

RISK INSPECTION REPORT
OF
ODISHA POWER GENERATION CORPORATION (OPGC)

BY

ABHISHEK MONDAL

ON BEHALF OF

SAFERISK INSURANCE BROKERS PVT. LTD.





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RISK INSPECTION REPORT

Report No. AM/24-25/RISK INSP/07

Date: 01/05/2024

Name of the Insured	:	M/s. Odisha Power Generation Corporation Ltd.
Date of Inspection	:	19/04/2024
Persons Contacted	:	Lingaraj Patra – Electrical (Manager) Srihas Bhadey – Planning Sarada Nayak – Senior Assistant Manager (Planning)

LIMITATION OF RISK INSPECTION REPORT

In pursuant to the instruction received from Saferisk Insurance Brokers Pvt. Ltd., Bhubaneswar office, the Risk Inspection was carried out on 19/04/2024 for the purpose of risk assessment. This is based on the site conditions and practices observed during the visit and the information collected/provided by officials responsible for the operations of the company. This report is not exhaustive and does not constitute an under taking to determine or warrant that the practices of M/S ODISHA POWER GENERATION CORPORATION Ltd are safe or in compliance with any law, rules, or regulations. The insured remains solely responsible in making its decisions to reduce potential risks as well as for compliances with all the applicable laws, rules, and regulations.

The objective of this report is to provide information to the Insurers for Risk Evaluation and Business Acceptance. This report includes an overview of risk improvement suggestions based on the physical risk visit.

The Risk inspection was carried out for the purpose as cited above. This has been based on present condition of machineries as observed during our course of visit and information collected /provided by officials responsible for the operations of the company at site.

This report is issued without prejudice subject to the terms, conditions, stipulations of related policy to be issued in favor of the insured & final consideration of the underwriter.

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1. General Information:

Name of plant	ODISHA Power Generation Corporation Limited (OPGC)
Plant commissioning date and capacity	Unit 1: 02.06.1994 - 225 MW Unit 2: 22.10.1995 225 MW Unit 3 : 2019 – 660 MW Unit 4 : 2019 – 660 MW
Major revamps / projects, description, and date	OPGC started with two units (OPGC 1 - Unit I & II) . It added two more units III & IV (OPGC 2) in the year 2019. It is a thermal power plant .
Type of plant:	It is a thermal power plant. The power plant consists of Coal Handling Plant, Raw Water Treatment Plant, BTG House, ESP section, Cooling Tower, Pulverization Plant
Work force	Permanent own employees – 500 (OPGC 1 and OPGC 2 combined) Contractual – 1200 (OPGC 1),
Certifications like ISO etc	9001, 14001, 45001, 55001, 27001

2. Brief Description of The Process:

The plant generates electricity using coal as fuel. Each unit is independent and has separate Boiler (Steam Generator), Turbine, Cooling Tower etc. The chimney for flue gas however common for both the units. Coal fired in the furnace with circulating liquidized bed technology of steam generator as the primary fuel. LDO is used as start-up fuel. The heat generated by combustion fuel is absorbed by water circulated through the water wall tubes and a portion of the circulated water is converted into steam. This is now goes to a drum where the steam is separated and flows into super heater coils where steam is superheated. From the outlet of super heater, the steam is carried to high pressure pipe line to steam inlet valves. This high pressure and temperature steam drives the HP Turbine expending part of thermal energy and returns to the steam generator through reheat pipelines. The reheated steam drives the LP turbines. The HP & LP turbines drive common shaft which intern drives the turbo generator. This power is step up in a transformer and fed to the state grid through a network of breakers and buses power lines. The steam entering the condenser is cooled back to water. The circulating water in turn is cooled in the cooling tower by evaporative cooling. All the Turbines are fully condensing type and incorporated with Electronic Governing System. The turbines are coupled with speed reduction gear box where speed is reduced and the gearbox is coupled with Generator.

3. Accessibility :

Nearest airport/railway station and distance	Nearest airport is Jharsuguda (46 km) /Jharsuguda railway station is nearest (38kms)
Surrounding industries / installation/neighbourhood	Surrounding industries are: <ul style="list-style-type: none"> ● TRL Krosaki Refractories Ltd, Belpahar ● Vedanta Ltd, Jharsuguda
Nearest river and distance	Nearest water body is Ib river (15 kms)
Distance from sea / creek	400 kms approx. from Paradip Sea Port
Access to main highways by road	Nearest Highway is NH49 which is 125kms away

- The insured is located in an industrial belt with several other industries in near vicinity making an easy access to all the strategic means of transportation.
- So, being conveniently connected by highway and railway, logistics and transportation would be easier.

4. Earthquake, Flood & Storm:

Earthquake exposure	Plant is in zone-IV of Earthquakes Classified Zones. Exposure: Low
What is the type of sub-soil	Laterite and Lateritic soils
Plant design for earthquake basis (Richter scale or MMI)	Yes
Flood exposure	<ul style="list-style-type: none"> ● Nearest water body is Ib River which is a tributary of Mahanadi River in North-Eastern Central India. It joins Mahanadi River flowing directly into the Hirakud Reservoir. The river originates in hills near Pandrapet at an elevation of 762 meters ● There was no incident of flood in the past as stated during inspection. Approx. normal annual rainfall is about 1000-1200 mm. ● Well separate drainage system all around the plant premise.
Storm exposure	The plant is adequately designed for violent storms as the area is a cyclone prone area

5. Exposure to Social Perils:

- Whether there has been any history of Riots/Strikes in near vicinity of the Plant/Risk location:
There has been no such incident reported near Odisha Power Generation Corporation Limited.
- Whether satisfactory Human Relation (HR) maintained with workers and neighbourhood: Yes, satisfactory Human Relation (HR) is maintained with workers and neighborhood.

