received inside the plant are still available and in usable conditions, the materials are not stolen or cannibalized or damaged (except those which were observed damaged or considered as damaged and /or lost as per the inputs and records shared by KMPCL site team)
- The legal fees of statutory and regulatory bodies, such as IBR, CCOE, MOEF, CEA etc. are considered in the cost estimate.
- It is assumed that the right of way for installation of various systems which are outside the plant boundary like MGR, River water intake system including intermediate reservoir, 400KV Transmission lines for power evacuation from switchyard (all are outside the plant boundary), will be arranged separately by owner as per earlier approvals. No cost is considered for such approvals

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- Plant boundary wall repair cost is not considered. As per site KMPCL, the scope for both inner and outer boundary walls were completed. The repair/reconstruction of damaged boundary walls is being executed from O&M budget of running plants.
- Cost of any future Transmission line as shown in the Switchyard SLD for power evacuation is not considered based on discussion with KMPCL
- The water of 100MCM allocated from Mahanadi river is sufficient for all the 6 units while operating at MCR.
- Any claims / counter claims of EPC and other contractors and back charging by KMPCL has not been considered as a cost under CTC.

### 10.1 Estimated Cost To Complete (CTC)

The following methodology is adopted to arrive at the cost to complete up-to COD of Unit1, 5 & 6 and for balance works of Unit#2:

#### Unit # 2

Cost towards the supply, erection, testing & commissioning of balance items have been worked out considering the current plant status at site and inhouse data / prevailing market data.

#### Unit # 5


Apart from the consideration made under Unit # 2, for Unit # 5, some amount of reverse engineering, compatibility assessment, rework / refurbishment, retrofitting etc. would be required to be done by the incumbent EPC contractor / alternate OEM for completing the unit by utilizing the already supplied and erected materials for BTG.

This being unprecedented, data of revival of stalled project by other OEM for such brown field project is not readily available and the actual cost to be incurred would depend on the comfort level of the incumbent EPC contractor / alternate OEM to complete the project which was designed / conceptualized by present OEM.

#### Unit # 1 & 6

As practically negligible supply and erection has been made, BTG is considered totally as a new package.

- Since substantial amount of work has been completed for the common facilities catering to all the six units, therefore, keeping the operation philosophy same, the cost of BOP system is arrived at considering the balance work. Accordingly, the cost for separate facilities for Units 5, 1 and 6 is not envisaged. The total balance cost of BOP systems has been equally apportioned to Unit 5, 1 & 6.
- Cost towards balance civil works covering balance buildings, roads & drains, RCC, finishing, earth work, Architecture, PMG, and other services has been estimated and apportioned to units as below.
  - a. Cost towards balance Buildings – Unit # 5

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b. Cost of other civil works – Equally apportioned to Unit 5, 1 & 6


- Since acquired land is sufficient and development of land has been done suitably for 6 x 600 MW plant, no major land development and refilling cost has been envisaged. However, required land development for various balanced buildings / structures has been considered under the balance Civil works.
- The Non-EPC costs such as Transmission line, Railway infrastructure, Silos etc. are considered in Phase-II as these are required to be completed for smooth operation of the plant and complete power evacuation of Phase-I and Phase-II units while all are in operation (4X600MW= 2400MW). As one transmission line (two circuit tower) can carry maximum 2400MW power, full 2400MW power cannot be evacuated if there is an outage in any circuit. Similarly the incoming railway corridor line is not ready and the outgoing line is used for both coal and LDO/HFO transportation from Akaltara railway discharge point to the plant.
- For balance erection, KMPCL's inputs and L&T-S&L's in-house estimation is considered.
- For other items such as Water infrastructure, Railway infrastructure, coal, Oil etc., FGD, SCR etc., L&T-S&L's in-house estimation is considered in addition to the input received from RP/KMPCL and EPC Contractors guaranteed quantity of fuel requirement till PG test etc. to arrive at the cost.
- For determining the cost of coal, LDO, HFO and Start-up Power required for balance units, quantity as indicated in the on-shore supply contract agreement between KMPCL and SEPCO is considered with suitable assumptions. Present landed cost of fuel has been considered based on the inputs from the KMPCL.
- The cost is excluding the taxes and duties due to, 1) Mega Power Status of the project, 2) Rate of GST is different for different items, 3) Input tax credit to the contractor is possible

#### 10.1.1 CTC of Unit#2 and 5 and Unit# 1 and 6

The estimated cost to complete the Unit # 2 & 5 and Unit# 1 & 6 is summarized below.

**Table 10-1: Summary of Estimated Cost for Unit # 2, 5, 1 & 6**

Unit #	Estimated Cost To Complete (Rs. Crs.)	Details
2	35.26	Clause no. 10.1.2
5	1862.5	Clause no. 10.1.3
1& 6	4616.0	Clause no. 10.1.4

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### 10.1.2 CTC of Unit # 2


**Table 10-2: Estimated Cost to Complete for Unit # 2**

Sr. No.	Particulars	Cost (Rs. Crs.)	Remarks
	<b>Supply Cost</b>		
1	TDBFP	12.00	1 set of TDBFP
2	CW Pump - Common Standby	1.80	1 Set of CW Pump
3	Workshop tools & Tackles	3.00	1 Set
4	Boiler Elevator	0.60	1 No.
5	One single phase GT	6.50	One No.
6	Bull Dozer, Fork lifts	1.20	1 set
<b>A</b>	<b>Total Supply Cost</b>	<b>25.10</b>	
<b>B</b>	<b>Erection, Testing, Commissioning of Balance Items (Sr. No. 1 to 4 of A above)</b>	<b>3.48</b>	20 % of the supply cost
<b>C</b>	<b>Liquidation of punch point items - Service Cost</b>	<b>5.0</b>	Ball park estimate
	<b>Total (A + B + C)</b>	<b>33.58</b>	
	Contingency (5 %)	1.679	
	<b>Total Balance Cost for Unit # 2</b>	<b>35.26</b>	

### 10.1.3 CTC of Unit # 5

**Table 10-3: Estimated Cost to Complete for Unit # 5**

Sr. No.	Particulars	Cost (Rs. Crs.)	Remarks / Basis
	<b>Supply Cost</b>		
1	STG & Auxiliaries	630	100 % balance and 1.05 Cr. /MW has been considered
2	Boiler & Auxiliaries (Excluding ESP)	283.1	33 % balance and 1.43 Cr. /MW has been considered
3	ESP	6.5	9 % balance and 0.12 Cr. / MW has been considered
3	Balance of Plant	72	15 % balance and 0.8 Cr. / MW has been considered
4	Transmission line	32	Considered to be ready along with Unit# 5. Estimated considering the partial progress of 1 double circuit line (Circuit 1 & 2). Balance work for 16 km line @ Rs. 2 Crs. / km.
<b>A</b>	<b>Total of Supply Cost</b>	<b>1023.6</b>	
	<b>Civil works, Erection , Testing, Commissioning, other services cost</b>		
5	Reverse Engg., Compatibility assessment, Refurbishment, Retrofitting, supply of Cannibalized items etc.	255.9	25 % of Supply Cost
6	Erection, Testing and Commissioning	204.7	20 % of Supply Cost


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Sr. No.	Particulars	Cost (Rs. Crs.)	Remarks / Basis
	Cost		
7	Civil Buildings	49.9	As per Sr. No. A of Table 10-5 below
8	Balance Civil Works - Apportioned to Unit 5	95.2	As per Sr. No. H of Table 10-5 below
9	Silos – 2 nos.	7.5	KMPCL's input and assessment during site visit
<b>B</b>	<b>Total of Services Cost</b>	<b>613.2</b>	
<b>C</b>	<b>Total of Supply and Services Cost (A + B)</b>	<b>1636.8</b>	
D	Contingency (5 % of C)	81.8	
<b>E</b>	<b>Total Balance Cost for Unit # 5</b>	<b>1718.6</b>	
	<b>Other Operating Cost</b>		
10	Statutory cost / License fees	5.0	Approximate Value assumed
11	Insurance	10.0	Approximate Value assumed
12	Start-up Power till RRT	16.8	Rs 4 per unit is assumed considering the power sourced from Operational units. The quantity required is taken from on-shore supply contract, 126000000 Kwh/3 per Unit
13	Coal till RRT	34.0	Rs 3400/MT considered. The quantity mentioned in on-shore supply contract as 1650000 MT for 3 units, appears to be on higher side. We've considered coal consumption of 1 Lakh ton per unit
14	LDO till RRT	18.4	Rs 40,000/MT considered. The quantity required is taken from on-shore supply contract, 13770/3 per unit
15	HFO till RRT	14.7	Rs 38,000/MT considered. The quantity required is taken from on-shore supply contract, 21000/3 per unit
16	Commissioning manpower up-to RRT	10.0	Approximate Value assumed
17	Administrative expenses till RRT	15.0	Approximate Value assumed
18	Owner's Engineer	20.0	Approximate Value assumed
<b>F</b>	<b>Total of Other Operating Cost</b>	<b>143.9</b>	
	<b>Total Balance Cost of Unit 5 (E + F)</b>	<b>1862.5</b>	

#### 10.1.4 CTC of Unit # 1 & 6

**Table 10-4: Estimated Cost to Complete for Unit # 1 & 6**

Sr. No.	Particulars	Cost (Rs. Crs.)	Remarks
	<b>Supply Cost</b>		
1	STG & Auxiliaries	1260.0	100 % balance and 1.05 Cr. /MW has been considered
2	Boiler & Auxiliaries	1860.0	100 % balance and 1.55 Cr. /MW has been considered

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Sr. No.	Particulars	Cost (Rs. Crs.)	Remarks
3	Balance of Plant	144.0	15 % balance and 0.8 Cr. / MW has been considered
<b>A</b>	<b>Total of Supply Cost</b>	<b>3264.0</b>	
	<b>Civil works, Erection , Testing, Commissioning, other services cost</b>		
4	Reverse Engg., Compatibility assessment, Retrofitting, supply of Cannibalized items etc.	28.8	20 % of BOP Supply Cost - Approximate Value
5	Erection, Testing and Commissioning Cost	652.8	20 % of Supply Cost
6	Balance Civil Works - Apportioned to Unit 1 & 6	200.4	As per Sr. No. J of Table 10-5 below
<b>B</b>	<b>Total of Services Cost</b>	<b>882.0</b>	
<b>C</b>	<b>Total of Supply and Services Cost (A + B)</b>	<b>4146.0</b>	
D	Contingency (5 % of C)	207.3	
<b>E</b>	<b>Total Balance Cost for Unit # 1 &amp; 6</b>	<b>4353.3</b>	
	<b>Other Operating Cost</b>		
7	Statutory cost / License fees	10.0	Approximate Value assumed
8	Insurance	15.0	Approximate Value assumed
9	Start-up Power till RRT	33.6	Rs 4 per unit is assumed considering the power sourced from Operational units. The quantity required is taken from on-shore supply contract, 126000000 kWh/3 per Unit
10	Coal till RRT	68.0	Rs 3400/MT considered. The quantity mentioned in on-shore supply contract as 1650000 MT for 3 units, appears to be on higher side. We've considered coal consumption of 1 Lakh ton per unit
11	LDO till RRT	36.7	Rs 40,000/MT considered. The quantity required is taken from on-shore supply contract, 13770/3 per unit
12	HFO till RRT	29.4	Rs 38,000/MT considered. The quantity required is taken from on-shore supply contract, 21000/3 per unit
13	Commissioning manpower up-to RRT	20.0	Approximate Value assumed
14	Administrative expenses till RRT	10.0	Approximate Value assumed. It is assumed that commencement of completion of balance unit will be carried out simultaneously.
15	Owner's Engineer	40.0	Approximate Value assumed
<b>F</b>	<b>Total of Other Operating Cost</b>	<b>262.7</b>	



