



Marsh Specialty

Brahmaputra Cracker & Polymer Limited
(BCPL)

Downstream Underwriting Report

Lepetkata Plant, Dibrugarh, Assam, India

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Following:

A survey visit to the BCPL Lepetkata facility from 17 March 2026 to 18 March 2026, and discussions with the site personnel.

Revision History

Revision	Date	Comments
0.0	March 2020	Original issue following February 2020 survey.
0.1	April 2020	Updated report issued following review of draft report by BCPL and no further changes suggested.
1.0	April 2022	Draft issue following February 2022 survey.
2.0	April 2026	Draft issue following March 2026 survey.
2.1	May 2026	Updated report issued following the information shared by BCPL.

Acknowledgements

We gratefully acknowledge the contribution of everyone involved in the survey and in particular the following personnel.

Joyonto Panging	- Chief Operating Officer (COO)
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and others

In the presence of:

Santanu Konwar	- Executive Vice President, Marsh India
Nitish Kumar	- Vice President, Marsh India
Dulal Buragohain	- Assistant Vice President, Marsh India

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Section One

Executive Summary

Introduction

The purpose of this report is to provide information for Brahmaputra Cracker and Polymer Limited (BCPL), insurers and reinsurers who underwrite the following insurance covers for the Lepetkata plant asset:

- Property Damage – Physical Damage.
- Property Damage – Business Interruption.
- Machinery Breakdown – Physical Damage.
- Machinery Breakdown – Business Interruption.
- Contingent Business Interruption.

The report provides a description of the facilities surveyed and gives an assessment of the Estimated Maximum Loss (EML) with respect to the above insurance covers; there is also a qualitative analysis of liability. Recommendations are given that highlight potential areas of improvement and risk reduction and the status of any previous recommendations was reviewed.

This report has been prepared following a two-day visit to the site on 17 – 18 March 2026; Marsh previously visited the site in 2020 and 2022. The survey took the form of a structured meeting with site management and department heads, together with a site tour.

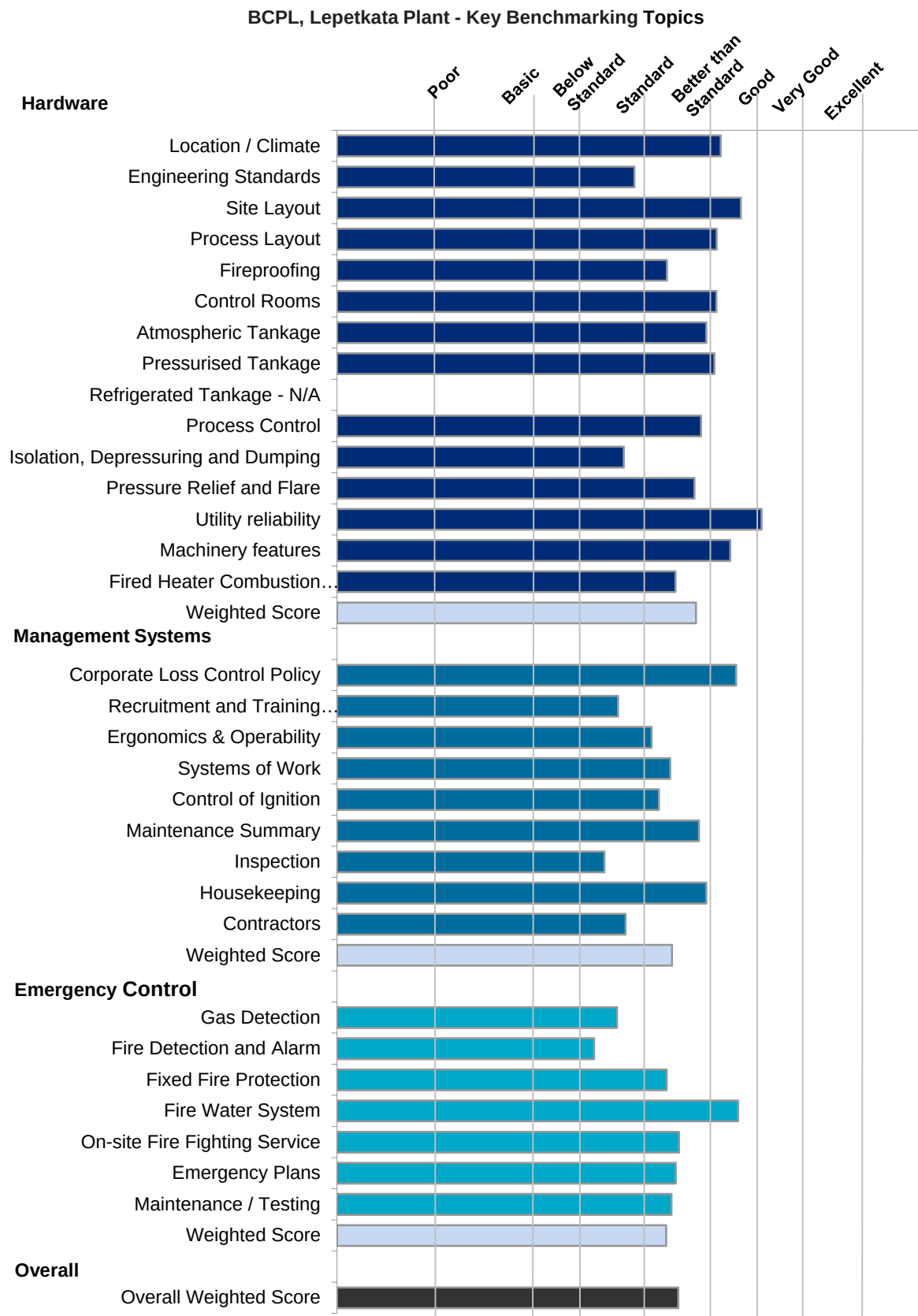
This report should be read in conjunction with the Marsh [Underwriting Report Framework](#), which provides information on the following:

- The basis of Marsh Opinion.
- The basis of [Natural Perils Exposures](#).
- The technical basis of [Loss Estimates](#).
- The basis for [Risk Improvement Recommendations](#).
- A glossary of terms.

Risk Quality

In our opinion, the quality of the BCPL, Lepetkata plant risk on a worldwide industry basis is demonstrated in the following table and in the chart overleaf:

Category	Risk Quality 2026	Previous Survey (2022)	Comment
Hardware	Better than Standard	Better than Standard	
Software	Better than Standard	Better than Standard	
Operations	Better than Standard	Better than Standard	
Engineering	Better than Standard	Standard	MoC procedure has been updated. Refer to Management of Change section.
Maintenance	Better than Standard	Better than Standard	
Inspection	Standard	Below Standard	Baseline inspection data has been collected. Improved progress in previous recommendations. Refer to Inspection for more details.
Emergency Control	Better than Standard	Better than Standard	
Overall	Better than Standard	Better than Standard	



Key Changes since the Last Survey

The main changes that have occurred at the Lepetkata site since the 2022 survey are as follows:

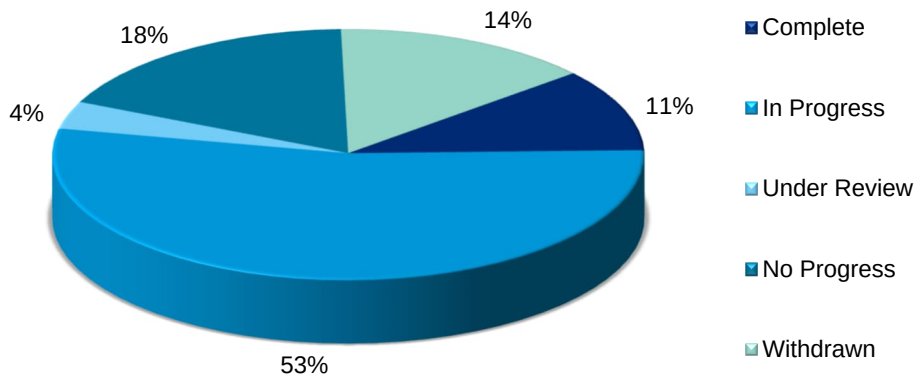
- Process Safety Management implementation is under progress. See [Process Safety Management](#) for further details.