6. Plant Load Factor(PLF) and Plant Availability Factor(PAF):

OPGC 1:

PLF -> 67.94 % PAF -> 81%

OPGC 2:

PLF -> 80 % PAF -> 80.51 %

7. Details of Transformers & D.G sets:

OPGC 1:

Number of Transformers	2	4	2
Capacity of each, MVA	GT, 240 MVA	UAT, 16MVA	ST, 55MVA
Voltage Ratio	15.75/220 KV	15.75/6.6 KV	220/6.6 KV
Type of Oil	Mineral Oil	Mineral Oil	Mineral Oil
Dielectric Test/Moisture Test value of oil	70 KV	70 KV	70 KV
Quantity of oil in each	54000 lts	11000 lts	38400 lts
Is there any firewall between transformer & building, if yes then thickness	250 MM – 300 MM	250 MM – 300 MM	250 MM – 300 MM
Distance of firewall extension between transformers topmost point	300 MM	300 MM	300 MM
Distance from transformer to building	Min 5 meters		
Does transformer have an oil soak pit? If yes, then capacity	70 KL		
Fire/Smoke detection	Through sprinkler associated with deluge valve		
Fire Protection-High velocity water spray/local flooding by CO2?	High velocity water spray system		
Design basis of Fire Protection System	As per NFPA		
Transformer anchored or free to move?	Wheel with locking facility		

OPGC 2:**Transformers:**

Number of transformers	7	4	1	6	2	2
Capacity of each, MVA	270MVA	50MVA	50MVA	16MVA	13MVA	8
Voltage ratio	420/√3/21KV	21/11.5KV	400/11.5KV	11/3.45KV	11/3.45KV	11/3.45kV
Type of oil, e.g. mineral oil / askarel / silicone /stabilised hydrocarbon liquids	Mineral Oil	Mineral Oil	Mineral Oil	Mineral Oil	Mineral Oil	Mineral Oil
Dielectric test/moisture test value of the oil	>70KV, PPM<6	>70KV, PPM<6	>70KV, PPM<6	>70KV, PPM<6	>70KV, PPM<6	>70KV, PPM<6
Quantity of oil in each, litres	57000/Each, Total 385000 litres	28800/Each, Total 115200 litres	43410 litres	11000/Each, Total 66000Litres	7190/Each, Total 14380Litres	4606/ Each, Total 9212Litres
Is there any firewall between transformers and building, if yes, what is the thickness	Firewall of 10.7Mtr height is provided between transformers. Thickness is 600MM Up to 350MM from bottom to top.	Firewall of 7Mtr height is provided between transformers. Thickness is 600MM Up to 350MM from bottom to top.	Building wall is provided as Fire barrier wall,	Firewall of 6Mtr height is provided between transformers. Thickness is 600MM Up to 350MM from bottom to top.	Firewall not provided.	Firewall not provided.
Distance of firewall extension beyond transformers top most point	610mm	610mm		610mm		
Distance from transformer to buildings	21600mm from Transformer centre to Building Wall	14120mm from transformer bushing to Building wall	8000mm from transformer bushing to Building wall	13893mm from transformer bushing to Building wall	3300mm from transformer centre line to Building wall	2070mm (wall to LV bushing) 3570 (wall to trafo centre)
Does transformer have an oil	Yes, there are Oil soak pit for each	Yes, there are Oil soak pit for each	Yes, there are Oil soak pit in RAT	Yes, there are Oil soak pit and	There are Oil soak pit and	There are Oil soak pit and

soak pit, if yes – capacity	transformer and there are 2 nos. common oil soak pit. One common soak pit connected to U-3 and another common soak pit connected to U-4. Common soak pit of each unit with capacity 117M ³ .The soak pit is common for GT, UT, UAT, SAT & RAT in U-3 & GT& UT, and UAT for unit-4.	transformer and there are 2 nos. common oil soak pit. One common soak pit connected to U-3 and another common soak pit connected to U-4. Common soak pit of each unit with capacity 117M ³ .The soak pit is common for GT, UT, UAT, and SAT & RAT in U-3 & GT& UT, and UAT for unit-4.	and connected to Common soak pit of Unit-3 with capacity 117M ³ .	connected to Common soak pit of each unit with capacity 117M ³ .	connected to Common OIL pit of capacity 25M ³ for both the Transformer.	connected to Common OIL pit of capacity 17M ³ for both the Transformer.
Fire / smoke detection	Fire detector	Fire detector	Fire detector	Fire detector	Fire detector	Fire Detection
Fire Protection – High velocity water spray/local flooding :co2	Hydrant, Spray system	Hydrant, Spray system	Hydrant, Spray system	Hydrant, Spray system	Hydrant, Spray system	High Velocity water spray
Design basis of Fire protection system	Yes	Yes	Yes	Yes	Yes	Yes
Transformer anchored or free to move?	Wheel Locking arrangement with Foundation	Wheel Locking arrangement with Foundation	Wheel Locking arrangement with Foundation	Wheel Locking arrangement with Foundation	Free to move (with stopper on rail)	Free to move (with stopper on rail)

- **D.G sets:** 3 nos.
 - Capacity-1750KVA each
 - Make-CUMMINS (Model QSK-50-G10), Year of manufacture:2016
- The D.G sets and Transformers were found to be in proper working condition.

8. Details of various building blocks and its construction inside the premises:

OPGC 1:

Buildings Construction	Plant/Block	Warehouses
Load Bearing structure:	MS Beam Column	MS Beam Column
Exterior wall material: -	Brick	Brick
Detection at ceiling	Yes	Yes
Lightning protection	Adequate lightning protection	Adequate lightning protection
Hydrant spacing	Fire Hydrants including water monitors and risers are installed as per TAC Fire Protection Manual.	Fire Hydrants including water monitors and risers are installed as per TAC Fire Protection Manual.