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Sr. No.	Particulars	Cost (Rs. Crs.)	Remarks
	<b>Total Balance Cost of Unit 1 &amp; 6 (E + F)</b>	<b>4616.0</b>	

### 10.1.5 Cost estimation for Balance Building and Civil Works

**Table 10-5: Cost Estimation for balance Building and Civil Works**

Sr. No.	Description	Estimate (Rs. Lakh)	Remarks / Basis
	<b>Buildings &amp; associated works</b>		
1	Admin building	625	
2	Canteen	750	
3	Cycle shed	160	
4	Car shed	160	
5	Plant Service building	1250	
6	Bull Dozer shed	194	
7	Loco shed	239	
8	Toilet block	40	
9	Rail unloading PH	218	
10	Auto garage	100	
11	Security Post	10	
12	Horticulture and Gardening	300	
13	External painting of all buildings	110	
	Sub-total:	4156	
15	Additional cost of furniture, fittings, etc 20%	831.2	
<b>A</b>	<b>Total of buildings:</b>	<b>4987.2</b>	<b>Apportioned to Unit # 5 – Sr. No. 7 of the Table 10-3</b>
	<b>Balance Civil Works</b>		
<b>B</b>	Existing building finishing and balance RCC-Roads, drains, paving etc, Balance RCC estimated 1,09,902 M3 ( Roads & drains- 27868, TG-Boiler-TRF-ESP-Mill, Clarifier 3000M3, CT 2400M3 etc, BOP-Paving-CHP-AHP-WTP etc 6836M3, Misc RCC 8422, Factor 20%, PCC 16509M3 : <b>Total RCC 1,09,902M3 - Cost 165 Cr and @ Rs 15,000, Total PCC 16509M3 @ 30% of Rs 15000/M3 - cost 8 Cr, Total cost 173 Cr</b>	17300	
	Total of A + B	22287	
<b>C</b>	<b>Rounded Off</b>	<b>23000</b>	
	<b>Other cost:</b>		
16	Cost of earthwork, de-watering	4600	20 % of C
17	Architectural cost	460	2 % of C
18	Structural work	1200	Approximate Value
19	Construction permits and clearances	1200	Approximate Value
20	Area development and finishing of structures, legend marking etc	1200	Approximate Value
<b>D</b>	<b>Total of Other cost</b>	<b>8660</b>	

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Sr. No.	Description	Estimate (Rs. Lakh)	Remarks / Basis
<b>E</b>	<b>Sub-Total: (B + D)</b>	<b>25960</b>	
<b>F</b>	Procurement cost, expediting, inspection, site mobilization, co-ordination etc	2596	10 % of E
<b>G</b>	<b>Grand Total (E + F)</b>	<b>28556</b>	
<b>H</b>	Cost Allocation to Unit 5	<b>9519</b>	1/3 rd of 285.56 Crs. <b>AppORTIONED TO Unit # 5 – Sr. No. 8 of the Table 10-3</b>
<b>I</b>	Cost Allocation to Unit 1 & 6	19037	2/3 rd of 285.56 Crs.
<b>21</b>	Modification in existing Civil works of BTG and other areas	1000.0	Approximate Value - New OEM will have to validate the compatibility of existing civil & structure and required to rework / replace / reinforce
<b>J</b>	<b>Total Cost Allocation to Unit 1 &amp; 6</b>	<b>20037.3</b>	<b>AppORTIONED TO Unit # 6 – Sr. No. 6 of the Table 10-4</b>

The worked out cost of balance building and Civil works is apportioned and included in the Cost to Complete of Unit # 5 (Table 10-3) and 1&6 (Table 10-4) above.

For details of balance work for Buildings and Civil refer Annexure 3.

Note:

The breakup of cost estimation of the balance work for the Railway and Water Infrastructure is tabulated in the Annexure 4 and 5 respectively. The balance cost for completion of Water Infrastructure should be considered in Phase-III (Unit 1 and 6).

## 10.2 Additional Cost towards meeting the Environment Norms (All 6 units)


Tentative cost for installation of FGD and ESP modification for meeting the latest environment norms is tabulated below.

**Table 10-6: Cost towards meeting the Environment Norms (All 6 units)**

Sl. No.	Description of cost head	Amount (Rs. Crs.)	Remarks
1	Cost of FGD	1872	
2	Cost of ESP Modification	12	Controller modification and new ESP management system
	<b>Sub-total:</b>	<b>1884</b>	

Notes:

- The cost is an indicative EPC cost. The detailed feasibility report shall be carried out for the Project specific cost estimate.
- The SC on July 8 relaxed limits for coal-fired power stations commissioned between December 2003 and 2016 — to 450 mg / Nm<sup>3</sup> from 300 mg / Nm<sup>3</sup>. The relaxation, however, will not affect the deadline to meet the December 2015 pollution norms, which is up till December 2022 for most units. Accordingly, cost towards meeting the NO<sub>x</sub> limits could be around 900 Crs.

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## 11.0 PLANT PROGRESS- UNIT 1, 5 AND 6

Phase I which consists of Unit 3 & 4 were commissioned and in operation. Accordingly, a 100 % project progress is achieved. For Phase II, which consists of Unit 2 & 5, COD has been achieved for Unit 2. Unit 5 and Phase III units (1 & 6) were under construction.


Percentage progress of the plant-BTG for Unit 1, 5 and 6 is tabulated below. Current overall progress of the plant has been arrived at as below.

**Table 11-1: Plant Progress- Unit 1, 5 and 6**

Particulars	Estimated % Completion of BTG				Remarks for estimated % Completion
	*Weightage (%)	Unit#1	Unit#5	Unit#6	
Engineering	12	90	90	90	Balance infrastructure, Township, non-plant buildings, As-built drawings, O&M manuals, Balance vendor engineering etc.
Supply	55	0	45	0	Based on site assessment and judgment
Erection	27	0	25	0	Based on site assessment and judgment
Commissioning	6	0	0	0	No pre-commissioning activities were performed due to non-availability of back charging power
Overall		10.8	42.3	10.8	(Weightage X Unit progress)

\*Typical weightage % considered for Engineering, Supply, Procurement and Commissioning

**Note:** BOP and other infrastructures required for these units are 85% completed. Major balance activities are CT – Completion of balance civil works, mechanical erection and commissioning, CW pump erection and commissioning, CW pipe laying and backfilling, Fly ash collection and disposal systems, CHP conveyer system (CD lines from TT6 to respective units), piping, Electrical and C&I systems such as cabling, HT-LT panels, MCCs, DCS systems, TSI etc. with BTG packages of under construction units and to that of balance equipment erection of unit#2 (under operation).

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## 12.0 ASSESSMENT OF TIME TO COMPLETE

The time to completion schedule has been worked out based on the assessment of balance work. The major milestones are tabulated below.


**Table 12-1: Major Milestones for Time to Completion Schedule**

Sr. No.	Milestones	Timeline (Months)		
		Unit#5	Unit#1	Unit#6
A	Pre NTP Activities	-4	-4	-4
1	Release of LOI / WO to OEM / Contractors	-1	-1	-1
2	Statutory Approval	-1	-1	-1
3	Site Mobilization	0	0	0
4	Reconciliation of Material	0	0	0
B	NTP (Notice to Proceed)	0	0	0
5	Engineering work	6	6	6
6	Start of erection of Boiler, Turbine & it's Auxiliaries	1	13	16
7	Supply of balance items at site	12	17	19
8	Boiler Hydro test	13	25	28
10	TG & Auxiliaries readiness	15	22	27
11	Oil Flushing	17	24	29
13	TG ready for Barring Gear	17.5	24.5	29.5
14	Boiler Light up	19	28	31
15	Steam Blowing and restoration	21	29	32
16	Synchronization	23	31	33
17	COD	24	32	34
18	PG Test	24.5	32.2	34.5

As per the estimated completion of balance work, COD of the Unit # 5, Unit#1 and Unit # 6 is envisaged to be achieved in 24<sup>th</sup>, 32<sup>nd</sup> and 34<sup>th</sup> month respectively after NTP. However,  $\pm 3$  months change in the estimated completion may be considered as optimistic and pessimistic scenario. Also, pre NTP activity period of 4 months has been considered.

The BOP system and CHP & ASH systems which are common except hooking-up with Units 1, 5 and 6 are nearly ready. The main balance work are BTG foundations, TG deck casting, BTG erection, boiler hydro test, , CT civil, mechanical erection, CP pump, CW pipe laying near CWPB and TG hall, CD line of CHP system, Transmission line, Rail corridor, commissioning, BLU, Synchronization etc.

The milestone schedule (L1) is attached as **Annexure 6** to this report.

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### ANNEXURE - 3: Assessment and Site Photographs

DETAIL BALANCE WORKS – PACKAGE / SYSTEM WISE – UNIT1, 5 AND 6:


#### 1. Civil – Building and Structures, Roads and Drains

- Various buildings such as administrative building, service building, canteen, car and scooter sheds, training center, main gate, watch tower etc.