Recommendations Overview

Risk Improvement Recommendations from the 2022 survey, as presented to the facility management on 18 March 2026 are detailed in the [Risk Improvement Recommendations](#) section and cover the following areas:

- [26.01](#) – Improvements in EDG testing, Category 2.
- [26.02](#) – Develop an impairment procedure for faulty and isolated fire protection and detection equipment, Category 2.

The following charts show the status of previous recommendations made by Marsh and others:



Status of all 28 recommendations from 2020 to 2024

Further details can be found in the [Previous Risk Improvement Recommendations](#) section.

Insurance Loss Record

BCPL, Lepetkata Plant has advised us at the time of 2026 survey of the following losses since commissioning of the plant in 2016 that have resulted in insurance claims:

- Damage to extruder of LLDPE/HDPE unit on 06 November 2018.

For more information, please refer to the [Insurance Loss Record](#) section of this report.

Values and Loss Estimates Summary

Estimated Maximum Losses have been calculated using the Replacement Cost Values (RCV), which were supplied by the BCPL, Lepetkata plant for the 2025-26 policy and assumed as of 01 July 2025. The basis of the valuation is a study by Protocol Valuers Private Limited Valuations Company dated 27 January 2022.

Values

The total sums insured for Lepetkata plant as mentioned in 2025-26 policy are:

Property, plant and equipment	INR 107,738 million	USD 1,184 million
Machinery	INR 97,301 million	USD 1,069 million
Pipeline (outside plant)	INR 13,065 million	USD 144 million
Business Interruption FLOP & MLOP (12 months Indemnity Period)	INR 6,500 million	USD 71 million

Note:

1. Rate of Exchange USD/INR = 91 has been assumed.

Loss Estimates

The following represents a summary of the 'ground up' Underwriter's exposures:

	Estimated Maximum Loss ¹ (INR Million)	Estimated Maximum Loss (USD Million)	Comment
Property Damage (PD) ²	33,000	360	VCE originating from Ethylene Reflux Drum in ECU. Underwriter's exposure is capped by sublimit on debris removal, firefighting expenses and start-up/shutdown costs. BCPL exposure is INR 35,000 million.
Machinery Breakdown (MB)	2,000	22	Catastrophic failure of 22.5 MW GTG. Not the BI-MB case.
Machinery Breakdown (MB)	1,400	15	Catastrophic failure of Cracked Gas Compressor (CGC) in ECU.
Business Interruption ⁴			
- PD	6,500	71	VCE originating from Ethylene Reflux Drum in ECU. Underwriter's exposure is capped by 12 months indemnity period. BCPL exposure is INR 20,000 million for 36 months.
- MB	6,500	71	Catastrophic failure of Cracked Gas Compressor (CGC) in ECU. Underwriter's exposure is capped by 12 months indemnity period. BCPL exposure is INR 9,800 million for 18 months.
- Suppliers' extension	1,300	14	Loss of feedstock from Duliajan as a consequence of a catastrophic event at OIL Duliajan site. Underwriter's exposure is capped by policy limit on named Customers extension. BCPL exposure is INR 6,500 million for 12 months.

- Customers' extension	-	-	No significant exposure.
- Loss of Import / Export Facilities	2,600	29	Catastrophic fire at Naphtha unloading facility (rail), resulting in 40% loss of BI for 12 months period.
- Loss of Utilities	4,900	54	Catastrophic damage to flare stack resulting in loss of flare stack for nine months.
Combined			
- PD + PD BI	40,000	430	VCE originating from Ethylene Reflux Drum in ECU. Underwriter's exposure is capped by sublimit on indemnity period, debris removal, firefighting expenses and start-up/shutdown costs. BCPL exposure is INR 55,000 million.
- MB + MB BI	7,900	87	Catastrophic failure of Cracked Gas Compressor (CGC) in ECU. Underwriter's exposure is capped by 12 months indemnity period. BCPL exposure is INR 11,000 million for 18 months.

Notes:

1. All figures are to two significant figures.
2. The Physical Damage Estimated Maximum Loss assumes a loss on 30 June 2027, 36 months of reconstruction, and allowances for firefighting, debris removal, investigation, commissioning, start-up and other costs.
3. Inflation has been assumed to be 4% per annum.
4. The BI values provided by BCPL is for 2025-26 period and has not been adjusted for inflation and growth.
5. Exchange rate of USD/INR = 91 has been assumed.

Section Two

The Risk

Overview

A Process Flow Diagram (PFD) of the site is shown overleaf. Further details of the site's process units are presented in [Appendix B](#); details of the site's storage facilities are in [Appendix C](#).

BCPL was conceived to utilise the rich gas fraction (C2+) in the gas / associated gas produced by the upstream oil and gas companies in the north-east part of India. The shareholders of the company include:

- Gas Authority of India Limited (GAIL): 70%.
- Oil India Limited (OIL): 10%.
- Numaligarh Refinery Limited (NRL): 10%.
- Government of Assam: 10%.

GAIL, OIL and NRL are all majority government owned entities.

BCPL was incorporated on 08 January 2007, and the foundation stone of the project was laid on 09 April 2007. Although many imported equipment were received at the site by 2010, there were some delays and the last process unit to be commissioned was HDPE/LLDPE unit in January 2016.

BCPL assets include the following:

- 6 million metric Sm³/d gas dehydration and rich gas compressor station at Duliajan (65 km from Lepetkata plant), adjacent to OIL plant. The Duliajan plant receives rich gas from OIL Central Gas Gathering Station (CGGS), dehydrates the gas, compresses it and sends the rich gas to Lepetkata plant for extraction of C2+ components. The lean gas (4.65 million metric Sm³/d) is then sent back to OIL Duliajan plant.
- 1 million metric Sm³/d gas extraction plant at Lakwa (around 60 km from Lepetkata plant), which receives rich gas from ONGC upstream assets, extracts 32,000 TPA C2+ liquid and is transported to Lepetkata plant through pipeline. The 0.77 million metric Sm³/d lean gas is sent back to ONGC facility.

- Rail unloading facility for Naphtha at Lalmati, around 4 km from Lepetkata plant. Naphtha is transported through 8" pipeline to Lepetkata plant has an annual capacity of 160,000 TPA.
- Lepetkata plant, which receives C2+ liquid from Lakwa and rich gas from Duliajan along with naphtha from Lalmati unloading station.

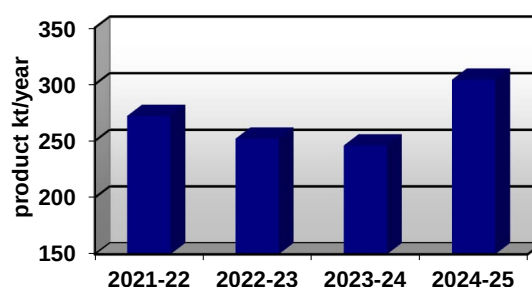
The Lepetkata plant is the subject of this Underwriting report. It includes a mixed naphtha-gas cracking plant and downstream PP and HDPE/LLDPE units. Naphtha is stored in floating roof tanks and other raw materials including C2+, propylene and Butene -1 are stored in spheres.