OPGC 2:

Buildings Construction	Plant/Block	Warehouses
Load Bearing structure: Exterior wall material: -	Burnt Brick and RCC Construction with Metallic Structure where -ever needed (Mostly Class-I construction). As per process requirement process block is partially open.	RCC Construction Brick/CI sheet
Roof	RCC/Roof with ACC with North Light	CI sheet over steel structure
Lightning protection	Available in all high-rise construction	Adequate lightning protection
Hydrant spacing	Fire Hydrants including water monitors and risers ate installed as per TAC Fire Protection Manual.	Fire Hydrants including water monitors and risers ate installed as per TAC Fire Protection Manual.

Details of TG Power House Building (Unit III & IV):

- Total Length x Width x Height: 264 x 43 x 37.5 (mtr)
- Total length is divided in to 25 no. of Grids & Width divided by A, B, C Rows & total 4 Floors: 0 mtr, 8.5 mtr, 17 mtr & 25.5 mtr
- Majority of walls are constructed by brick work and some locations insulated sheet.

Description of various blocks along with construction features and degree of hazard:

S.No.	Block	Degree of Hazard	Construction features	Segregation from nearest block	Remarks
1.	Raw material handling and storage yard (coal)	High	Open	Segregated	Exposed to spontaneous combustion in coal
2.	Main Generation Blocks –BTG Block	High	Both open and shed	Segregated	Fire Hazards, Movable Machinery Hazards & Steam and Hot Material Hazard
3.	Main Office Block /Service Building	Low	Brick wall in RCC Frame with RCC roof	Segregated	Administration
4.	Cooling Tower	Low	Open	Segregated	Process Requirement
5.	Water Intake	Low	Brick wall in RCC Frame with RCC roof	Segregated	Process Requirement
6.	Security Office in Gate, Rest Room, & Workmen living rooms	Low	Brick wall in RCC Frame with RCC roof	Not communicating with any block	Administration
7.	F.O Pump House	High	Both Open and Shed	Segregated	Process Requirement
8.	Water softening Plant	Low	Both Open and Shed	Segregated	Process Requirement
9.	Workshop and Engineering Dept	Medium	Partly Open and Partly RCC wall and ACC Roof	Segregated	Process Requirement
10.	CW Pump House	Low	Partly Open and Partly RCC wall and ACC Roof	Segregated	Process Requirement
11.	Substation	Medium	Partly Open and Partly RCC wall and ACC Roof	Segregated	Process Requirement

Most of the utility services rooms i.e., Electrical Incoming Power Transformer, D.G Set Room and water Pump House / Cooling Tower /Water Softening Plant are either open or Class I construction as per process requirement. Overall construction was found to be very good.

Regarding the type of material stored: All type of material (Spares & Consumable) stored inside the warehouse premises except the chemical and lubricant. For storing of the lubricant recently two no semi-closed shed is constructed and lubricant is stored.

9. Type of Fire Protection Systems:

Following types of Fire protection Systems are provided in both the units:

- a) Hand appliances
- b) Hydrant system
- c) Foam Protection System
- d) Sprinkler system
- e) High Velocity Water Spray System
- f) Medium Velocity Water Spray System
- g) Clean Agent flooding system
- h) Fire Detection and Alarm system

Fire Protection for OPGC 1:

- a) **Hand appliance like Fire extinguishers:** Yes

Type	Capacity	No.
Water	9 lts.	Nil
DCP	6kg	146
CO2	4.5 kg	63
CO2	9kg	Nil
CO2	22.5kg	14
Foam	9lts	10
Foam	20lts	NA
Fire Extinguisher inspection & maintenance monthly.		

- b) **Fire hydrant system:** Yes

No. Of Outlets	199
Fire Pumps	Hydrant pumps – 3, Spray pumps – 2, Jockey pumps – 2 Hydrant pump – 4550 LPM (273 m ³ /hr.) 90.84m Jockey Pump – 183 LPM (11 m ³ /hr.) 92.8m
Reservoir	Common Sump capacity. 55000 KL
Area protected	Switch Yard, Transformer Yard, TG Building, Unit Area, BOP Area, Fuel Oil tanks farm U& pump house, Coal Handling Plant.
Maintenance	Hydrant Pumps tested on weekly basis. Maintenance as per schedule. Fire Hydrant inspection & maintenance monthly.

- Single headed Hydrant (External): 124
- Single headed Hydrant (Internal): 75
- Water Jet Monitor: 8

c) **Sprinkler system:** Yes

No. of sprinkler heads	2 Nos. (Over the Conveyor & for protection of cable gallery).
Pumps	02 no Spray pump – 6833 LPM (410 m ³ /hr.) 91.4m
Reservoirs	Common Sump capacity. 55000 KL
Area Protected	Transformer, Turbine Generator, Coal Conveyor, fuel oil tanks.
Is water supply tapped from hydrant system?	Separate network for Spray system
Maintenance	Quarterly testing of spray system

Fire Protection for OPGC 2:a) **Hand appliance like Fire Extinguishers:** Yes

Type	Capacity	No.
Water	9 lts.	53
DCP	6kg	208
CO2	4.5 kg	134
CO2	9kg	30
CO2	22.5kg	20
Foam	9lts	50
Foam	20lts	15
Fire Extinguisher inspection & maintenance monthly.		

b) **Fire hydrant system:** Yes

No. Of Outlets	129 (SH-110+Double Head-3 +/Monitor-16)
Fire Pumps	Electric Pump-4+Diesel Pump—2+ JockeyPump-2
Reservoir	Water Reservoir With adequate capacity
Area protected	Entire Plant in Loop Formation
Maintenance	Fire Hydrant inspection & maintenance monthly.