NON PLANT BUILDINGS YET TO BE CONSTRUCTED						
	Nos	No of Floors	L (m)	B ( m)	Floor Ht ( m)	Total Ht
Admin Building	1	2	50	25	5	10
Canteen Building	1	2	50	25	5	10
Cycle Shed	1	1	100	8	4	4
Car Shed	1	1	100	8	4	4
Plant Service Building	1	4	30	20	5	20
Bull Dozer Shed	1	1	100	12	6	6
Loco Shed	1	1	20	15	8	8
Toilet Block	2	1	10	10	4	4
Rail Unloading Pump House & pipe rack	1	1	51	10	6	6
Auto Garage	1	1	30	25	4	4
Security Post	2	1	3	3	3	3
Petrol Pump	1	1	-	-	-	-

- Plant roads and drains including internal approach roads to buildings. Balance quantity is given below

S. No	Description	Balance Qty-Meters	Remarks
1	7 mtr Road	1749	250 thk PCC
2	4 mtr Road	2848	250 thk PCC
		Balance Qty - Meters	
3	7 mtr Road	14121	150 mm thk RCC
4	4 mtr Road	5144	150 mm thk RCC
S. No	Description	Balance Qty in Length ( m)	Remarks
1	RCC drains	24889	Average size 1.2 m x 1.2 m x Thk150 mm


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### **Balance Civil Buildings and Structures**

Major civil works balance in BTG and BOP areas:

- Grade slab of equipment areas
- Column foundation of Unit#6 TG building
- Deck slab of Unit#1 and 6
- Column foundations of TG building Unit#6
- Encasing and grouting of columns
- IPS flooring of BTG areas, Boiler & ESP areas
- IPS flooring of finished buildings (CW pump house etc.)
- RCC pathway in BTG areas
- Area paving, plinth protection of all buildings (completed buildings also), BOP areas
- Paving in ash Silo areas covering radius of 100 Meters
- Building painting and finishing of existing buildings
- Encasing of balance CW pipelines (supply and return lines of Unit # 1 and 6)
- Balance civil works of Cooling tower # 1 and 6 such as deck, walls, columns, channels etc., Coal tar painting of basin
- Balance BTG structures, cladding sheets, encasing of columns etc.
- Equipment grouting and finishing
- RCC of Unit#5 TG hall roof
- Balance RCC of Ash Silos
- Roof treatment of all buildings
- Clarifier Tank RCC structure – 2 nos.
- Roof of Clarifier water storage tank
- Civil works of one no. store (presently roof has been made)
- Bottom ash hopper equipment foundation and grade slabs
- Equipment foundation, grade slab, plastering of ESP control rooms
- Roads and drain including repair of existing PCC roads & drain
- Finishing, painting, legend marking etc.



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Plant Roads – PCC only



Painting balance of existing buildings



CW Pump House



TG equipment – Ground Floor



Unit#1 (structure, deck slab incomplete)



Unit #2 TG hall




Pathway between Boiler and ESP



Mill area of Unit#6



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Unit#5 Equipment floor



Clarifier tank (RCC)



Condenser shell of Unit#5



GT Transformer Foundation

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## 2. BOP Packages – CW Pumps, Cooling Tower etc. - Balance Activities

### Cooling Water Pump House (CWPH-1)

- Supply and erection of 3 nos. pumps and motors
- CW pipe connection between CW pump discharge and common header

### Cooling Water Pump House (CWPH-2)

- Supply and erection of 5 nos. pumps and motors
- CW pipe connection between CW pump discharge and common header

### Cooling Tower #1:

- RCC structure including deck slab balance
- Equipment not supplied

### Cooling Tower#6:

- RCC structure including deck slab balance
- Equipment not supplied

	
<b>CWPH1</b>	<b>CWPH2</b>
	
<b>CT#1</b>	<b>CT#2</b>

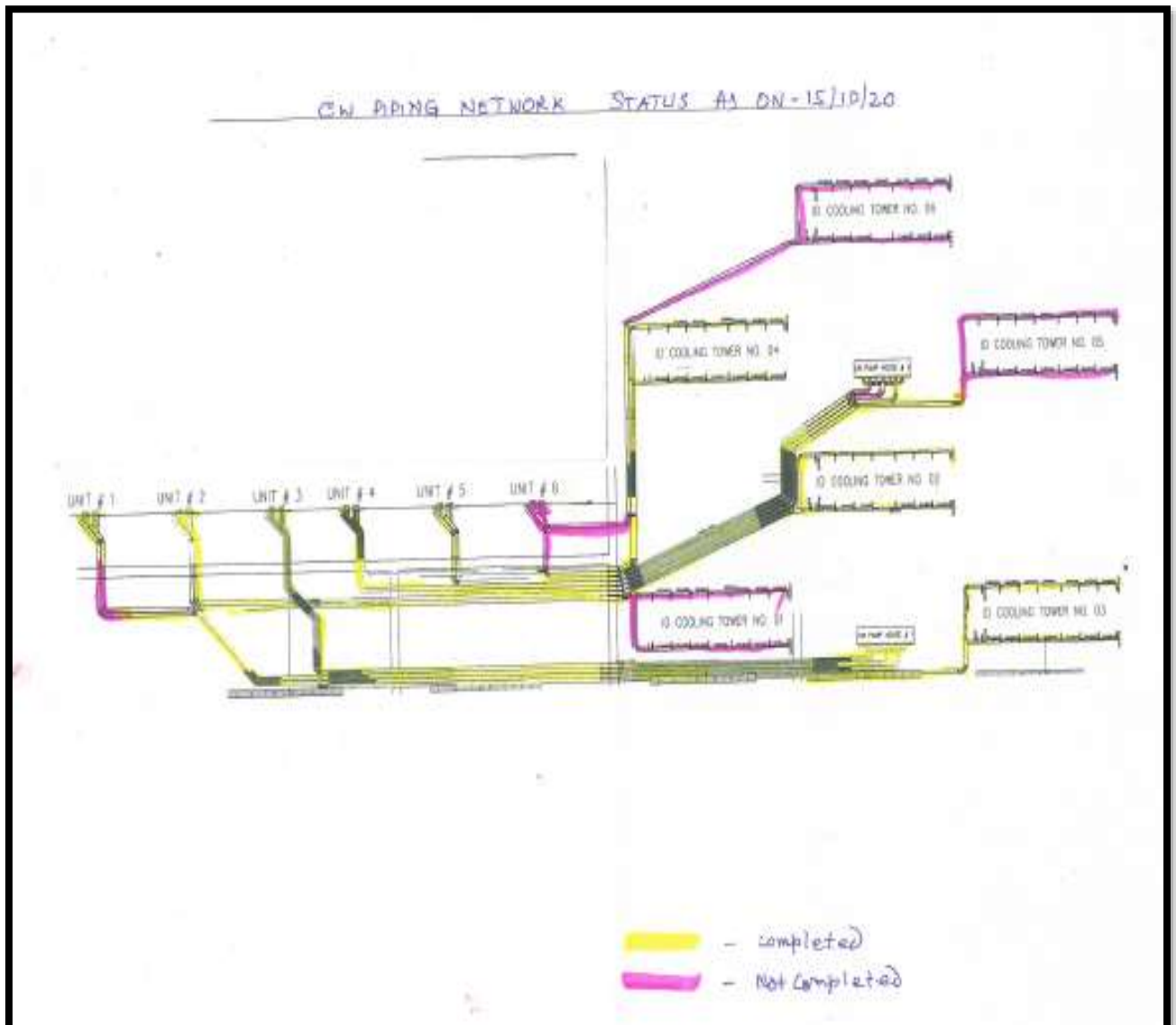


Internal roads



CWST storage Tank

### Sketch of CW Piping





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### 3. Coal Handling Plant (CHP)

The CHP system is in operation for the operating Units #2, 3 and 4 and the CHP system such as crusher house, TTs, stacker reclaim etc. are also ready except CD lines from TT0 to TT7 and bunker bays of Unit #1, 5 and 6. In-order to feed coal to operating Unit#2 (as per design C line is configured for Unit# 1 & 2), a temporary extension line is constructed from AB line to Unit# bunker bay.

Major balance activities are mentioned below.

- In stacker reclaim areas, erection and commissioning of approximately 120 Meters rail line and conveyor belt is balance
- Shed of Wagon Tripler
- Track hopper-1 rails & electrification balance, fire fighting piping, lighting & Ventilation balance
- Building finishing, painting, area paving, drains, access roads
- CD line conveyor system



Wagon Tippler



Track Hopper-1



TT6-TT7




Pump house


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#### 4. Ash Handling Plant (AHP):

The AHP system is common for all the six units and major portion are in operation (which are catering to the operating units #2, 3 and 4) except bottom ash and fly ash system of Unit #1, 5 and 6. Both bottom ash pond and fly ash dyke is ready. The other balance works are mentioned below.

- Two nos. fly ash silos for evacuating fly ash through railway corridor
- Fly ash and bottom ash system for Unit# 1, 5 and 6
- Finishing and painting of buildings / structures

	
Ash disposal pipelines	Ash water Pump House
	
Ash Silos	Unit#5 Fly Ash system in ESP

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## 5. Fuel Oil Handling System

The Fuel Oil Handling System is in operation. However, the fuel oil line for under construction units yet to be laid and commissioned. The present status is mentioned below.

- Unloading provision for 7 nos. of road tankers provided and the system is commissioned & operational
- Unloading of LDO & HFO from road tanker & storage the same in respective storage tank LDO tank (2 Nos. 1000M3) & HFO Tank (4 no. 2000 M3) is provided. Two nos (1W+1S) LDO unloading pump & Two Nos. (1W+1S) HFO unloading pump provided. The system is commissioned & operational.
- LDO tank (2 Nos 1000M3) & HFO Tank (4 no. 2000 M3).Erection completed Commissioned & operational. HFO heated in the storage tank to maintain the suitable temperature by supplying steam through floor coil heaters.
- Two Nos LDO forwarding pump (1W+1S) from which supply line go to the three operation boiler burner, splitting for each unit near boiler. Return line from boiler to LDO tank provided. Both pump commissioned & operational
- Supply & Return LDO piping from boiler 1,5,6 to common header pipe in pipe rack pending
- Firefighting system , Foam system with necessary accessories commissioned & in operational
- Supply & Return HFO piping from boiler 1,5,6 to common header pipe in pipe rack pending




Unloading system from tankers



Unloading pumps & piping



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<p>LDO and HFO tanks</p>	<p>LDO Pumps</p>
	
<p>FF Foam System</p>	<p>HFO pump and piping</p>



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## 6. Electrical and C&I Packages:

Supply status of major electrical and C&I packages is given below:

Package description	Unit#1	Unit#5	Unit#6	Remarks
Generator Transformer – 1 per unit	NA	NA	NA	Foundation completed
Station Transformer – 3 nos.	Available	Available	Available	2 are charged. One placed on foundation
UAT – 2 nos. per Unit	NA	NA	NA	
HT Panels	NA	Available	NA	Not erected
MCC	NA	Available	NA	Not erected
Auxiliary Transformers (Dry Type)	NA	NA	NA	
CW Pump panels	NA	Available	NA	
CT MCC	NA	Available	NA	Civil ready. Not erected
HT Cables (815KM per Unit) LT cables (172KM/Unit)	NA	Partially available	NA	
Unit Boards	NA	40 nos. available		
Boiler MCC	NA	NA	NA	
Lighting MCC	NA	NA	NA	
UPS & Battery	NA	Available	NA	UPS of Unit#5 not erected. Battery charged
Relay Panels	NA	NA	NA	
DCS – Operating stations, Engineering stations, TSI, Field instruments, ETS,	NA	NA	NA	Only LV TV received and erected
DCS panels- 20 nos./Unit	NA	Available*	NA	Placed in CCR room. Not erected *Panel Cabinets are available. Modules are used in operational unit
DCS Remote panels	NA	Available	NA	Panels are placed in location For Unit#1 & ^: Separate building which are yet to be constructed
ESP Control panels (8 nos./Unit) and AHP panels (5 nos./Unit)	NA	Partially available	NA	Unit#5: Controller not received
GT Protection panel	NA	Available	NA	Not erected
Lighting Mast	Commissioned			
SWAS	NA	NA	NA	

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Major works balance:

- Erection works of panels
- Cable tray laying and Cabling
- Field instruments
- Hook-up between CCR and Switchyard etc.
- Pre-commissioning and Commissioning



Relay panel room of Unit#5




DCS panels of Unit#5



Control Room








ESP Control Room

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## 7. Storage Yard

The materials stored in the open storage yard and in closed/semi open storage yard, the overall condition of the materials is satisfactory. However, due to stagnation conditions in open storage yards since April'2018, there is a possibility of deterioration of materials due to rusting, foreign particles etc.