The company has signed a 15-year supply agreement with OIL for supply of rich gas and with NRL for supply of naphtha. See next [section](#) for further details. The plant also procures some polymer grade propylene from external agencies for use as feedstock in PP unit.

All polymer products are marketed by GAIL.

Operational Status and Reliability

The chart below shows the production (kt per year) for the last four financial years.



The site has achieved 112% of the production target in 2024-25 financial year and it was positive to note that the site has already achieved 105% of the production target for the financial year (FY) 2025-26 at the time of the survey. This is considering 330 days

of processing days in a year. This was made possible by efficient operations and reducing any major unit trips or unplanned shutdowns which helped in the extended run while maintaining the unit capacities within the design limits. At no point, the site has exceeded throughput capacity beyond its original design of 110%.

The Lepetkata plant is designed to process a mixture of naphtha and C2+ hydrocarbons in a 40:60 ratio. At the time of March 2026 survey, BCPL were processing feed composition of 68% C2+ hydrocarbons and 32% naphtha. During 2026 survey, it was reported that the plant can be operated with 100% C2+ hydrocarbon feed at 80% of the design capacity and 100% naphtha as feed at 50% of the design capacity.

During the 2026 survey, the plant was operating at 80% of its design capacity because geopolitical supply-chain disruptions limited naphtha availability; the site reported no technical constraints preventing the process units from operating at full design capacity.

Naphtha can be received from multiple sources by rail and C2+ is delivered from two agencies, ONGC and OIL. At the time of 2026 survey, BCPL informed that majority of naphtha requirement for Lepetkata plant is sourced from suppliers other than NRL, using rail unloading facilities. The cost of transporting naphtha from other suppliers is borne between NRL and BCPL in the ratio of 60:40. This arrangement in feedstock supply provides redundancy in site operations.

The ECU unit has total four furnaces, out of which three are in line and one is in standby mode. Two furnaces run fully on C2+ feed, and the third furnace has naphtha and C2+ in 3:1 ratio as its feed. It was reported that the Heater 1 and 2 coils were replaced in 2025 and Heater 3 and 4 coils replacement is planned in 2026 and 2027 respectively. At the time of 2026 survey, one furnace was under maintenance for decoking activity and insulation/refractory repair jobs were being carried out.

Below are the details of the unit wise unplanned shutdowns/trips occurred in the financial years (FY) 2024-25 and 2025-26 which resulted in a downtime of more than 24 hours.

Unit	FY 2024-25		FY 2025-26	
	Incidents	Total hours	Incidents	Total hours
GSU	0	0	1	60
ECU	2	128	1	64
LLDPE	2	136	3	243
PPU	0	0	2	169

It was positive to note that there were no unplanned shutdowns in FY 2025-26 which resulted in total complex shutdown. The details of unplanned and planned shutdowns are held on file by Marsh.

It is positive to note that BCPL has an automatic load shedding plan in place in case of partial power failure scenario and is based on the criticality of the equipment and plant.

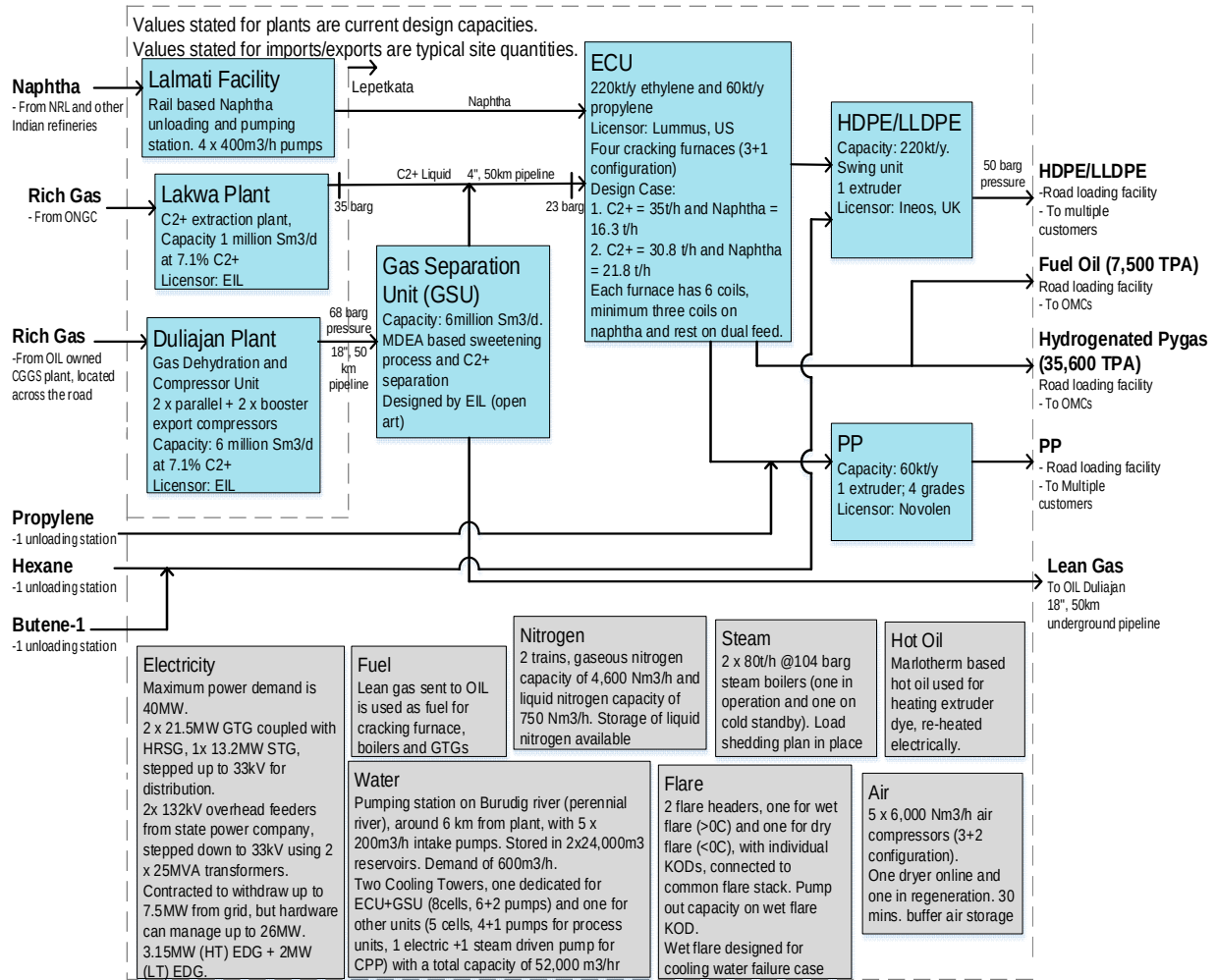
BCPL has taken whole complex shutdown for turnaround in May 2023, and the next turnaround is planned in March 2028 for Maintenance and Inspection (M&I).

It is positive to note that there has not been any major fire or loss of containment incident in past two years at Lepetkata plant since the last site visit by Marsh in February 2022.

Technology Risk

The Lepetkata plant uses well established technology in the production of polymers, hence technology risk is considered low.

BCPL has automated reaction kill mechanism in HDPE/LLDPE unit. Carbon Monoxide (CO) is used as kill agent in HDPE/LLDPE reactor. In case of minor disturbance, mini kill method is used to control the reaction and in case of major disturbances such as power dip scenario, maxi-kill mechanism is used. In PPU unit, Carbon Dioxide (CO₂) is used as a kill agent in reactor. In ECU there is a risk of runaway reaction in Acetylene hydrogenation reactors, but the reactors have safeguards/trip system which trips and cuts off the feed to the reactor along with auto depressurization of the reactor to the flare at high temperatures.