10. Technical Data of Pumps:

TECHNICAL DATA FOR HYDRANT PUMPS				
Sr. No	Particulars	Units	MOTOR DRIVEN	ENGINE DRIVEN
1	Manufacturer & Model No.		Mather & Platt Pumps Ltd & SCP 150-530 HA	
2	Design Standard		HIS/IS 6595	
3	No. Of Pumps	Nos.	Hydrant Pumps-3Nos (W)	Hydrant Pumps-1No (S)
4	Performance Standard		HIS	
5	Guaranteed Design/Rated Capacity		410	410
6	Guaranteed Total Head at Design Capacity	MWC	105	105
7	Type of Pump		Horizontal Axial Split	
8	Suction & Delivery size	mm	200x150	200x150
9	Rated Capacity	m ³ /hr.	410	410
10	Range of Operation		0-150% of rated flow (TAC)	
11	Shut off head	m	110	110
12	Pump developed head at 100% capacity	m	105	105
13	Power absorbed at 1150% capacity	W	194	194
14	Pump developed head at Shut-Off Capacity	m	110	110
15	Maximum Speed	rpm	1480	1480
16	Noise at 1M from Pump	dB	85	85
17	Pump efficiency at duty point	%	75% No negative tolerance on Pumps eff.	
18	Pump Input at Duty point	W	156.32	156.32

TECHINCAL DATA FOR SPRAY PUMP				
Sr. No	Particulars	Units	MOTOR DRIVEN	ENGINE DRIVEN
1	Manufacturer & Model No.		Mather & Platt Pumps Ltd & SCP 150-530 HA	
2	Design Standard		HIS/IS 6595	
3	No. Of Pumps	Nos.	Spray Pump-1 No (W)	Spray Pump-1 No (W)
4	Performance Standard		HIS	
5	Guaranteed Design/Rated Capacity		410	410
6	Guaranteed Total Head at Design Capacity	MWC	105	105
7	Type of Pump		Horizontal Axial Split	
8	Suction & Delivery size	mm	200x150	200x150
9	Rated Capacity	m ³ /hr.	410	410
10	Range of Operation		0-150% of rated flow (TAC)	
11	Shut off head	m	110	110
12	Pump developed head at 100% capacity	m	105	105
13	Power absorbed at 1150% capacity	W	194	194
14	Pump developed head at Shut-Off Capacity	m	110	110
15	Maximum Speed	rpm	1480	1480
16	Noise at 1M from Pump	dB	85	85
17	Pump efficiency at duty point	%	75% No negative tolerance on Pumps eff.	
18	Pump Input at Duty point	W	156.32	156.32
TECHNICAL DATA FOR BOOSTER PUMP				
	Particulars	Units	MOTOR DRIVEN	ENGINE DRIVEN
	Manufacturer & Model No.		Mather & Platt Pumps Ltd & SCP 150-530 HA	
	Design Standard		HIS/IS 6595	
	No. Of Pumps	Nos.	Booster Pump 1No. (Working)	Booster Pump 1No. (Standby)
	Performance Standard		HIS	HIS
	Guaranteed Design/Rated Capacity		137	137
	Guaranteed Total Head at Design Capacity	MWC	45	45
	Type of Pump		Horizontal Axial Split	
	Suction & Delivery size	mm	125 x 100	125 x 100
	Rated Capacity	m ³ /hr	137	137
	Range of Operation		0-150% of rated flow (TAC)	
	Shut off head	m	50.7	50.7
	Pump developed head at 100% capacity	m	45	45
	Power absorbed at 1150% capacity	W	27.5	27.5
	Pump developed head at Shut-Off Capacity	m	50.7	50.7

TECHNICAL DATA FOR JOCKEY PUMP		
Particulars	Units	MOTOR DRIVEN
Manufacturer & Model No.		Mather & Platt Pumps Ltd. & RN 80 x 8 Stg
Design Standard		HIS/ IS 6595
No. Of Pumps	Nos.	Jockey Pump-2Nos. (1W+1S)
Performance Standard		HIS
Guaranteed Design/Rated Capacity		35
Guaranteed Total Head at Design Capacity	MWC	110
Type of Pump		Multistage Ring
Suction & Delivery size	mm	100 x 80
Rated Capacity	m ³ /hr	35
Range of Operation		0-150% of rated flow (TAC)
Shut off head	m	122.1

Hydrant System shall protect the following areas / buildings: -

1. Power house including Boiler areas
2. Mill and bunker building.
3. ESP control cum fly ash equipment building
4. HFO & LDO Pump house area
5. HFO storage tanks
6. Compressor area and diesel generator area
7. Generator, Reserve and Unit auxiliary transformers in transformer yard for unit no: 3 & 4.
8. CW pump house
9. Water treatment plant
10. Sludge pump house
11. Clarified water pump house
12. Chemical house
13. Coal Handling Plant and Coal Storage Yards including all transfer points, bunker bay conveyors, sub-stations and control room, office building of CHP
14. Track Hopper/Track Hopper Control Room & MCC Room
15. Ash Slurry Pump House, Ash Water Pump House, Fly Ash Conveying Compressor Building, MCC rooms.
16. C.W. Chlorination Building
17. CPU Regeneration Building
18. Hydrogen Generation Plant
19. 400 KV Switch yard Control Room Building
20. HCSD pump house.
21. ESP
22. Fuel oil dyke area (HFO/LDO) Tank)
23. The tapping for the following areas are taken from existing plant hydrant network available in that areas as per tender specification.
 - a) Clarified water pump house and MCC
 - b) DM plant pump house and MCC
 - c) Effluent treatment Plant

c) Foam Protection System: Yes

Automatic foam protection system shall be provided for HFO /LDO bulk storage tank located in fuel oil dyke area. The system shall be designed as per NFPA-11 / TAC. System will consist of 2 x 100% capacity foam concentrate tank (MS epoxy or FRP lining inside the tank) with foam concentrate, 2 x 100% capacity foam Pumps (one motor driven and one diesel engine driven), foam proportioner, foam makers with discharge outlets, associated piping valves, fittings, instrumentation etc. The foam will be Aqueous Film forming Foam (AFFF) type.

d) Sprinkler System:

No. of sprinkler heads	2 Nos
Pumps	Available
Reservoirs	Water Reservoir (Dedicated)
Area Protected	Installed in all critical Areas
Is water supply tapped from hydrant system?	Yes, water in supplied through pipelines
Maintenance	Regular Preventive Maintenance
Comments	Installed as per TAC Fire Protection Manual.