	
<b>Unit#5 Pressure Parts</b>	
	
<b>Pipe yard</b>	<b>Cable storage yard</b>

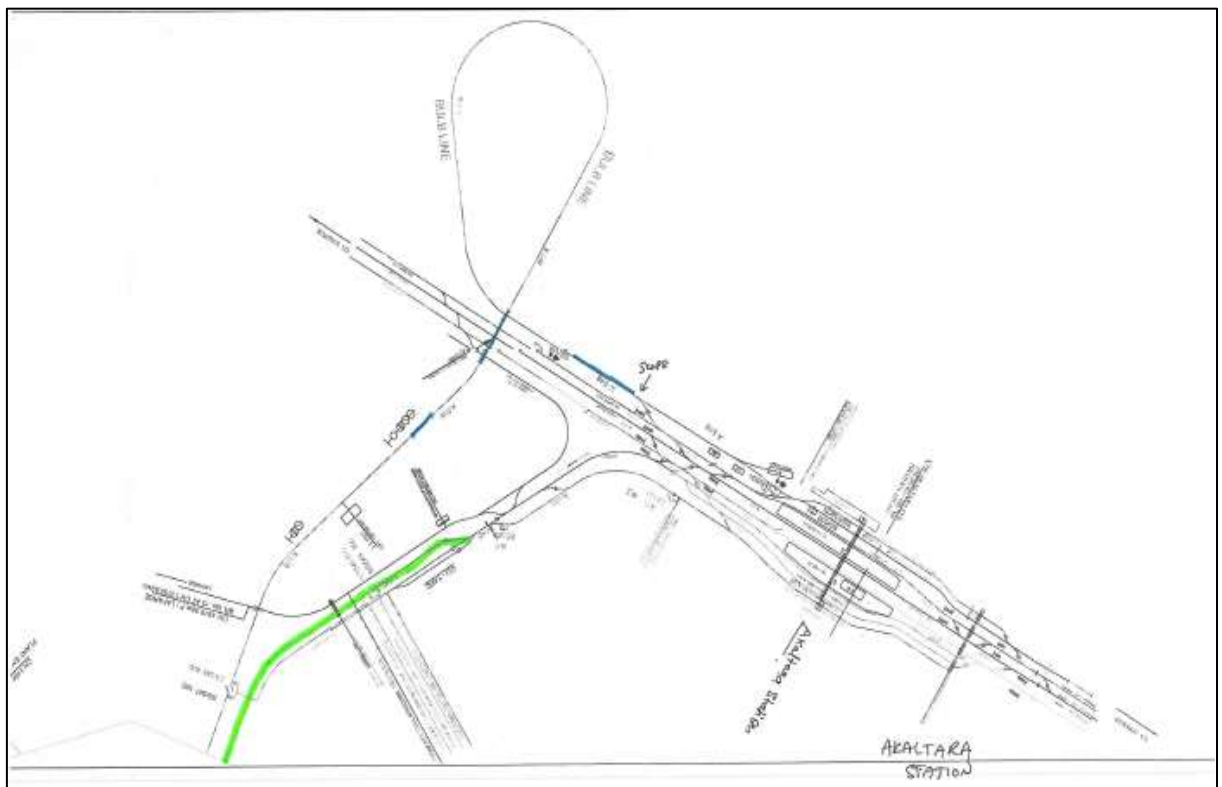
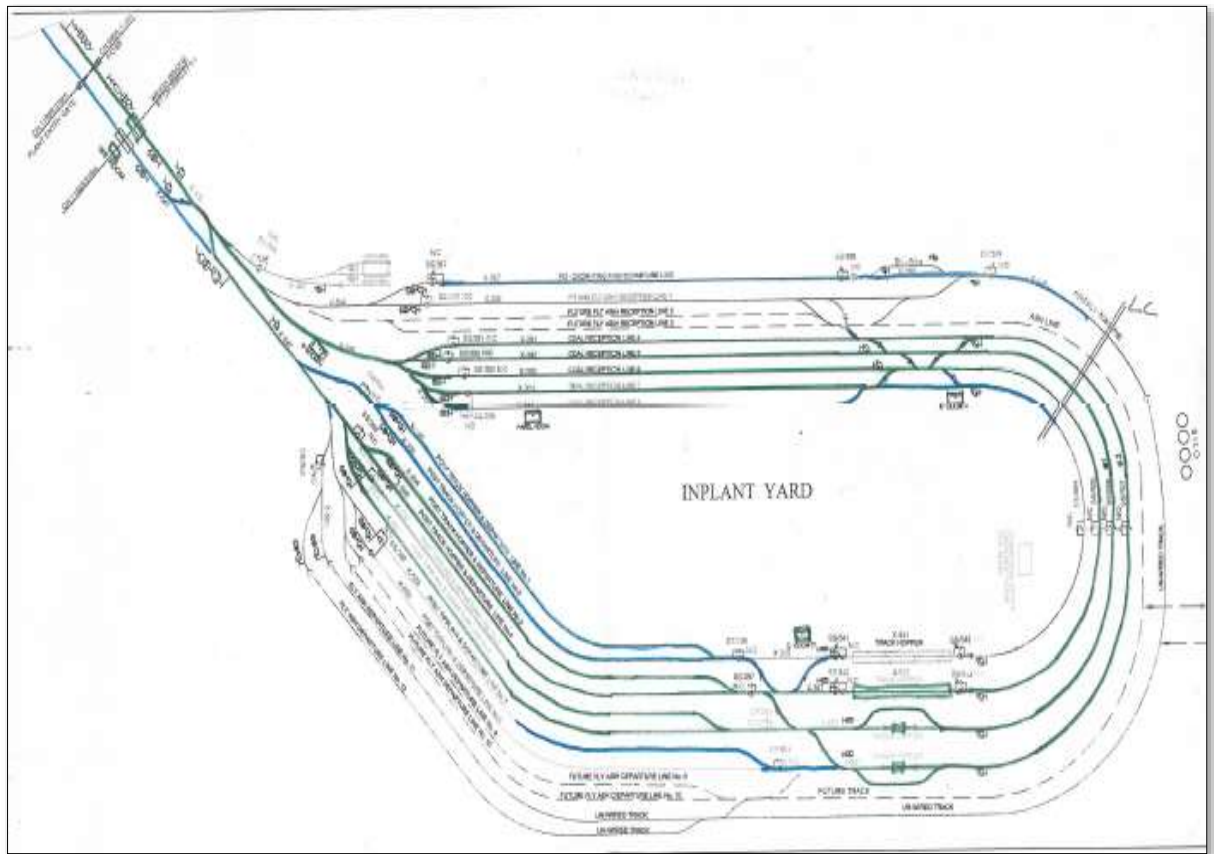
<b>Technical Study Report</b>	<b>6 X 600 MW Thermal Power Plant, M/s. KMPCL at Akaltara, Chhattisgarh.</b>	 <b>L&amp;T-S&amp;L</b> <b>L&amp;T – Sargent &amp; Lundy Limited</b>
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#### **ANNEXURE - 4: Railway Infrastructure**

Transportation of coal which is the primary fuel for 6X600 MW KMPCL Power Plant from Akaltara Railway station (exchange yard or take-up point) to plant and then return back to the main line of Akaltara Rail station is considered as the scope under Railway Infrastructure project. The following are the major scope of the complete railway infrastructure on Engineering, procurement, supply, installation, testing and commissioning and handing over to KMPCL basis.

- Total length of the railway corridor is approximately 44.5 KM
- Incoming and outgoing line from Akaltara exchange yard to the power plant
- MGR loop consisting various lines
  - Fly ash departure lines (Line nos. 11 and 12)
  - Future Fly ash departure lines (Line nos. 9 and 10)
  - Post Tippling and departure lines (Line nos. 5, 6, 7 and 8)
  - Post Track hopper and departure lines (Line no. 1, 2, 3, 4)
  - Coal reception lines (Line nos. 4, 5, 6, 7, 8)
  - Future Fly Ash reception lines (Line nos. 2 and 3)
  - FO and Fly ash reception line (Line no. 1)
  - FO Decanting and departure line
  - Change over links and system from one line to other lines
- 3 numbers control rooms
- One number panel room
- Overhead electrification
- Signaling system
- In-motion weighing bridge
- Half in-motion weigh bridge
- 2 numbers diesel loco engine
- Loco shed
- Acquiring land along the railway corridor outside the plant boundary
- Rail On Rail(ROR) bulb line
- Power feeder lines (from AKT/TSS/LAFARGZ/BM Feeder1, AKT/TSS/KSKMPCL/BM Feeder2 &3, AKT/TSS/CCIBM Feeder4)
- Fencing/ marking of the land on either side of the railway lines (incoming and outgoing lines) outside the plant boundary

Refer the sketch below.





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#### **Present progress status and balance works:**

The required Fuel (Coal and oil) are being transported through the railway corridor to meet the fuel requirement of the operating units 2, 3, and 4. The control and signaling system for the lines completed in all respect are in operation. Out of 44.5 KM of rail infrastructure lines, 20.5 KM rail lines are completed.

Assessment of Railway Infrastructure has been carried out based on the site visit observations & discussions, information / documents available in the previous reports. Being a different SPV, there is a limitation in availability of documents, present status, cost details etc.

The major balance supplies and erections are mentioned below.

- Loco shed
- 23.5KM railway line including supply and erection of rails, sleepers, special sleepers, overhead electric lines, change over lines, cabling etc.
- Commissioning of second in-motion weigh bridge
- Fencing of areas parallel to the incoming and outgoing track outside the boundary wall. Boundary limits are identified with stones

The balance major BOQ of various items is given below.


- 18 KM rail lines (6 KM rail lines available)
- Special sleepers for 45 points
- Normal sleepers for 24 KM length ( 1660 nos. required/KM)
- Loco shed – 1 no. of size 20M(L) X 15M(W) X 8M(H) – This is considered as part of Construction cost











Complete Railway corridor from Akaltara railway station to Power Plant





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<p>Loco Engines</p>	<p>Rail lines</p>
	
<p>Control Room (GOOMPTY)</p>	<p>Electrical Panel Room</p>
	
<p>Incoming and Outgoing lines</p>	
	
<p>Track hopper 1</p>	<p>Track hopper 2 line (balance)</p>

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#### Cost Estimation of Balance Work:

Sr. No.	Item Description	UOM	Quantity	Rate (Rs.)	Total Amount (Rs. Lakhs)	Remarks
1	Rail	km	18			121 MT / km
		MT	2178	50000	1089.0	
2	Special Sleepers	Points	45	350000	157.5	
3	Normal Sleepers	km	24			1660 nos./ km
		Nos.	39840	3000	1195.2	
4	Electrical and C&I			300	300	Estimated Value
5	Accessories and miscellaneous cost				100	Estimated Value
	Total Supply Cost				2841.7	
6	Transportation Cost				113.7	4 % of Supply Cost
7	Erection Cost				852.5	30 % of Supply Cost
	Sub Total				3807.9	
8	Contingency and Other work				380.8	10 % of Sub-total
	Total Cost				4188.7	
	Rounded Off				<b>4200.0</b>	

## ANNEXURE - 5: Raw Water Infrastructure

### Process Description for the Project

Water is sourced through 2 different sources (39 km & 60 kms away) involving barrages with pumping station, intermediate reservoir with pumping station, transportation infrastructure including the piping system, intermediate reservoir and electrical transmission line.