OMCs: Oil Marketing Companies, including IOCL, BPCL and HPCL, all majorly government owned
ONGC: Oil and Natural Gas Corporation; OIL: Oil India Limited

Lepetkata plant Process Flow Diagram

Location

Approximate co-ordinates:	Latitude	Longitude
Lepetkata plant	27° 21' 56.3" North	94° 53' 07.5" East

The petrochemical plant is located on the outskirts of the city of Dibrugarh, in the northeast state of Assam in India. The site is flat and occupies around 987 acres of land.

Exposures from / to Third Parties

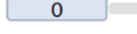
The nearest third-party hazards are considered to be:

North:	Open land followed by residential area, around 400m from nearest road unloading facilities of BCPL.
East and South:	Small river followed by tea gardens.
West:	Tea gardens followed by residential area and highway; around 550m separation between naphtha tanks and residential area.

Overall, exposures from and to third parties are considered low.

Natural Perils Exposures

This section should be read in conjunction with the Marsh [Underwriting Report Framework](#), which provides a basis for the exposures summary, overleaf:

NATHAN Hazards	Score	Low Hazard	High Hazard
 Earthquake	● Zone 2 MM VII		
 Volcanoes	● No Hazard		
 Tsunami	● No Hazard		
 Tropical Cyclone	● No Hazard		
 Extratropical Storm	● No Hazard		
 Hail	● Zone 2		
 Tornado	● Zone 2 0.6 – 2.0 (per 10,000 km ² and year)		
 Lightning	● Zone 4 10.1 – 20.0 (per km ² and year)		
 River Flood (Defended)	● Zone 0 minimal flood risk		
 Flash Flood	● Zone 2		
 Storm Surge (Defended)	● No Hazard		
 Wildfire	● Zone 2		

Natural perils exposure summary from Munich RE NATHAN

The structures are built to withstand the seismic forces of this zone as per IS 1893-Part 4. Categorization of structures are as per IS 1893 (Part 4). Structures in Category 1 are designed for seismic forces calculated from maximum considered earthquake. MCE (which is twice the forces calculated from design basis earthquake DBE). Structures in Category 2, 3 and 4 are designed for seismic forces from DBE. The plant team has reported that piling has been provided for all structural foundations, up to 15m depth in some locations.

Overall, exposures from natural perils are considered modest.

Other exposures

Type	Comment
Aircraft Impact:	Exposure to aircraft damage is considered high as the plant is some 18 km from Dibrugarh local airport. Overflying was not noted during the survey. The runway is oriented such that the aircrafts fly near the plant during landing.
Helicopter Impact:	Exposure to helicopter damage is considered medium as there is a helicopter base on the site, however it is only used very infrequently, during visit by ministerial level people.
Marine Impact:	There are no marine facilities at this location.
Road Impact:	Exposure to vehicle damage is considered low as the plant is at reasonable separation from the public highway. The Butene-1 and propylene road offloading facilities are located near the storage areas. The polymer product offtake trucks are loaded in the product warehouse, which is well separated from the plant. Pipelines running between Lepetkata and Duliajan, Lakwa and Lalmati are vulnerable to impact by vehicles where above ground, and have the possibility of being damaged by excavation where buried.
Rail Impact:	There are no rail facilities at the Lepetkata plant.

Overall, other exposures are considered modest.

Projects

Current and Future Projects

The following projects are planned for the next few years:

Project	Description	Start-up	Value (INR million)
HPG-2	Capacity: 52 kt/a. Benzene content in the existing Hydrogenated Pyro Gasoline Unit (HPG-1) is currently high, hence the HPG-2 will utilise Hydrogen from PSA-2 and produce low benzene gasoline which can then be sold to oil marketing companies.	April 2026	3,354
Butene-1	New Butene-1 plant of 10 kt/a capacity. To mitigate the import dependency of co-monomer.	July 2026	4,825
Capacity Enhancement	Capacity enhancement of Lepetkata plant to 140% of current capacity has been proposed and Detailed Feasibility Report (DFR) has been submitted to BCPL by EIL. During 2026 survey discussions, it was reported that the project is on hold.	On Hold	108,670

EIL has been awarded the EPCM contract for the three projects mentioned above.

Insurance Loss Record

The following are the reported insurance losses that have occurred since commissioning of the plant in 2016.

Date	Description	Amount (INR million)
06 November 2018	Failure of second gear and pinion of gearbox of extruder in LLDPE plant	96.6 (claimed)

Section Three

Site Facilities and Hardware

Layout and Construction

General Site

A site plot plan is available upon request; refer also to the plot plan in [Property Damage Estimated Maximum Loss](#).

The BCPL Lepetkata plant is located approximately 15 km south of Dibrugarh, Assam. The site occupies 986 acres of land which includes 749 acres of plant area and 235 acres of green belt, located mostly in a flat terrain.

Entry to the BCPL complex is from the northwest side, leading to the administration building. The central warehouse and fire station are also located in the same vicinity, around 1.3 km from the nearest processing unit (LLDPE/HDPE), on the centre of the plot.

The main processing area, on the middle of the plot, consists of the Utilities (such as power plant, utility boilers, nitrogen and instrument air system) on the north side, processing units on centre and raw water along with fire water reservoirs on the south side. It is positive to note that process units inside Lepetkata plant complex have good spacing between them which will help in avoiding the escalation in case of any emergency event in a unit. Approx. 16 m wide roads around the main process units provide good approach and accessibility during any emergency scenario while utility units are separated by 7.5 m to 12.5 m roads.

Polymer product warehouse is located on the west of the processing area, around 65 m from the nearest process unit, LLDPE. The Effluent Treatment Plant (ETP) is located on southwest of the main processing units, followed by the three naphtha feed tanks. TEAL is stored in a remote and dedicated warehouse, located on the southwest of the complex, around 170 m from ETP, which is the closest plant asset.

The C2, ethylene and Butene-1 spheres are located on the east of the processing units, with minimum separation of 200 m between spheres and Gas Separation Unit (GSU). The propylene spheres and other atmospheric product storage tanks (RPG and HPG) are located further west.

The single flare stack is located further west, at around 190 m from the nearest hydrocarbon inventory of propylene spheres and approximately 750 m away from nearest process unit GSU. The central workshop is around 250 m north of the flare area.

The cracker unit cooling tower is located on the south of it, at around 110 m separation. The fire water pump house and raw water pump house are located adjacent to each other, at around 220 m south of the GSU plant.

The main control room is also located on the north of the main processing area, around 160 m from the HDPE plant.

The BCPL complex was constructed by multiple contractors, with Engineering and Project Management Consultation (PMC) provided by Engineers India Limited (EIL). The design of the plant features international standards. Use of piling has been done for all structural foundations, due to the high earthquake prone zone.

Process Areas

Congestion level within process units ranges from low to medium, with maximum three levels of equipment in the layout. The cracker is very well laid with a network of pipe racks, and large open spaces on the sides, which provides very good access for firefighting.

The pump motors are within the piperack shadow; however, the pumps are outside the shadow, also no air fin fan coolers were noted in the cracker unit.

The compressor house of the cracker unit is large and spacious, with end-to-end layout of the cracked gas compressor and the tertiary refrigerant compressor. Separation distance between both compressors is more than 15 m. The compressor house is constructed of steel structure and is fully covered with metal sheets. Overhead crane is parked in the middle of both the machines. The associated lube oil skids of the machines are located within the compressor house, however away from the respective machines.