Automatic Sprinkler system shall be provided for the following areas. The system shall be designed as per TAC/ NFPA-13.

Water for the Sprinkler System shall be taken from Hydrant System Network in the area.

- a) Bunker bay conveyor.
- b) Each Turbine Generator area under-floor (Ground floor, including all Areas subject to spread of oil)
- c) Each Turbine Generator area under-floor (Mezzanine floor and turbine Lagging, including all areas subject to spread of oil)
- d) Each cooling towers.
- e) Diesel Generator Building
- f) Fire water diesel engine area
- g) Lockers room, Corridors, Laboratories, and office building.

e) High Velocity Water Spray System (HVWS)**Category-A**

This system shall automatically detect, control and extinguish any out-break of fire and simultaneously give audible alarm. Water line forms a ring around the equipment to be protected with projected outlets at various selected points fitted with the specially designed nozzles. The water supply to the HVW spray system is controlled by deluge valve which shall be operated hydraulically. This valve is normally closed by water pressure in the water piping. The same water pipe forms a ring around the equipment to be protected and frangible bulb type detectors are mounted on this water line at selected places. When the surrounding temperature raises more than the rated temperature of the detector, detector quartzoid bulb collapses releasing water and consequently pressure in water line will fall sharply. This fall of pressure opens the deluge valve and water starts projecting out from the projectors. Local audible alarm shall be produced by water motor alarm gong. The operation of the Deluge Valve shall be annunciated in the respective Fire Alarm Panel as well as in the Fire alarm Repeater panel at Fire Station.

The system shall also have a manual over riding facility along with regular testing facility.

Category-A type: HVW Spray System shall be provided to protect the following equipment / area:

- a) Generator transformers (GT) : 6 Numbers + 1 spare single-phase transformer.
- b) Unit Transformers (UT) : 4 Numbers
- c) Reserve Auxiliary Transformer : 1 Number
- d) Station Auxiliary Transformers : 2 Numbers
- e) Unit Auxiliary Transformers : 4 Numbers
- f) Any other oil filled transformers above 10 MVA rating and 2000-liter oil capacity.
- g) Drain oil tank in fuel oil pump house.

Category-B

In this system fire shall be detected by use of either fixed or combination [contains fixed temperature and rate-of-rise (ROR) elements.] heat detectors. Upon detection of fire, HVW Spray System shall be brought in operation automatically by opening deluge valves. Category – B type HVW Spray System shall be provided for the following areas:

- a) Main lube oil tank
- b) Boiler Firing Floor
- c) Steam Turbine Bearings
- d) Lube Oil Tank for Pulverize, ID, FD and PA fans
- e) Unit turbine oil tanks
- f) Main turbine Lube oil purifiers
- g) Lube oil piping
- h) BFP Turbine bearings
- i) BFP Lube Oil Tanks
- j) Generator hydrogen seal oil system
- k) Oil filled Transformers less than 10 MVA rating

f) Medium Velocity Water Spray System (MVWS)

Medium Velocity Water Spray (MVWS) System is provided to protect the following equipment's / area:

- a) Cable galleries / cable vaults / cable spreader rooms in power house building (Unit-3 & Unit-4), ESP control building, CHP main switch gear room, AHP compressor house Switch gear room.
- b) All Coal conveyor galleries, all conveyor tunnels and conveyor in Track Hopper complex of the coal handling plant. Full length of each conveyor both top and bottom belt shall be protected with MVWS.

g) Clean Agent Flooding System

The inert gas extinguishing system consists of inert gas (as per NFPA-2001) cylinders filled with the agent gas, cylinder mounting accessories, cylinder manifold, automatic discharge valves, discharge piping, nozzles, automatic operating devices, manual operating devices, manual actuation devices/abort switches, associated fire detection/alarm system, audio-visual safety warning devices, instrumentation associated control systems, panels etc. These cylinders are stored in the space for fire-fighting cylinders room. Inert gas extinguishing system - IG-541 shall be provided to cover the following rooms including area above false ceiling. Detail volume calculations shall be submitted later.

TG building EL.8.5M

- a) 24v Battery & Battery Charger Room Unit-3
- b) UPS 24v Battery Room Unit-4
- c) UPS room for Unit#3 (Between grid 10 & 12)
- d) Computer Room Unit – 4 / Record & shift in charge Room

TG building EL.17.0M

- a) Control & Equipment Room unit - 3
- b) Control & Equipment Room unit - 4
- c) Central Control Room (Common for Unit 3 & 4)
- d) Computer Room Unit – 3 / PADO Room
- e) UPS / 24V Charger Room

11. Fire Water Storage System:

Clarified Water System to 'Fire Water Storage tank' as dead storage of fire water for the plant. Fire water storage tanks (two numbers) of vertical storage tank of 2000cu.m capacity of steel construction. Makeup water connection to fill the fire water storage tanks from WTP with available 3 no Service water pump (3*100 m3) & service water tank provided from SW OVERHEAD TANK (2nos) on power house building roof at 32.5 M.

Details of specific Fire protection system for Boiler House and ESP.

Fire Hydrant System installed at Boiler all floors & ESP Area. Motor & Diesel Driven Booster Pumps are installed to ensure required hydrant pressure at Boiler Highest point of 90 mtr.

- HVW Spray system is installed at all firing Elevations/Burner Floors.
- Dedicated Fire Fighting Line with working Pressure of 7.5 Kg Installed at APH in Both the Units.
- HVW Spray system is installed at ID/FD/PA Fans & Coal Mill LOP Area.
- Mill Inserting steam line installed at all scraper chambers of all coal mills.