KWIPL has constructed / is constructing an Intermediate Reservoir and three pumping stations one each at the Barrage sites and another at the Intermediate Reservoir. The Pumping stations are designated as PS-1, PS-2 & PS-3 for Basantpur, Sheorinarayan and Intermediate Reservoir, respectively.

The Project consists of five main components under this Raw Water linkage arrangement which has been described as follows:

- Barrages on River Mahanadi at Basantpur & Sheorinarayan are being constructed by WRD, Chhattisgarh:
- Pump Houses at Basantpur, Sheorinarayan & Intermediate Reservoir
- Water transportation infrastructure from river to plant site including underground pipeline running from Barrage to power plant, SCADA System etc.
- Intermediate reservoir (IR) of 7 Million Cubic Meters (MCM) Capacity (equivalent to one month's storage requirement of power plant).
- Transmission line from the power plant to the pump houses running parallel to the pipelines.

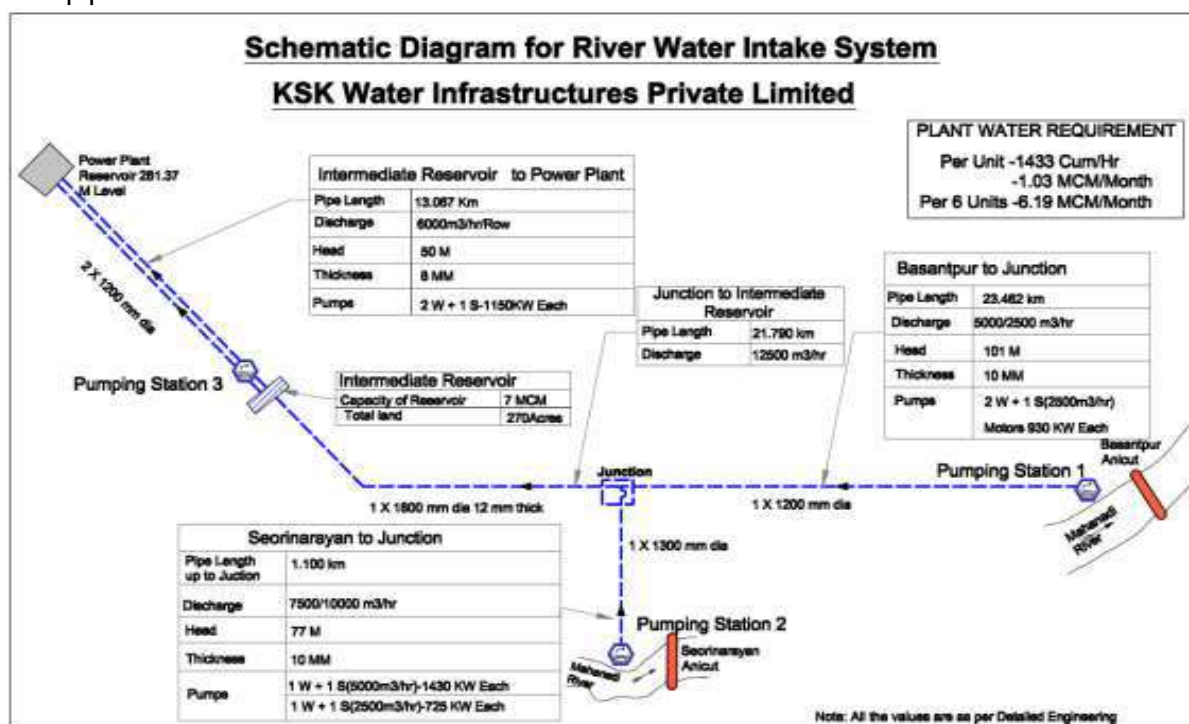


Fig: Schematic diagram for river water intake system



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during site visit it was observed that, bypass line is provided after the junction point to divert raw water from ps-1 and ps-2 directly to the power plant. Necessary hardware required for the bypass arrangement are in place.

Assessment of Water infrastructure has been carried out based on the site visit observations & discussions, information / documents available in the previous reports. Being a different SPV, there is a limitation in availability of documents, present status, cost details etc.

Detailed status report on each section of water infrastructure is described below

### **Pump Station – 1 (Basantpur Pump Station)**



Pump station -1 (ps-1) is situated at basantpur anicut reservoir. as per approved p&id, 3 pumps are provided for the ps-1 each with the capacity of 2500 m<sup>3</sup>/h at 101 m head. ps-1 mainly consist of following major components.

- River mouth
- 2 nos of screen namely bar screen and coarse screen
- Raw water pumps
- Pump house building
- Surge tank
- Switch gear room
- Plc control room
- Power station 33 kv

Status for all above major components is as shown below:

	
<p>River mouth</p>	<p>Bar screen and chain pulley arrangement</p>
	

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Inside view of Pump house	Discharge head piping
	
MCC Room	Switch gear building and 33KV/11KV Substation

It is to be noted that, details for river mouth, bar screen, course screen and surge tank are not available in the approved P&ID and any other relevant technical documents. Status for these equipment's are derived based on the site visit.


#### **Pump Station – 2 (Seorinarayan Pump Station)**

Pump station -2 (PS-2) is situated at Seorinarayan Anicut Reservoir. As per approved P&ID, 4 pumps are provided for the PS-2 each with 2 pumps having capacity of 2500 m<sup>3</sup>/h at 77 m head and remaining 2 pumps with capacity of 5000 m<sup>3</sup>/h at 77 m head. PS-2 mainly consist of following major components.

- River mouth
- 2 nos of screen namely Bar Screen and Course Screen
- Raw water pumps
- Pump house building
- Surge tank
- Switch gear room
- PLC control room
- Power station 33 kV

Status for all above major components is as shown below:

	
Intake channel	Pump house

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MCC Room	Pump house

It is to be noted that details for river mouth, bar screen, coarse screen and surge tank are not available in the approved P&ID and any other relevant technical documents. Status for these equipment's are derived based on the site visit.

### Pump Station – 3 (Intermediate Pump Station)

Pump station -3 (PS-3) is situated at Intermediate Reservoir. As per approved P&ID, 3 pumps are provided for the PS-3 each with the capacity of 6000 m<sup>3</sup>/h at 50 m head. PS-2 mainly consist of following major components.

- Intake well
- 2 nos of screen namely Bar Screen and Course Screen
- Raw water pumps
- Pump house building
- Surge tank
- Switch gear room
- PLC control room
- Power station 33 kV

Status for all above major components is as shown below:

	
Intake well with bar screen	Pump house



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Pump House



MCC Room

It is to be noted that details for intake well, bar screen, coarse screen and surge tank are not available in the approved P&ID and any other relevant technical documents. Status for these equipment's are derived based on the site visit. Concerned official of KMPCL has confirmed that the motor of all the pumps are received.

#### Intermediate Reservoir

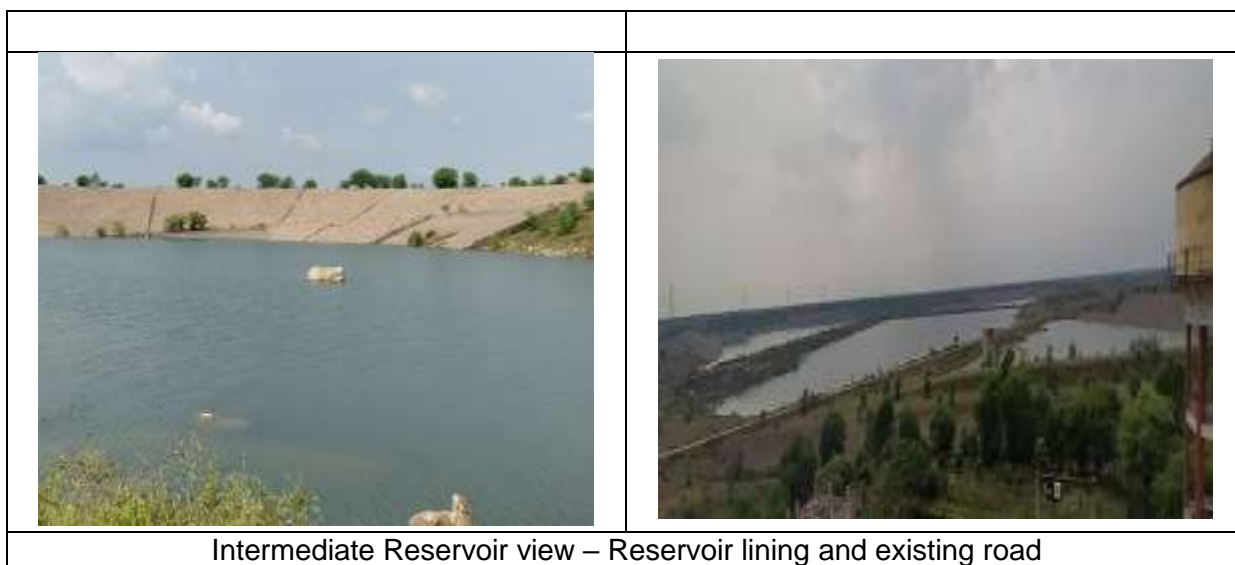
Raw water from PS-1 and PS-2 is collected at intermediate reservoir. As per approved P&ID, capacity of intermediate reservoir is 7 million cubic meter which is equivalent to one-month storage requirement for the power plant.

Present status for intermediate reservoir is described below:

It is to be noted that details for intermediate reservoir other than capacity is not available in approved P&ID and any other relevant technical documents. Status for reservoir is derived based on the site visit.