During 2026 survey site tour near ECU compressor house, it was noted that pumps 113-PA-201A/B (CGC 1st stage) discharge vents (HPV) were not blinded. It is suggested to ensure end blinds are installed on the designated High Point Vents (HPVs) and Low Point Drains (LPDs) as these lines are usually rely on a single isolation valve and keeping the end flange in open to atmosphere condition may lead to hydrocarbon or toxic gas release into atmosphere if valve leaks or is accidentally opened. This has been raised as an observation 26.01.

Client Comments: INSERT RESPONSE HERE

Electrical cables for major equipment run in underground channels; instrumentation cables run in overhead cable trays on the pipe racks.

Major columns such as de-ethaniser are located on the corner of the plot, so as to limit any cross exposure. Also, there are no surge drums (for naphtha in ECU and propylene in PP unit) present in the plants, with the storage area directly feeding the units, this limits the hazardous inventory in the process units.

The cracking furnaces are also well separated from the light end section of the plant, also other equipments are at around 15 m distance from the cracking furnaces.

Piping is colour coded as per service and the type of service is also mentioned on Utility service lines. During the 2026 survey site visit to the BCPL process units, the points below were noted:

- Alternate escape route in ECU compressor house was not easily identifiable near CGC compressor.
- Scaffolding rods and manway covers are left on the Ethylene Reflux drum technical structure on the condenser floor.

It is suggested that the site should clearly mark the alternate escape route near the CGC compressor to ensure unobstructed and quick evacuation during emergencies. Scaffolding rods and manway cover left on the Ethylene Reflux drum structure create tripping hazards, so they must be promptly removed and stored properly. This has been raised as an observation 26.02.

Client Comments: INSERT RESPONSE HERE

During 2026 survey discussions, it was reported that the utility hoses used in the process areas are segregated and tags installed on the hoses. Hose register is being maintained and details of date of inspection/hydrotest is tracked. Post survey, site has shared hose register of ECU. It was noted that the register has details such as hose tag numbers, size, tested date and remarks where the hose is located. There were no details of the due date of the next testing date. Therefore, previous [Risk Improvement Recommendation 2024.12](#) on this topic has been marked in progress.

All process units are built on concrete grading with slope towards the Contaminated Rainwater Sewage (CRWS) collection pits. A storm sewer channel is located on the perimeter of each process units; the channel was noted as dry and clean during the 2026 survey.

Plant structures are a combination of metal and concrete.

All pumps handling flammable and pressurized hydrocarbons are equipped with double mechanical seals which alarm to the control room. The compressors are fitted with dry gas seals.

Buildings

There is one single central control room for all process units and one control room for Offsites and

Utilities, which are further supported by three satellite rack rooms. All these buildings are of blast resistant construction.

Substations are also built of RCC material; however, the substation buildings have windows and lack blast resistance feature.

The central control room is a single storey, blast resistant building, constructed of RCC. It is equipped with auto closing heavy metal doors, which leads to operation offices and the control room. During 2026 survey to central control room points below were noted:

- Floor tiles were removed at various locations for instrumentation job without any barricading.
- Combustible material (instrumentation spare or project material) was kept in the control room.

It is suggested that the floor tiles removed for instrumentation work must be barricaded to prevent accidents, and combustible materials should be stored safely outside of control room at safe place to reduce fire risk. This has been raised as an observation 26.02.

Client Comments: INSERT RESPONSE HERE

During the site visit to BCPL Lepetkata plant, it was noted that the admin building, main canteen, and main fire station are well distanced from the process plant area. The admin building is approx. 1.3 km away from the nearest process plant. The main fire station is approximately 1.0 km away from the process plant and the canteen building is approximately 430 m away from the nearest process plant. This is considered a positive feature.

Storage Areas

The floating roof naphtha tanks are 0.75D apart, however the pygas tanks are around 1D apart. Few tanks are in individual bunds, while some share a common bund between two or three tanks. Tank bund is of concrete construction.

The spheres used for storage of pressurised hydrocarbons are around 0.5D apart. However, the spheres are full concrete coated, from bottom to top. Also, the sphere outlet line is full coated with

concrete. There are no flanges under the sphere and the outlet side ROIV valve is located outside the shadow.

Spheres of each service are grouped together in a single bund. Concrete bund wall is of low height, and the full bund is sloped to a collection area, which leads to the OWS area through a normally closed gate valve.

Pumps are located outside the concrete bund for all atmospheric and pressurised hydrocarbons.

Import / Export Facilities

The import pipelines from Lakwa, Duliajan and Lalmati are all buried at least 1.5 m in the ground.

Control and Safety Systems

Philosophy

This facility has a Distributed Control System (DCS) with an independent trip system.

Control Systems

Yokogawa Centum VP v6.0 based DCS is used at Lepetkata plant. The transmitters in the plant are connected to the respective Satellite Rack Rooms (SRR) in the plant, which is then connected to the main control room. There are three SRRs in the Lepetkata plant.

CCTV cameras are installed at the flare area, with viewing screen provided at the control room. Major trends are also displayed on a separate large screen for easy identification of any process disturbance.

Consolidated Alarm Management System (CAMS) system is provided by Yokogawa. During 2026 survey it was noted that the site does not generate any Daily Alarm Summary report and does not have Alarm Information Management System (AIMS) to manage the daily alarm rate. However, the rationalization of alarms can be done manually. Alarms are categorized into red (critical) and yellow (non-critical). Critical alarms are those that can impact the safety and functioning of the plant, while

non-critical alarms are those that are unlikely to affect the plant's operation or safety.

A separate DCS screen is dedicated for F&G alarms in process area of each unit and annunciator alarm is linked to F&G detectors.

During 2026 visit to the BCPL Central Control Room (CCR), it was positive to note that there was no flooding of alarms on DCS panel. The panel engineer in Ethylene Cracker Unit (ECU) informed that they are getting approximately 20 alarms per shift and at the time of the visit it was noted that there were four standing alarms. BCPL has also carried out DCS alarm rationalization in all the process units in the past. Recurring alarms are highlighted to the maintenance team. Post survey site has shared alarm details of LLDPE/HDPE unit as mentioned below:

Date	Number alarms per day
07 May 2026	133
08 May 2026	143
09 May 2026	159
10 May 2026	119
11 May 2026	189

Control Rooms

The main control room is well laid out with separate control panels for each process unit. The Shift in Charges sit in the same room, however the workspace is well separated from the consoles area.

The control room is ergonomically designed and well lit. There is a separate HVAC for the building, with gas detection on the inlet air side, which is interlocked with closing the inlet dampers. The air intake system for the control room building is from the opposite side of the plant facing area.

There are CCTV cameras installed at flare and other critical areas, such as compressor shed in ECU unit, with display at the control room in separate screens.

It was positive to note that BCPL displays production key figures and milestones of a particular process unit on a board adjacent to their respective DCS panels in CCR. The data displayed on the board

includes daily production figure, last shutdown date etc. This is considered as a positive feature as it helps in general awareness about the unit operating status for the Operations team.

Process Emergency Shutdown (ESD) Systems

ProSafe RS based PLC system, supplied by Yokogawa, is used at the Lepetkata plant. The PLC based ESD system is independent of the DCS and a SIL assessment was carried out during the design stage of the plant. SIL 3 certified hardware is used for the PLC system.

Relief and Flare Systems

All relief valves on hydrocarbon service, including those on spheres, are connected to the plant's relief system. There are multiple relief valves in most of the locations, which provides redundancy to test one valve with the other in service.

During 2026 survey site visit it was noted that in ECU few PSVs isolation valves were found to be in Car Sealed condition and the site has developed LO/LC register, and yearly audit is being conducted to ensure healthiness of car seal. It is recommended to add other critical valves such as isolation valves of kill systems to the list and increase the audit frequency to every three months (industry standard practice). See previous [Risk Improvement Recommendation 20.01](#) by Marsh and [Risk Improvement Recommendation 2024.06](#) by others for further details.