Source of hydrant water – Capacity of water reservoirs/tanks for Hydrant system.

- Hydrant Water System Suction line is connected with Service Water Pump discharge line (Taking suction from Clarified Water Storage Tank Capacity: 2x 4000 M3)
- 2 No of Fire Water Storage tanks are installed at Fire Water Pump Hose area, each tank is having capacity of 2000 M3.
- At Fire Water Pump House Following equipment's are installed i.e., 4 Hydrant Pumps (3 Motor Driven + 1 Diesel Engine Driven), 2 Spray Pumps (1 Motor Driven+1 Diesel Engine Driven), 2 Jockey Pumps and One Hydro Pneumatic Tank.

12. Loss Prevention and Management Practices:

- OPGC has in-house Fire Brigade.
- It consists of : 2 Orissa Fire Services, 1 OPGC own fire brigade and 1 is under procurement

OPGC 1:

Fire brigade:

In-house professional fire staff	15
Minimum number of available fire fighters during holiday or week-end	All are available locally.
Type of training provided to fire fighters (both initial and ongoing)	Fire Hose drill, Fire tender operation, Rescue operation, SCBA use.
Mobile equipment details	
No. of Foam / water tenders and capacity each –	03 foam water tender
No. of foam trolleys –	03 foam trolley
No. of DCP tenders and capacity each –	500 kg. DCP trailer
No. of Emergency / Rescue tender –	Nil
No. of long-range water / foam monitor & capacity	01 foam trailer.
Fire jeep –	NA
Ambulance –	03
Foam stock (AFFF) –	10000 L

OPGC 2:

Fire brigade:

In-house professional fire staff	19
Minimum number of available fire fighters during holiday or week-end	All are available locally
Type of training provided to fire fighters (both initial and ongoing)	Fire Hose drill, Fire tender operation, Rescue operation, SCBA use.
Mobile equipment details	
i)No. of Foam / water tenders and capacity each	<ul style="list-style-type: none"> • Multi-purpose fire tender with 3000 lit of water & 500 lit of foam, 03 no. • Fire tender with 500Liter foam is available • Available • 2 Tank with each 1900 litre in fixed foam tanks for the HFO tank Fire fighting system, & 8000 lit of Foam stock in 20 lit drum.
ii)No. of foam trolleys	
iii)Ambulance	
iv)Foam stock (AFFF)	

➤ **Mutual Aid Scheme for both units of OPGC:**

There is agreed terms towards Mutual Aid with the following organizations:

Vedanta Group	Located about 45 KM away.
MCL (Mahanadi)	Located about 10 KM away
Tata Refractory	Located about 20 KM away

13. Safety Organisation and Procedures:

Does the safety manual include? 1. All safety procedures 2. Incident reporting 3. Safety committee structure	Yes, it includes all the three points.
Who is the issuer of – - Hot Work permit - Work on electrical equipment	Safety officers and plant in charge.
Do you have any smoking policy?	Smoking is prohibited inside the plant
Furnish list of major or minor incidents in last three years	No incident as stated
Is root cause analysis of such incidents carried out	Yes, it is carried out.
Is safety Training provided to contractor personnel? If so state duration	On regular basis.
Is there any safety assessment system for contractor work execution- specify systems	Yes, there is safety assessment system for contractor work execution.

14. Emergency Planning:

Emergency Procedures: Standard procedure followed as per recommendations of Safety committee.

Emergency Organisation: Safety committee is headed by each plant head & regular fire safety drill is carried out and recorded in the register.

15. Storage of Coal:**OPGC 1:**

Capacity of Coal Stock Yard	2,00,000 MT
Open	Yes
Maximum Stack height of coal heap	10mtr
Whether coal heaps are water sprayed regularly	Yes
Whether segregated from production blocks/attached	Yes
Average Coal stock in stockyard	1,80,000 MT or 20 days inventory
Per day coal consumption	8000 MT

OPGC 2:

Capacity of Coal Stock Yard	2,00,000 MT
Open	Yes
Whether Coal handling plants are protected by hydrant/sprinkler system	Yes
Maximum Stack height of coal heap	10mtr
Whether coal heaps are water sprayed regularly	Yes
Whether segregated from production blocks/attached	Yes
Average Coal stock in stockyard	1,80,000 MT or 9 days inventory
Per day coal consumption	20,000 MT

Source of Coal:

For OPGC I -> Lakhanpur Coal Mines, Mahanadi Coalfields Limited (MCL)

For OPGC II -> Manoharpur Coal Mines, Orissa Coal and Power Limited (OCPL)

16. Tank Storage:**OPGC 1:**

Storage Tanks	Above Ground
Number of Tanks	Total 6 tanks (2 not in use).

OPGC 2:

Storage Tanks	Capacity of Storage tank
i) Above ground	8000 M3 (4000+4000)
ii) Underground	Nil (Raw Water Directly taken from Canal of Hirakud Reservoir)

Note: Raw Water is directly sourced from dedicated intake channel from Hirakud reservoir for both units of OPGC.

17. Hydrogen Plant:

- Hydrogen is produced using the Electrolysis process.
- Raw Material used is demineralized water.
- The Hydrogen plant has a capacity of producing 24 cubic meter hydrogen per day.
- Approx 2 hydrogen cylinders are used per unit per day.
- Hence for OPGC 1, 2+2 cylinders are used (2 for each unit) and for OPGC 2, 2+2 cylinders are used (2 for each unit).

18. Maintenance: -

Insured has separate maintenance department for every major block which includes Electrical and Mechanical maintenance department separately.

Spares for effective maintenance process are maintained. There is specific allocation in their operation budget as stated during inspection.

Yearly maintenance schedule of plant particularly for TG/Boiler includes overhauling of all major machines will be performed & regular preventive maintenance in general are carried out. Specific preventive maintenance include:

- Condition Monitoring
- Vibration Monitoring
- Temperature parameter control
- Interlocking system checking.