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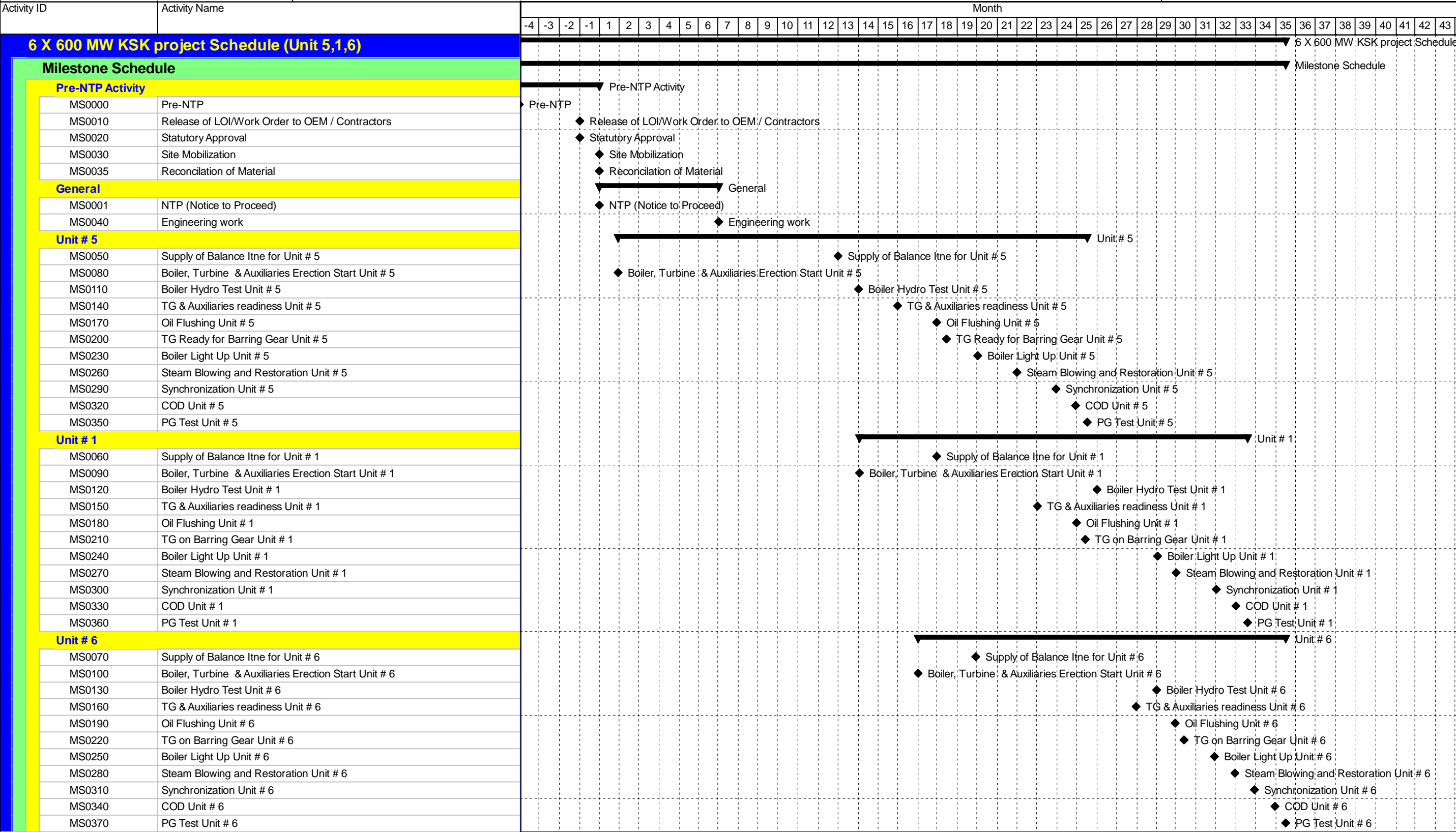


#### Cost Estimation of Balance Work:

Sr. No.	Description	Cost (Rs. Lakhs)	Balance items / works
1	Pump Station -1 (PS-1)	81.4	Approach platform, cabling for street lighting, boundary wall, painting of bar screen, ladders, PLC room, structure etc.
2	Pump Station -2 (PS-2)	227.7	River mouth construction of length (approx.220 mtrs), Approach platform painting bar screen, ladders, PLC room, structure, fixing of chequer plate, plastering, pavement, pre-commissioning and commissioning Boundary wall (@ 750 mtrs.), plant internal roads (@ 100 mtrs.)
3	Total balance cost intermediate reservoir	1593.7	Road around reservoir and top bund, excavation, embankment, fencing, lighting, construction of steps, ramps, fabrication and fixing of sluice gate at intake wells, construction of parapet wall / fixing of guard stones etc.
4	Pump Station -3 (PS- 3)	98.1	Approach platform painting bar screen, ladders, PLC room, structure, fixing of chequer plate, plastering, pavement, pre-commissioning and commissioning, Sluice gate partially balance (@ 50 %), erection of motors & instruments, boundary wall (@ 350 mtrs.) etc.
5	Other miscellaneous cost	450.0	Estimated Value
	Sub Total	2450.9	
6	Contingency (5 %)	122.5	
	Total balance cost	2573.4	
	Round off	<b>2600.0</b>	


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## **ANNEXURE - 6: L1 Schedule**




Current Bar Labels  
◆ Milestone  
Summary

L1 Project Schedule

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## Part C – Assessment of Cost Incurred

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### 13.0 FINANCIAL OVERVIEW

<b>Name of the Company</b>	KSK MAHANADI POWER COMPANY LIMITED
<b>CIN</b>	U40300TG2009PLC064062
<b>Registered Office</b>	8-2-293/82/A/431/A, Road No.22 Jubilee Hills, Hyderabad-500033, Telangana
<b>Project Site</b>	Near Nariyara Village, Akaltara Tehsil, Janjgir-Champa District, Chhattisgarh
<b>Project Title</b>	The project for Setting up of 6x600 MW Thermal Power Plant at Near Nariyara Village, Akaltara Tehsil, Janjgir-Champa District, Chhattisgarh on build, own and operate basis.
<b>Report for the period ending on</b>	02.10.2019

#### 13.1 EPC Contracts

##### 13.1.1 EPC Contract with SEPCO

Below mentioned Contracts were signed by the Wardha Power Company Private Limited & SEPCO Electric Power Construction Corporation for the EPC requirement for all the units of the project. It is further stated that pursuant to the scheme of Arrangement of Demerger approved by the Hon'ble High Court of Andhra Pradesh, India, the project referred to in the Contract was demerged from Wardha Power Company Private Limited (WPCL) to KSK Mahanadi Power Company Limited (KMPCL) and accordingly the Contracts together with all rights, obligations, liabilities, benefits and privileges thereunder of WPCL stood transferred to and vested in KMPC for the all EPC contracts as stated above.

- Contract No: SEPCO, CHINA/SK.1160201/252→For Off- Shore Supply Contract
- Contract No: SEPCO, CHINA/SK.1160201/253→ For Off- Shore Services Contract
- Contract No: SEPCO, CHINA/SK.1160201/254→ For On- Shore Supply Contract
- Contract No: SEPCO, CHINA/SK.1160201/255→For On- Shore Services Contract
- Contract No: SEPCO, CHINA/SK.1160201/256→For Construction Contract

The summary of the contracts is as tabulated below.

**Table 13-1: Summary of EPC Contracts**

<b>Particulars</b>	<b>Units relates to</b>	<b>Contract Value</b>
Off- Shore Supply Contract	All units	US \$ 1,946,644,000
Off- Shore Services Contract	All units	US \$ 4,860,000
On- Shore Supply Contract	All units	Rs. 3,585,636,314
On- Shore Services Contract	All units	Rs. 11,399,000,000
Construction Contract	All units	Rs. 28,805,000,000



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### 13.1.2 Contract No: SEPCO, CHINA/SK.1160201/252→For Off- Shore Supply Contract

As per the fourth Amendment to the Offshore Supply Contract between KSK Mahanadi Power Company Limited (KMPCL) And SEPCO Electric Power Construction Corporation dated 30th Mar 2016, the contract price shall be as follows. The Contract price shall mean the price for supply supplied on CFR (INCOTERMS 2000) basis.

**Table 13-2: Off- Shore Supply Contract Price Total and Phase Wise**

<b>Sequence and Commissioning of Unit Numbering:</b>	<b>Total Contract Price for 6 Units</b>	<b>\$1,94,66,44,000</b>
3 & 4 Units	First 2 Units Offshore Supplies Chinese	<b>\$ 79,22,16,456</b>
2 & 5 Units	Next 2 Units Total	<b>\$ 68,35,96,342</b>
1 & 6 Units	Next 2 Units Total	<b>\$ 47,08,31,202</b>

### 13.1.3 Contract No: SEPCO, CHINA/SK.1160201/253→ For Off- Shore Services Contract

As per the first Amendment to the Offshore Service Contract between KSK Mahanadi Power Company Limited (KMPCL) and SEPCO Electric Power Construction Corporation dated 30<sup>th</sup> Mar 2016, the contract price shall be as follows.

As per Clause 8.2 (ii) Any exchange rate variation with respect to the reference rate of RMB to USD (1 USD equivalent to 6.82RMB, based on the USD buying rate published by the Bank of China on the date of payment release shall be on account of owner and contract price varies accordingly, the contractor shall raise a debit / credit invoice to the owner which shall be duly supported by the relevant back up documents of exchange rate and the variation thereof.

The total contract price was **\$ 48, 60, 000.**

### 13.1.4 Contract No: SEPCO, CHINA/SK.1160201/254→ For On- Shore Supply Contract

As per the First Amendment to the Onshore Supply Contract between KSK Mahanadi Power Company Limited (KMPCL) And SEPCO Electric Power Construction Corporation dated 9<sup>th</sup> June 2011, the total contract price was **₹ 3,58,56,36,314.**

### 13.1.5 Contract No: SEPCO, CHINA/SK.1160201/255→For On- Shore Services Contract

As per the First Amendment to the Onshore Supply Contract between KSK Mahanadi Power Company Limited (KMPCL) And SEPCO Electric Power Construction Corporation dated 30<sup>th</sup> March 2016, the contract price was **₹ 11,39,90,00,000 exclusive of Tax.** The contract price would be Rs. 1163.3 Crs. including the tax as on date.

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### 13.1.6 Contract No: SEPCO, CHINA/SK.1160201/256→ For Construction Contract

As per the Fifth Amendment to the Onshore Supply Contract between KSK Mahanadi Power Company Limited (KMPCL) And SEPCO Electric Power Construction Corporation dated 30<sup>th</sup> March 2016, the contract price shall be ₹ 28,80,50,00,000.

### 13.2 Assessment of Cost Incurred

Payment under aforementioned contracts specifically service and construction contracts are based on various milestone achieved. The contracts doesn't provides the break-up of cost unit wise. Also, since the contract is EPC, where the supply, erection, commissioning is the responsibility of the Contractor, no cost break up has been given and the contracts provides the payment structure linked to milestones which cannot be co-related to the actual cost incurred. It has been noted that as and when the units are capitalized, the cost incurred till that date has been bifurcated with some assumptions which is solely for the purpose of accounting. Also, now since all the work done are capitalized, the total cost capitalized for the first three units which major break up into hard cost and soft cost and the cost pending for capitalization for the balance three units have been presented below.

It is to be noted that cost to complete estimates covered in the **Section 10.0** of the report is based on the assessment of plant status, inputs from KMPCL and taking into account inhouse / prevailing market data.