Each of the wet and dry flares is provided with a KOD, located close to the main flare stack.

Remote Isolation, Depressurisation and Blowdown

The design of the Lepetkata complex incorporates use of ROIV valves on critical hydrocarbon inventory, such as column bottoms (e.g. depropaniser and de-ethaniser) and reflux drum (e.g. depropaiser reflux and de-ethaniser reflux) liquid outlet lines. However, the site philosophy is to provide remote isolation on the column/reflux drum outlet, and not on individual

pump inlet/outlet valves. All ROIV valves were noted to be provided with a metal 'fire cover', to prevent damage to actuator in case of a fire.

Machinery Safeguards

All critical rotary machines such as Cracked Gas Compressor (CGC), Tertiary Refrigeration Compressor (TRC) and other compressors in polymer units are equipped with Bently Nevada 3300 series fixed machine monitoring system.

The monitoring equipment will alarm (in control room) and trip the aforementioned machines in the event of high and high high reading of the monitored parameter such as:

- Excessive Vibration.
- Axial Movement.
- High bearing temperatures.

Antisurge control equipment has been fitted to cracker plant compressors.

The Cracked Gas Compressor at ECU unit has two lube oil pumps, primary steam driven pump and the secondary electric pump.

Combustion Safeguards

The cracking furnaces are equipped with automatic double block and bleed arrangement in the common fuel gas line. Furthermore, each burner is provided with an isolation valve on the fuel gas and pilot side. Emergency push buttons were installed at strategic locations to shut down the individual heaters in the field.

The utility boilers are equipped with automatic double block and bleed valves on the fuel gas supply. Flame scanners are present on each burner for both main

and pilot gas. Full Burner Management System (BMS) is installed for each boiler, with multiple interlocks provided. Purging is a manual process, however a mandatory part of the start-up sequence. Portable ignitors are used to ignite pilot burners which then ignites the main burners in ECU furnaces.

Storage Safeguards

Each naphtha tank is equipped with one servo and one radar based remote monitoring-based level transmitter. Both the inlet and outlet piping is equipped with Motor Operated Valves, with the inlet MOV interlocked with the high high reading of the radar level transmitter.

Each sphere is equipped with one servo and one radar based remote monitored level transmitter. There is also one high high switch, interlocked with the inlet ROIV. The inlet, outlet and vapour return line of each sphere is equipped with a ROIV, the inlet and vapour return line ROIV are located outside the bund.

All ROIVs in the storage area are protected by a metallic 'fire enclosure', which is provided to prevent damage to the valve actuator in case of a fire.

Marsh's Position Paper on good practice in this area is available to download [here](#).

Import / Export Safeguards

All pipelines connecting to the Lepetkata plant are equipped with ROIVs to isolate inventory at the plant battery limit.

The road unloading facility for Butene-1 and propylene are equipped with hard arms and ROIV system. Start permissive is also present, which is interlocked with the MOV.

Section Four

Management and Systems

Organisation

A site organisation chart is shown in [Appendix D](#).

Chief Operating Officer (COO) leads the site technical teams. There are around 700 staff at BCPL Lepetkata plant. The manpower is split in executive (including engineers and above) and non-executive (technicians and foreman level) staff. Each department also employs some contractor staff, for support, housekeeping and maintenance works.

BCPL has a pool of experienced manpower in Operations and Maintenance roles with industry background. At the time of 2026 survey discussions, it was noted that many staffs have been working since commissioning of the plant. BCPL informed that the operations and maintenance (O&M) contract is for two years and if there is any change in O&M contractor the manpower is retained while the contractor agency changes and hence the same bunch of contractor staffs have been associated with BCPL for a long time which is a good feature.

There are also few secondees from GAIL, in both technical and non-technical functions, currently on deputation to BCPL. Some of the functions such as inspection are a shared resource between Lepetkata plant, Duliajan and Lakwa plant.

The Operations team works in eight hours shift format, with some maintenance staff also working in shifts.

Process Safety Management Organisation

The implementation of Process Safety Management (PSM) is currently underway at the site in accordance with the OISD-GIDN-206 18-element Safety Management System. During the 2026 survey, it was reported that nine out of the 18 elements have been successfully implemented. Champions have been

appointed for each element. BCPL has engaged a third-party agency, iFluids Engineering, to assist with the review and implementation of PSM. As part of this process, the agency conducted a gap analysis and provided training sessions from 2023 to 2025.

One engineer in each plant (Operations team) and at each maintenance function are designated as a Process Safety Officer (PSO), responsible for leading Process Safety in the function. The PSO of all functions meet monthly and discuss the Process Safety performance of the unit/department. PSOs are mainly responsible for tracking the near misses, incident investigation actions and open recommendations of the associated plant.

Philosophy

Monthly HSE reports consolidating departmental highlights are prepared and reviewed at the monthly safety review meeting chaired by the COO/GM. The plant safety committee meets quarterly, while the Apex committee convenes annually under the chairmanship of the COO.

BCPL HSE team shares learning from incidents (case study) with all its staff, deputation staff and contractors. These case studies mainly comprise of incident reports received from GAIL (shareholder) or from industries all across the world. This is considered to be a positive feature.

Performance

Process Safety KPI data is presented in [Appendix E](#).

The site reports HSE Index as a KPI and the Index is calculated based on the weighted scores assigned to different elements in the HSE Management system.

Post survey site has shared monthly HSE report format and the same is held on file by Marsh. Below are the few broad level categories noted from the same:

- Safet Organization

- Consultation & Participation
- Process Safety Information
- Risk Analysis and Management
- Control of Defeat & Reliability of Critical Systems and devices
- Personal Monitoring
- Safe work practices, procedures and permits
- Safe Operation Management
- Asset Integrity Management (includes No. of PSVs, LEL detectors calibrated/scheduled)
- Training & Competence
- Incident Reporting, Investigation & Analysis
- Emergency Preparedness Exercise
- Statutory Compliance

BCPL has developed an internal portal called “BCPL Connect”. All the near-misses, Management of Change (MoC) procedure, minor and major incidents and their investigation reports are recorded on this portal and can be accessed by all BCPL staffs. This is a good platform called Recommendations Compliance Management System (RCMS) for recording and tracking of recommendations status of various audits and also capturing the details of any process safety incident.

Fire and gas leaks are categorised as major and minor incidents. Incident reports are produced for each incident, including fire and gas leaks. First Information Report (FIR) is filed within 24 hours of any incident, and an investigation team is formed to produce Failure Analysis Report (FAR). The recommendations raised by investigation team are uploaded in the BCPL Connect Portal and followed up to their completion and closure. It was reported during 2026 survey that there were no reportable fires or Loss of Primary Containment (LOPC) incidents in last two years.

It was noted that for the investigations conducted the recommendations were marked closed in the portal without any clear evidence of compliance. Post 2026 survey, site has shared two incident investigation Action taken Reports (ATR). The details of the incident were not clear in both the reports. One incident happened in February 2026 at HPG-2 project site. It was noted that there were three recommendations and the ATR has detailed actions taken with respect to each of the recommendations along with photographs attached as evidence.

Therefore, previous [Risk Improvement Recommendation 22.01](#) has been marked as in progress.

Marsh’s Position Paper on good practice in this area is available to download [here](#).

Process Safety Audits

The Fire & Safety department maintains an internal audit plan for all BCPL assets (including Lakwa and Duliajan).

Below are the external audits conducted recently:

- OISD audit was conducted for Lepetkata plant in 2023.
- T4S (Technical Standard & Specifications) audit was conducted for BCPL pipelines as per guidelines by the central government in December 2022.
- Promoter Audit by GAIL is conducted every year and the latest one was completed in March 2025.