Type	Unit Details	Observation
Strength	Dedicated maintenance engineers are employed under mechanical and electrical with leadership of in charge.	Such system is running satisfactory round the clock as stated by insured representatives
Workshop Facility	Routine minor repairs are carried out in house	The system is found to be satisfactory
AMC's/ARC's	Not available (Unit is in warranty period)	Not available (Unit is in warranty period)
Spares	Some Critical & Routine spares are available as mentioned above	Inventory management monitored from Head Office
Maintenance Schedule	Maintenance Schedule	Preventive maintenance carried out as per requirement

19.Overhauling:**Last Major Overhauling:**

For OPGC I: August 2023

For OPGC II: September 2023

Future Overhauling Plan:

For OPGC I: September 2024

For OPGC II: July 2024

20.Security:**OPGC 1:**

No. of Personnel	
i) Own Employees	Employee - Nil
ii) On Contract	Contractor-187
Minimum number of personnel available at any point of time	22-23
Are they trained in firefighting?	Imparted in house First-Aid Fire Fighting training to act as auxiliary squad to assist fire brigade in case of emergency
Furnish the following details:	
i)Type of fencing	Entire plant covered by Boundary wall made of solid brick & vital installations inside plant by chain-link fence.
ii)No. of Gates	03
iii)Width of the main gate	30ft.
iv)Width of roads within the plant	20-30 ft.

OPGC 2:

No. of Personnel	
i) Own Employees	Employee-Nil
ii) On Contract	Contractor-118
Minimum number of personnel available at any point of time	32
Are they trained in firefighting?	Imparted in house First-Aid Fire Fighting training to act as auxiliary squad to assist fire brigade in case of emergency
i) Type of fencing	Entire plant covered by Boundary wall & Vital installations inside plant by chain-link fence
ii)No. of Gates	Three
iii)Width of the main gate	Operation Plant Gate: 14 mtr. (Vehicle + Pedestrian) Project Gate: 17 mtr. (Vehicle + Pedestrian)
iv)Width of roads within the plant	7 mtr.

21. Observations/Remarks Made During Inspection:

Maintenance of critical equipment and spares available:

- a. For critical equipment spares available with the Insured.
- b. There will be no production losses except major breakdown of GT. In case of GT breakdown loss of production will be there for spare replacement period.
- c. All preventive and corrective maintenance are done in-house. In case of major equipment failure spare replacement can be done by in-house. There is Annual rate contract with OEM for services and expert visit for specialized job. There is maintenance planning in SAP for daily preventative maintenance and corrective maintenance. There is also rate contract for annual maintenance activity.
- d. To avoid major losses in the future, the client has installed Control switching device in 400KV switchyard for reducing the stress on GT during back charging. GT is not back charged. For ESP a separate RCA study has been made by M/s LNTS&L and the report already shared.
- e. The overall physical features of the Risk were found to be very good. Housekeeping of the powerhouse and other blocks were found to be excellent.
- f. Insured is having adequate number of Fire Extinguishers/Fire protection system available at various blocks/units. Kindly refer attached presentation.
- g. Various Blocks /units are having enough number of trained persons to handle any emergency round the clock.
- h. The Insured's risk is spread over a huge area and chances of propagation of fire is minimum from one unit to another.

Preventive measures in case of Grid Failure:

The stations are connected at two different location grid one state grid, 400KV Lapanga substation and another 400KV Pooling station of Power grid, Sundergarh. There are two lines with a double circuit configuration connected to 400KV Lapanga S/Odisha state grid and another two lines with double circuit configuration connected to 400KV Power grid pooling station, Sundergarh, Odisha. In case of disruption of any one grid there will be no effect to the generation as one line having sufficient capacity to evacuate full generation of both Unit 3 & Unit 4.

22. Risk Assessment /Analysis:

Major Risks:

- | | | |
|------------------------------|---|--|
| a) Fire | : | Moderate. |
| b) Breakdown/Electrical Fire | : | Moderate. |
| c) Explosion | : | Moderate. |
| d) Implosion | : | Low: Negligible vacuum operation etc. |
| e) Lighting | : | Low |
| f) Aircraft Damage | : | Low: As Jharsuguda airport is located about 46 kms away. |

g) Riot, Strike, Malicious Damage with labor.	:	Low: Since, Industrial relation is apparently cordial
h) Terrorism	:	Low.
i) STFI: -	:	Low
Storm –	:	Moderate.
Flood –	:	Low.
j) Impact Damage	:	Low.
k) Subsidence and Land Slide including Rock slide	:	Low: There is no hill/rock in the surrounding area.
l) Bursting/overflowing of water tanks, apparatus pipes	:	Low
m) Missile Testing Operation	:	No.
n) Leakage from automatic sprinkler installation	:	Low
o) Bush Fire	:	Low: No considerable vegetation in the vicinity.
p) Earthquake	:	Moderate (Jharsuguda District falls under Seismic Zone III).
q) Spontaneous combustion	:	Moderate (in case of coal in open)

Observations:

1. This is a Pithead Power plant with coal field nearby & a Merry Go Round system for coal transportation.
2. There is adequate water availability from the nearby Hirakud Reservoir with an Intake channel connected to Reservoir.
3. Long term Power Purchase Agreement with the State Power Transmission utility i.e., GRIDCO for 100% off-take.
4. Infrastructure like land and common facilities are available.
5. A dedicated team of young engineers and support staff.
6. Distance between OPGC Unit I&II and Unit III&IV is approx. 100 meters.

23. PML Calculation:

From the valuation sheet provided to us we observe that valuation of Unit III & Unit IV is much higher compare to Unit I & Unit II . More over the Unit I & II is comparatively older unit and as far as physical feature is concerned there is enough distance between TG Building I & II and TG Building III & IV which are to be treated as segregated.