For carrying out the analysis of the cost incurred for under construction units (Unit 1, 5 and 6), the documents relied upon and methodology adopted is as mentioned below.

- Asset under Construction Break up as on 02.10.19 represents the entries of cost towards various contracts for Unit 1, 5 and 6.
- Since unit wise cost has been not mentioned in the EPC contracts, we have bifurcated the cost incurred based on unit commissioned and units under construction.

**Table 13-3: Details of Cost Incurred**

Particulars	Actual cost capitalized (in cr)		
	For unit commissioned i.e. units 3,4 and 2	For unit under construction i.e. unit 1,5 &6	Total
Land (Free hold and lease hold)	-	-	324
EPC cost*	9,445	2,139	11,584
Non EPC cost	924	35	959
IDC,ERV and Preoperative cost	5,676	2,399	8,075
<b>Total</b>	<b>16,045</b>	<b>4,573</b>	<b>20,942</b>

\*As per the records, Rs. 173.98 Cr. worth of material is in transit

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### 13.2.1 Land Cost

As per the unaudited provisional financials as on 31st March 2020. The Land cost incurred till date is Rs. 323.95 Cr. for all the six units taken together.

Amount in Cr


Particulars	Up to 31/03/2019	Up to 31/03/20	Increment Land Cost
Freehold*	173.50	173.50	Nil
Leasehold**	150.45	150.45	Nil
<b>Total</b>	<b>323.95</b>	<b>323.95</b>	<b>Nil</b>

*\*Advance paid of Rs 92 lac for Freehold land which is included above in Rs 173.50 Cr is shown in the capital advance under Schedule 14 of Balance sheet as on 31st Mar 20.*

*\*\* Lease hold schedule 8 of Balance sheet is shown as Rs 154.56 Cr as on 31st Mar 20 as per the Accounting Standard 116 Leases. Lease hold land of Rs 150.45 Cr as above includes amortization of Rs 11.71 Cr and Security deposit and stamp duty under protest under claim receivable in balance sheet of Rs 13.45 Cr. Hence the net Lease hold land in 2nd Oct 2019 financials is shown as Rs 125.29 Cr.*

Based on documents made available, land cost verification has been carried out considering the financials and any verification of records and documents is disclaimed.

As informed by KMPCL, KSK Mahanadi has entered into agreement with CSIDC for 946.74 acres of lease hold land for its power plant. The said lease is for total tenure of 99 years with an option to renew for another 99 years.

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**Prepared by:-**

**L&T – Sargent & Lundy Limited**


**L&T Knowledge City, Vadodara, Gujarat.**

**CIN No. U74210MH1995PLC088099**

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## REFERENCE LIST

1. EPC Contract documents – Off-shore supply, Off-shore Services, On-shore Supply, On-shore services, Construction etc., 4th Amendment of Off-shore supply contract, Dated: 30th March'2016
2. EPC Scope of work and terminal points, WPCPL-TPP-VOL\_II\_SEC-4 Scope(final)
3. Non-EPC scope
4. HBD, Drg No. (WAX) D600-000014ASM, Rev A and WBD, Drg No. KMP-0—(MA-N000-W-102, Rev91
5. Plot Plan, GA drawings, P&IDs
6. Overall SLD, KMP-0-CMA-K000-E-001, Rev. 00
7. Switchyard SLD, KMP-0-EHV-N000-E-501, Rev. 00
8. COC report of STEAG, Dated: June'2018
9. L1 schedule of SEPCO
10. Sketch of Railway infrastructure indicating the present status
11. Sketch of Transmission line indicating the present status
12. Sketch of CW piping indicating the present status
13. KMPCL's list of balance buildings with size
14. KMPCL's document of balance Roads and drain
15. Financial Statement
16. Fixed Asset Register
17. CWIP excel sheet
18. Water Balance Diagram
19. Performance Test Report
20. Performance data for previous three years
21. Permits and Clearances
22. Plant technical and operational data
23. Plant inventory, Maintenance practices etc.
24. Piping and Instrumentation Diagram of Water intake system
25. GA drawing for intake channel of PS-2
26. Topographical survey of campus near Basantpur anicut and campus layout plan
27. Campus layout at Seorinarayan
28. Structural drawing of pump station and intake channel at Seorinarayan PS-2
29. GA drawing for control panel room (PS-2)


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30. Campus layout at intermediate reservoir
31. Protection, metering, and control SLD for 33 KV and 11 KV system at PES
32. Protection, metering, and control SLD for 33 KV and 11 KV system at PS-1
33. Protection, metering, and control SLD for 33 KV and 11 KV system at PS-3
34. Protection, metering, and control SLD for 33 KV and 11 KV system at PS-2
35. Surge analysis and fixing arrangement of surge protection device – PS1 (General Arrangement)
36. LOA / LOI from MCL / SECL
37. FSA
38. PPA
39. Information provided through other interaction



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## **ADDITIONAL PLANT PHOTOGRAPH**

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#### CONDITION ASSESSMENT PHOTOS OF UNIT # 1



Unit#1 Boiler structure is under construction. Bottom parts of few columns of the structure are embedded in soil which are prone for soil corrosion and needs to clean such areas.

Rivets and fasteners of the boiler and Turbine structure are without any protection against atmospheric corrosion.




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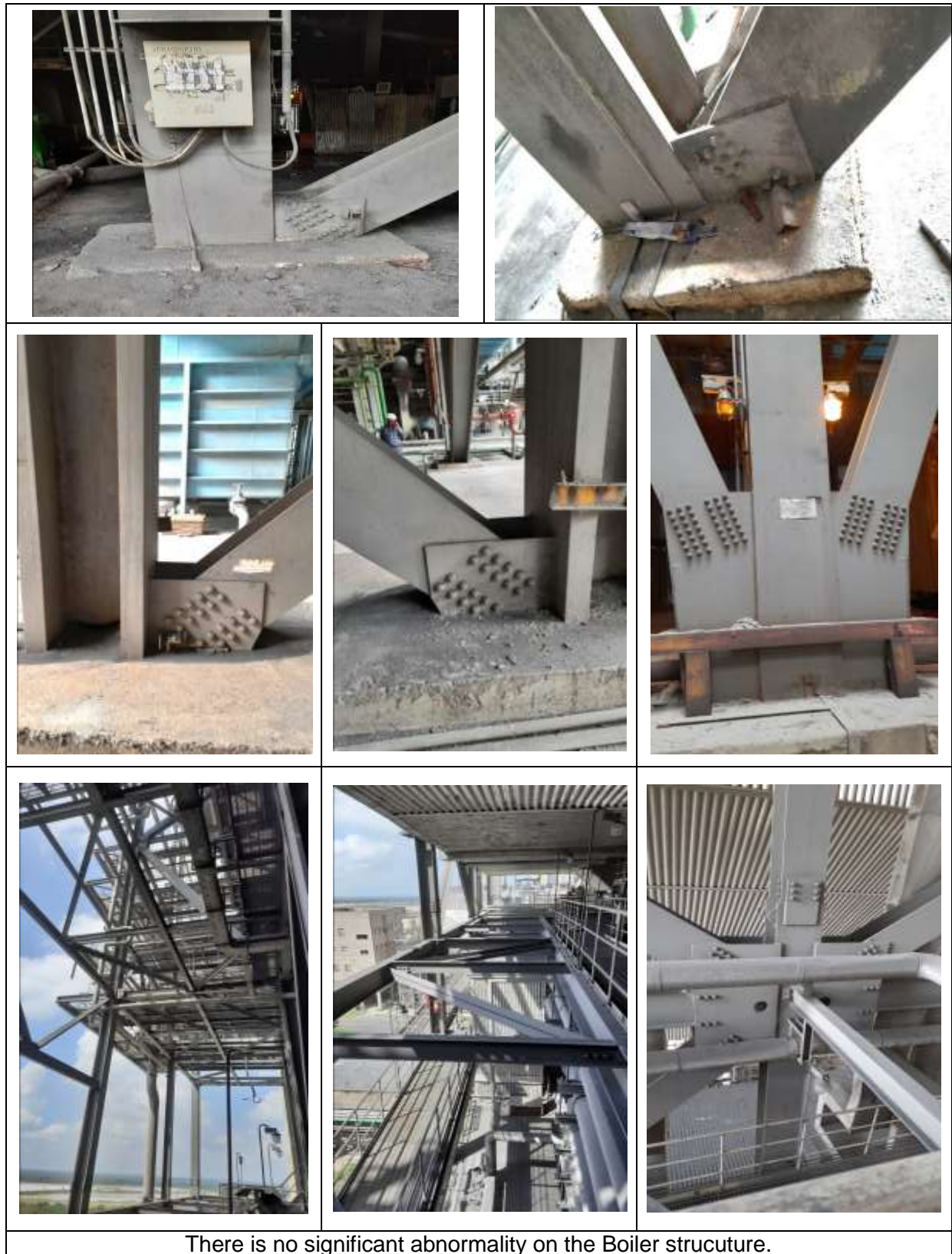
Foundation of Mill area. Foundation studs are found in good condition, however certain studs needs to be protected to prevent damage




TG deck foundation is incomplete and some of the portion is submerged in water. Rebars of the RCC structure are also in corroded condition. Needs immediate attention to protect damage to RCC structure.