Other than external audits, internal safety audit (ISA) is conducted every year for Lepetkata plant. For ISA, each audit team consists of 4 – 5 experienced staff, from different disciplines, nominated by the Chief Operating Officer (COO). There is an audit checklist in place for all internal audits. Observations from audits are recorded in the Audit Compliance Portal of *BCPL Connect* and tracked to completion. The responsible department, due date and status is recorded against all audit compliance observations. The Fire & Safety team conducts an independent verification of closure of action items by respective departments. This philosophy of verification of closure of action items by an independent team provides a check on the system of closure of the action items.

The open recommendations are also reviewed by the COO in regular meetings. Each plant has a dedicated Process Safety Officer (PSO), who is responsible for tracking the open recommendations of the associated plant.

The Technical Services department performs regular IMS audit.

Details of the site's [Process Safety Studies](#) can be found later in this report.

Operations Organisation

The Operations team is headed by three General Managers (GMs) (HOD): one overseeing downstream units (PP, HDPE, Technical Services, and Environment), another managing upstream units (GSU and ECU), and a third responsible for Offsites and other assets. These GMs report to the Chief General Manager (CGM) of Operations and Maintenance (O&M), who subsequently reports to the COO.

BCPL Operations team reported at the time of 2026 survey there were two vacancies at Senior Manager level (one in ECU and another one in LLDPE unit). It was noted that the site has recruited 15 personnel in operations in 2025 having industry experience in the range of one to two years.

The Operations team in each process unit is led by Area in Charge who is typically of Chief Manager or Senior Manager level. The Operations team during shifts in each plant is led by the Shift- In-Charge (SIC), who is typically a manager level employee. The LLDPE panel has three panel engineers, one SIC, and 10 field staffs including two BCPL staff, four contractor staffs (skilled), and four workers (unskilled) per shift. While the ECU unit have five panel engineers, one SIC, and approx. 15 field staffs including two BCPL staffs, five contractor staffs (skilled) and 8-9 workers (unskilled) per shift.

The operations team also uses contractor staff which includes unskilled helper level staff, used for housekeeping and skilled contractor staff, used for various operations support jobs, although only under the supervision of BCPL staff. Contractor staff is not allowed to work independently in the plant.

Experience and Training

The engineers working on DCS operations are 5 to 6 years experienced, with some of the Managers with more than 10 years of experience. The Senior Managers are 8 to 15 years experienced, with

average experience level of 12 years in oil and gas industry. The foremen level technicians have more than 2 years' experience, with some having more than 10 years' experience.

Trainee technicians are hired locally (within the state) and undergo a formal test as part of the hiring process. Engineers are hired centrally as Graduate Engineer Trainees (GET) and first undergo a safety induction training for one day, conducted by the Fire & Safety department following by technical induction (classroom) for 15 days. The trainee is then rotated in each plant for one week each, before attaching to the allotted process unit. Within the allotted process unit, the trainee starts with reading and understanding Process Flow Diagram (PFD) and Piping & Instrumentation Diagram (P&ID), followed by line tracing in the plant. Then the trainee is slowly involved in daily jobs such as preparation of equipment for maintenance, product routings, start up and shut down operations and emergency scenarios. The trainee is also attached to the plant SIC/engineer during this one year of training period. Quarterly tests and a six-monthly interview-based evaluations are conducted. HR team is also part of these assessments. The trainee is also required to present a technical presentation to the management as part of the final evaluation. The trainee is then formally hired and works as a shadow charge in the plant. Independent work is assigned based on the individual's competency level and the plant team's evaluation. The individual is only deputed to the control room operations after demonstration of good control of field activities.

The site follows the following induction and training process for newly hired experienced personnel: a one-day safety induction followed by 4–6 months of on-the-job training with monthly evaluations by area in-charges. Final validation is carried out by the Head of Department (HOD), after which the candidate is formally approved to work independently.

Systems of Work Shift Handover

Formal shift handover register is used by the panel engineers and SIC. Major production information, equipment under maintenance, works carried out

during the shift etc. are recorded on the shift handover register.

Marsh's Position Paper on good practice in this area is available to download [here](#).

Safety System and Alarm Bypass Procedure

The site follows a time-based escalation for managing ESD bypass system with the following authorisation levels:

- Bypass up to one day (<24 hours): Authorised by SIC.
- Bypass up to seven days: Authorised by HOD (GM).
- Bypass more than seven days: Authorised by Chief General Manager (CGM).

There were seven long term bypasses in LLDPE unit since commissioning. BCPL is in talks with OEM/licensor to find a permanent solution and remove these interlock overrides by making necessary changes through MoC system.

The Operations team has reported at the time of 2026 survey that there were two long-term bypasses in the ECU unit:

- One vibration probe, XI-91F10X, on the TRC compressor's turbine journal bearing has been bypassed since March 2025.
- Steam drum level 113-LT-1832 has been bypassed in February 2026.

The control room team of each process unit maintains an interlock bypass register. This includes details such as tag number, date and time of bypass, reason for bypassing, risks associated with bypass, mitigations adopted for bypass, signature of SIC and Instrumentation engineer, Plant Manager and CGM sign (on escalation), any remarks noted during bypass duration, date and time of normalisation along with signature of SIC and instrumentation engineer for restoration are recorded. While reviewing the trip interlock bypass register, it was noted that the mitigation measures for the two long-term bypasses in ECU were limited and generic. It was also noted that the space for entering risk

mitigation measures in the trip bypass register is very limited and long-term bypasses are not being routed through Temporary MoC, and mitigation measures are not being reviewed through interdisciplinary committee. Site has informed that new Interlock bypass procedure is being developed to address the limitations in the current interlock bypass procedure. See previous [Risk Improvement Recommendation 22.02](#) for more details.

Marsh's Position Paper on good practice in this area is available to download [here](#).

Work Permits

The Lepetkata plant follows the OISD 105 standard for the work permit system. It was noted that the site has transitioned from paper-based work permit system to SAP based one in 2024. The work permit procedure was last updated in August 2022. There are two major permits used at the site, hot work permit known as composite permit (pink background) and cold work permit (green background). Works such as confined space entry, work at height, hot jobs, excavation and vehicle entry are managed using hot work permit form. All permits are valid for one shift only and require to be revalidated by the incoming shift issuing and performing authority. Cold work permit may be renewed for next two more consecutive days if all conditions of work remain unchanged, work is being carried out in at least all A and B shifts, and issuer is satisfied that no deviations are observed. Hot work / Confined Space Entry / Work at height / Excavation / Vehicle entry work permit cannot be renewed for the next day and a new permit need to be raised.

Cold permits are issued in duplicate, with the original copy with the performing authority and the duplicate copy with the issuing authority. Hot work permits are issued in triplicate, with original copy retained by performing authority and one copy each with issuer and Fire & Safety.

The plant SIC is the issuer for cold work permits; hot jobs are issued by SIC with Level 1 approval from Senior Manager /Area In charge along with counter sign from the Fire & Safety officer. The HOD is required to sign / authorise any hot job to be carried after 1700 hrs (silent hours) or during off days.

A Process Safety Officer is designated for hot jobs in each process unit, responsible for ensuring the implementation and adherence of Permit to Work (PtW) system. Initial gas test results are recorded on the permit. The frequency of gas tests is decided as per the nature of the work and the same is recorded on the permit. BCPL reported that gas testing is being done before issuing the permit. During the 2026 survey site visit it was noted that continuous or Intermittent gas testing is not being done for hot jobs in critical areas. For example, one hot work permit (Hot work in heater area in ECU) was reviewed and it was noted that there was no portable gas detector available or fire & safety personnel to measure the explosivity (LEL) in the hot job area. It was also noted that there is no space to enter intermittent gas testing results in the permit. See previous [Risk Improvement Recommendation 22.03](#) for further details. Requirement of a standby person is also recorded on the permit.