In case of PML calculation we have considered concentration of Risk at single location. Insured's Power Plant consisting of TG Building, Boiler house , ESP, Coal handling Plant, Coal yard , DM Water Plant, Ash handling Plant , Transformer yard, Ware House, and other Utilities. All these blocks are spread over huge area of land and separated by considerable safe distance. All though these blocks and utilities are inter connected through pipeline and through conveyor belt but there is least possibility that Fire may propagate from one block/section to other considering the FEA system available at site. However, in case of TG Building and Steam Generator unit concentration of Risk is highest In case of Steam Turbine Generator both Unit III and Unit IV are located in the same building but in case of Steam Generator (Boiler) Unit they are basically open structure.

Considering this aspect we have computed PML for the risk as under:-

Zone I - Boiler / Steam Generator unit I & II

Zone II - Steam Turbine Generator Unit III & IV

1. PML for Power House Building and GT yard.

Now considering the valuation details as provided by the Insured as on 02/04/2024 we are computing value which are associated with Zone -I and Zone -II

Zone I (Boiler/ Steam Generator Zone)

Asset code	Block description	Valuation as on 02/04/2024
1300000155	Steam Generators - Pressure parts & access -Unit-3	10,43,87,69,196.45
1300000155	Steam Generator Auxiliaries -Fans & Ducts Unit-3	2,36,11,76,959.65
1300000156	Steam Generators - Pressure parts and ace Unit-4	10,90,02,74,873.42
1300000156	Steam Generator Auxiliaries-Fans & Ducts Unit-4	2,36,18,92,795.47
	Total Value	26,06,21,13,824.98

Zone II (Steam Turbine Generator Unit III & IV)

Steam Turbine Building and including all accessories and GT / Power Transformer etc which are installed just outside the power house building within close proximity. Considering this aspect, we are computing value of Zone II of the risk as under. While computing this value we have considered the valuation sheet as provided by the Insured.

Asset Code (Plant & Machinery)	Block Description	Valuation (Rs.)
1300000155	Steam Turbine Generator and auxiliaries Unit-3	8,32,73,06,499.15
1300000155	Power Cycle Piping, valves, and specialties Unit-3	1,57,72,91,869.81
1300000156	Steam Turbine Generator and auxiliaries Unit-4	8,78,62,34,820.69
1300000156	Power Cycle Piping, valves and specialties Unit-4	1,61,55,92,688.24
1300000155	GT, RAT, UT & Auxiliary Power Transformers Unit-3	15,41,32,16,882.05
1300000155	HT< power and control cables, trays & Acc Unit-3	80,62,08,720.57
1300000155	LT Motors, Station lighting & earthing system Unit-3	18,21,77,512.17
1300000155	LV Switchgears and Busducts Unit-3	44,82,55,281.27
1300000155	Station C&I System Unit-3	80,98,22,664.01
1300000155	Main Plant UPS System Unit-3	13,89,46,531.30
1300000156	GT, RAT, UT & Auxiliary Power Transformers Unit-4	1,57,83,34,884.65
1300000156	HT< power and control cables, trays & Acc Unit-4	82,99,70,341.93
1300000156	LT Motors, Station lighting & earthing system Unit-4	18,66,01,263.35
1300000156	LV Switchgears and Busducts Unit-4	46,62,91,390.07
1300000156	Station C&I System Unit-4	83,89,33,908.25
1300000156	Main Plant UPS System Unit-4	14,23,20,521.25
	Total value towards plant & machinery under Zone -I	42,14,75,05,778.76
1200000064	Power House Building (Unit- 3 & 4)	4,55,03,62,307.72

Thus, from the above computation concentration of value in case of Zone -II is much higher than Zone I. Therefore, for the purpose of PML calculation we are considering Zone-II for the risk as a whole.

From the valuation sheet it is observed that value of Power House building (Unit III & IV) is Rs.455 Cr. We have identified the major equipment in the power house and as declared by the Insured calculated value of Plant & machinery in power house/TG building. The major equipment installed in the power house building and adjacent are Generator and Switch Gear panel, RE Joints, Generator Transformer, Bus Duct, Control Panels, LT Switch Gear and LT Bus Duct. Now, total value as declared by the Insured for all the above-mentioned items for Unit 3 and Unit 4 comes to Rs 4214,75,05,778.76. or Rs 4215.00 Cr (rounded off) (Specifically mentioned in the Excel sheet)

Therefore, total value of asset (Building, Plant & Machinery) under MD section for Zone -II comes to Rs. 4670.00 Cr

The generational capacity of Unit 1 and Unit 2 (OPGC 1) is 450 MW.
The generational capacity of Unit 3 and Unit 4 (OPGC 2) is 1320 MW.

Total capacity is 1770 MW.

Ratio of exposure in OPGC 2 is $1320/1770 = 75\%$ approx.

BI Sum Insured is Rs. 1200 Cr.

BI apportionment of the Sum Insured of Turbine Hall is 75% of 1200 = 900

Since it is noted that probably major outdoor equipment like auxiliary, station transformers are included in the Zone II value, to maintain rationality, it is reduced by 20%.

Therefore, the Zone II value is assumed to be Rs. (80% of 4670) = 3736 crores INR.

As per recent guidelines of Insurer the Minimum PML to be considered is 40% on MD + 100% of BI and total Sum Insured under BI section under the current policy is Rs.1200 Cr

Risk Head	Sum Insured	Adequacy	Loss Extent %	Loss Amount
MD	3736.00	Yes	40	1494.40
BI	900.00	Yes	100	900.00
Total				2394.4

In view of the above facts and figure PML of the Risk to be considered as Rs. 2395.00 Cr

Abhishek Mondal

Abhishek Mondal



Plant premises



Coal Handling Plant



Turbine House (OPGC 2)



Hydrogen Plant



Transformer Yard



Fire Extinguisher



Pump House



ESP Section



Coal Handling Plant