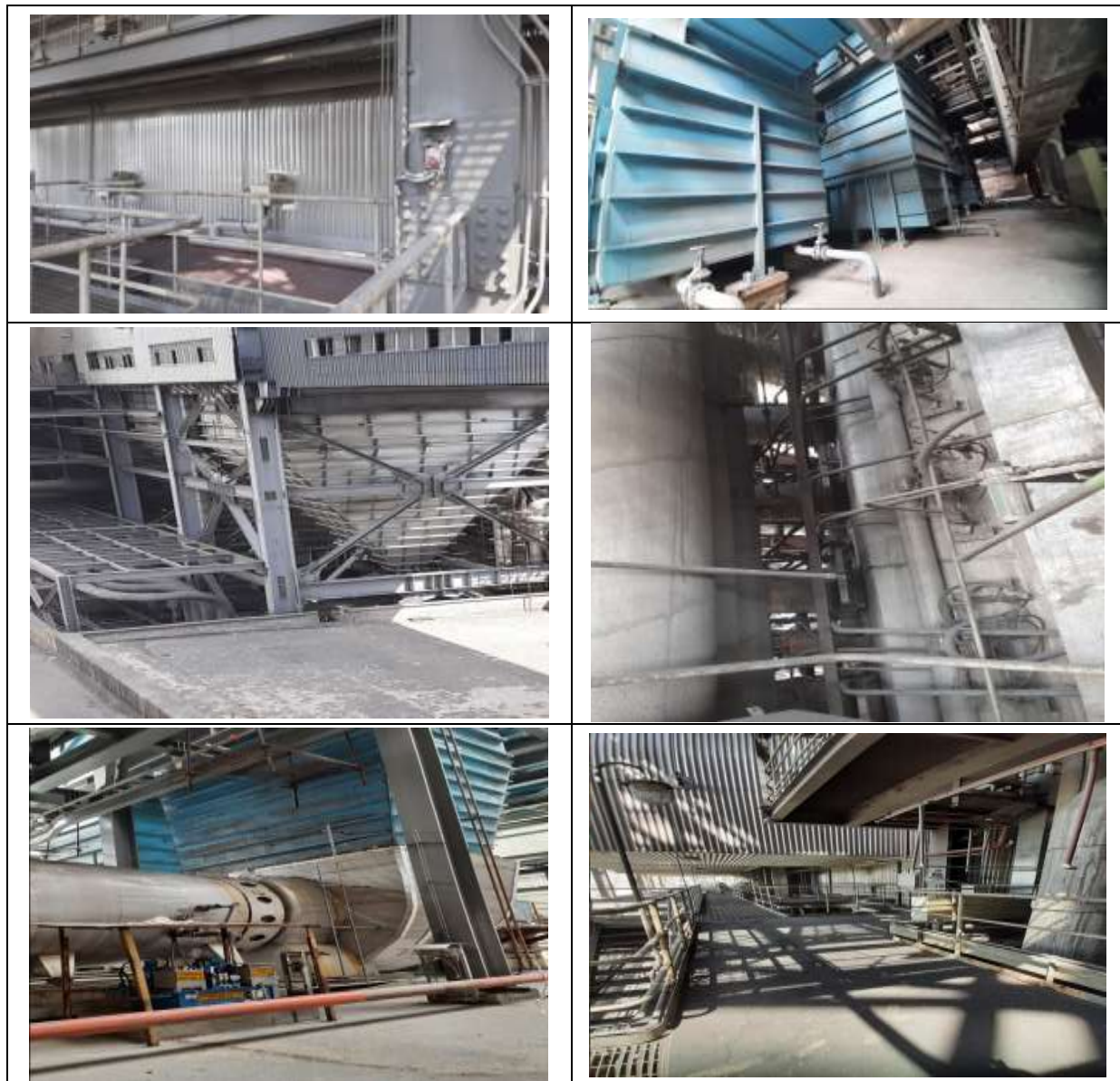
<p>Technical Study Report</p>	<p>6 X 600 MW Thermal Power Plant, M/s. KMPCL at Akaltara, Chhattisgarh.</p>	 <p><b>L&amp;T-S&amp;L</b> L&amp;T – Sargent &amp; Lundy Limited</p>
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#### CONDITION ASSESSMENT PHOTOS OF UNIT # 2






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There is no abnormality on Boiler cladding, casings and Hoppers




Condition of the cladding and Thermal insulation found satisfactory

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### CONDITION ASSESSMENT PHOTOS OF UNIT # 3

			
			
			
<p>Overall condition of the boiler structure is found satisfactory except at few location where the protective paint was damaged.</p>			




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At few location on the boiler structure, blistering observed on the paint but the extent of damage is not significant. However it is recommended to paint the affected surface with suitable paint.

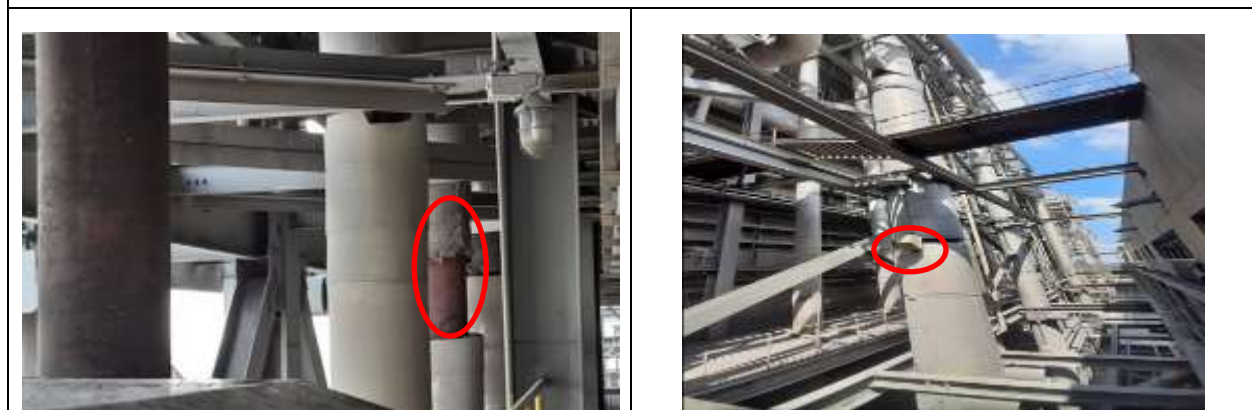


Condition of the cladding, casings etc. found satisfactory.

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Hopper, Burner corner and ESP structure found clean and no abnormality observed.



Cladding and Condition of thermal insulation found satisfactory except thermal insulation damaged at few location on Main Steam Line and Down Comer pipes.



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#### CONDITION ASSESSMENT PHOTOS OF UNIT # 4

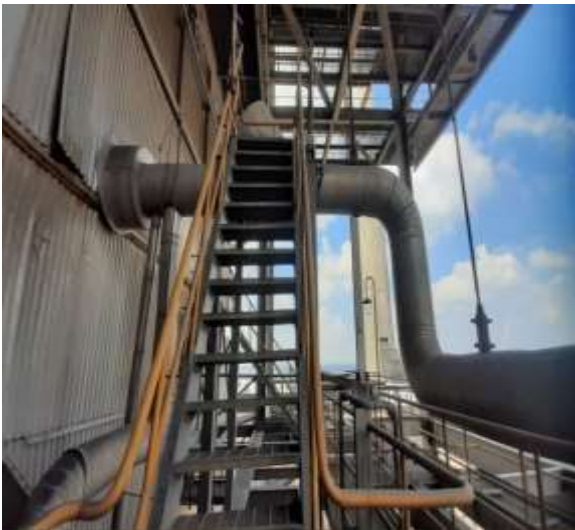


Condition of the Main Boiler structure. No significant abnormality observed.




Blistering of paint on the structural member. Needs to re paint to prevent corrosion damage.

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Condition of cladding and piping insulation found in good condition



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#### CONDITION ASSESSMENT PHOTOS OF UNIT # 5



Construction Boiler under progress




Construction of pressure parts under progress. Pressure parts are marked in photo



Condition of Boiler structure. Some of the structure is embedded in soil/vegetation. Needs to be attended to prevent damage due to corrosion.



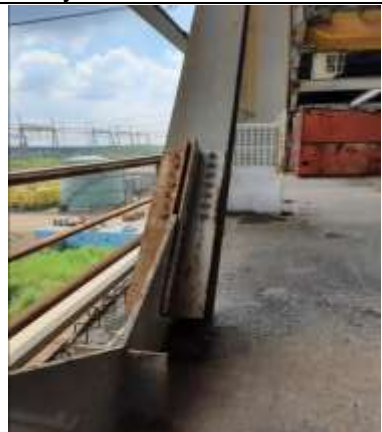
<p>Technical Study Report</p>	<p>6 X 600 MW Thermal Power Plant, M/s. KMPCL at Akaltara, Chhattisgarh.</p>	 <p><b>L&amp;T-S&amp;L</b> L&amp;T – Sargent &amp; Lundy Limited</p>
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Construction of ESP and duct under progress




Contruction work in Mill area. No significant abnormality observed.



Condition of TG structure- General corrosion observed and all such location needs to be painted.




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Condition of the turbine floor area and STG foundation. Certain fasteners are not protected. These fasteners need to be capped against any mechanical damage and protected with rust preventive oil/grease to protect the threaded part against corrosion.





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<p>Construction work and erection of equipments is under progress</p>	
	
<p>In complete civil work in TG area</p>	

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Condenser was erected but insertion of Condenser tubes has not started. CW pipes are in submerged condition and needs evaluation for reuse after removal of water.



ST placed on foundation




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#### CONDITION ASSESSMENT PHOTOS OF UNIT # 6





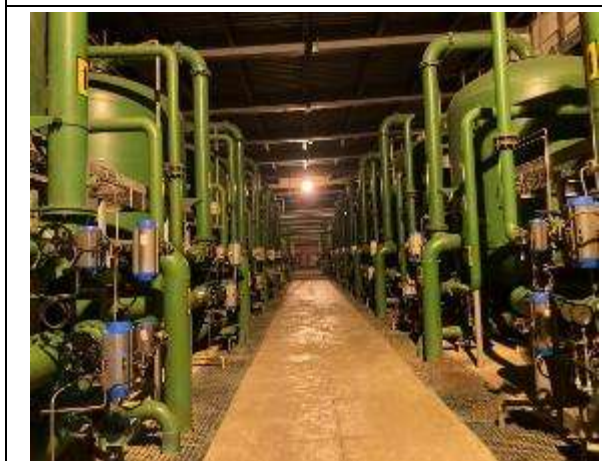


<p>Technical Study Report</p>	<p>6 X 600 MW Thermal Power Plant, M/s. KMPCL at Akaltara, Chhattisgarh.</p>	<p> <b>L&amp;T-S&amp;L</b> L&amp;T – Sargent &amp; Lundy Limited</p>
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#### SITE PHOTOS GRAPHS OF BOPs:



View of Raw water reservoir, WTP, Storage buildings, CWP, CT etc.



2X100% 240M3 DM streams



4X1600M3 Capacity DM Tanks




Fire Water Pump House



Fire Tender Building



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**Fire Water Pumps**



**Deluge Valve Shed**



**CW Pump House 1 & Fore bay**




**CWPH-1 : CW Pumps**



**CWP-2**



**CWPH-1: CW Pumps**

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**Compressor House -1**



**Compressor House-2**



**Clarifiers ( 1 and 2 are operational, 3, 4, and 5 are under construction)**




**Cooling Water pipelines near CWP2  
discharge**



**Exposed CW UG pipelines**



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**Cooling Tower 5**



**Plant Raw Water Pump House**



**Cable Cellar of Control building**




**Common MCC floor**









**GT Transformer Gantry Tower and Switchyard**




**Central Control Room 1 (Operating stations)**

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<p><b>Central Control Room 2 (Operating stations)</b></p>	<p><b>DCS Back-up panels – Unit#5</b></p>
	
<p><b>Dust suppression system of Track hopper</b></p>	<p><b>Track Hopper-1</b></p>
	
<p><b>View of ESP Control Unit#6 and TT6</b></p>	<p><b>TT6 – AB and CD line of CHP system (Unit1, 5 &amp; 6)</b></p>



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**Ash Slurry pump house**



**Ash water pump house**



**Fly Ash Silos**




**Ash disposal system**



**Closed storage shed**



**Internal view of closed storage shed**

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**Unfinished closed storage shed**



**Open storage yard**


**Handrails/Platforms of Unit#5 boilers**



**Pipes**

**Pressure parts of Unit#5**



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<p><b>Inner boundary wall of the plant</b></p>	<p><b>Outer boundary wall of the plant</b></p>
	
<p><b>Plant road in-front of Transformer yard</b></p>	<p><b>Plant roads near closed store shed</b></p>