The Fire & Safety department conducts an initial training for all permit issuers and receivers along with refresher training every year.

The control room team is verbally informed of permitted works by the SIC, who also sits out of the same office.

Job Safety Analysis (JSA) is carried out for composite work permit. Critical cold jobs or as deemed fit by issuer. It requires multi-disciplinary team to prepare JSA for the critical works.

Isolation Procedures

The site follows LOTO system for electrical isolations, using electrical isolation permit to manage such isolations. The permit is issued in triplicate with copies held by Operations (Issuer), Electrical Maintenance and relevant maintenance (Performing Authority). The associated maintenance permit number is cross referenced on the electrical isolation permit. Each department has different locks and keys, with all relevant maintenance departments putting their lock on the electrical panel. The operations (Issuer) department is the first to install the locks and last to remove it.

For mechanical isolations, it is required to mention if the equipment has been blinded, disconnected, closed and isolated. Also, there is a tick box to record equipment has been properly drained and de-pressurised. Blind lists and marked up P&ID are attached with the permit in case of mechanical isolations.

During 2026 survey site visit it was noted that, for process / mechanical isolations blind lists are used with blinds marked up on P&IDs. The rating of the blinds is also defined along with the details of when the blinds are installed/removed. In LLDPE unit a vessel isolation plan/blind list was reviewed and noted that for mark-up old P&IDs (September 2009 BDEP) were being used. The mark-up P&ID was missing for the permit reviewed in ECU (hot work: FF-103 insulation repair job inside furnace). The isolation valves that are being closed/open for the line break activity are not being marked on the P&IDs. It is noted that a list of process isolation valves to secure into position before line breaking to install blinds is not developed (minimum isolation philosophy HSG 253). It was reported that when process isolation valves are used as an isolation, the valves are only closed & tagged and is not locked/secured into position. See previous [Risk Improvement Recommendation 2024.09](#) for more details on this topic.

ROIVs, where used within the isolation scheme, are electrically de-energised, as part of the isolation requirement.

Documentation

Examples of documentation reviewed in the control room included:

P&IDs

During the 2026 survey visit to BCPL Central Control Room (CCR), it was observed that the A3 based laminated copies of P&IDs were kept in the control room. It was noted the P&IDs available in control room are stamped “Controlled” and “As Built”. Few P&IDs reviewed were observed to be updated with Revision-6 “Updated with HAZOP recommendations (2019)”. P&IDs of MoCs implemented till 2024 were available. For example, MoC-017 was implemented in April 2024 was available in the control room. It was

not clear whether site replaces the old P&IDs with Red lined marked P&IDs or hand drawn P&IDs with changes after a MoC is implemented. See previous [Risk Improvement Recommendation 22.07](#) and [Risk Improvement Recommendation 2024.02](#) for more details on this topic.

Standard Operating Procedures (SOP)

Hazard Identification and Risk Assessment (HIRA) has been performed for all activities in the plant. The relevant SOPs and checklists have then been developed for the plant operations.

Standard Operating Procedures are available in both electronic and paper-based copies. The SOPs are signed by relevant authorities and also dated. For example, one SOP reviewed (Hydrocarbon and Chemical Draining) was having a revision date of January 2023. During the 2026 survey discussions, it was reported that site performs SOPs revision every year and if there are any changes then the revision date is changed and revision number is updated, if not then the revision date and revision number remains the same, but the details of the last revised dates are updated in the master revision document. It is suggested to add the master revision document as part of SOP folder or update the revision date and revision number after every revision. This ensures that the operations team is referring to latest and updated documents.

The SOPs are tabulated and include job description and person responsible for the step. This step-based process is considered a positive risk mitigation feature.

Emergency Operating Procedures (EOP)

It was noted that the ECU unit maintains an updated copy of EOPs in electronic format and paper-based copies. Updated EOPs are kept in separate folder and are in checklist format. Power failure and Furnace emergency scenarios EOPs were available in the folder. It was noted that the indexation was missing for the folder. It is recommended to include scenarios of loss of other utilities such as loss of cooling water, loss of steam, loss of instrument air, loss of fuel gas, DCS failure etc. to the EOPs.

Previous [Risk Improvement Recommendation 20.02](#) on this topic has been marked in progress.

BCPL has prepared a unit wise pocket manual which contains key steps to be followed by plant engineers during utilities and power failure scenarios. The scenarios listed in pocket manual includes failure of cooling water, nitrogen, and instrument air. This manual is available with all the Operations staff.

Engineering and Technical Services Organisation

There are five personnel in the Technical Services department. The department is headed by GM (HOD). reporting to him are one DGM, one Chief Manager and three Senior Managers.

Engineering Standards

The BCPL plants have been designed based on relevant international standards such as API and ASME and also utilising Indian OISD (Oil Industry Safety Directorate) standards.

Project Engineering

Any new work/addition in the plant is managed by the Projects team. Minor additions are managed by Maintenance section.

Performance

The department responsibilities include energy monitoring, technical audits, optimizations, HAZOP and MoC.

The department maintains an Enterprise Risk Management Policy (Risk Register). The policy is a compendium of risks that are applicable to the site. The enterprise risks are categorised as Business operations, Liquidity, Credit, Logistics, Market, Human Resources, Disaster, System and Legal risks. The document also has details about factors affecting the enterprise risks such as economic environment, political environment, competition, etc. It is recommended that BCPL proactively develop a Business Continuity Plan (BCP) to minimize the potential business interruption impact such as failure

of single line equipments, etc on the BCPL as part of Risk Management Policy. See previous [Risk Improvement Recommendation 2024.15](#) for more details on this topic.

Process Safety Studies

Process Hazard Analysis

HAZOP was conducted for the BCPL Lepetkata complex during the initial design stage. Subsequently a re-HAZOP of the plant was again conducted in 2019 and March 2025. The HAZOP had participation from different BCPL teams, including Operations, Maintenance, Technical Services and Fire & Safety.

The existing P&IDs were utilised for the HAZOP process, and each plant was divided in nodes, with key words such as high flow, low flow, no flow etc, used.

297 recommendations were made in the 2019 HAZOP (including both Lakwa and Duliajan sites) and the recommendations are being tracked by the Technical Services department. At the time of 2026 survey it was reported that one recommendation is pending i.e., Installation of additional Naphtha feed pump which has been targeted by May 2026. The site is yet to receive final 2025 HAZOP revalidation report.

Safety Case

There is no formal requirement of Safety Case as per Indian regulation.

However, QRA was performed for the plant operations both during the design stage in 2005 and the same was revised in July 2020.

Safety Integrity Levels

SIL study was carried out during the initial design of the plant.

Management of Change (MoC)

During the 2026 survey it was noted that the latest MoC procedure has been issued by BCPL dated March 2025 and is available electronically on BCPL intranet, BCPL Connect. The procedures classify

'change' as a change of process/technology, hardware, software, chemical, catalyst, operating procedure, and personnel. The procedure has categorized MoC into Permanent and Temporary MoC. The new procedure also includes PSSR checklist, and closeout form. The Close out form is in checklist format. Implementation of the new MoC procedure is under progress. It was noted that the site is yet set a target completion KPI, for the timely closure of MoCs and associated documentation following commissioning of the MoC and monitor as a PSM KPI. Therefore, previous [Risk Improvement Recommendation 2024.13](#) has been marked in progress.

The MoC procedure, which now includes stages such as proposal, verification, approval, implementation, PSSR, performance review and Closure stage.

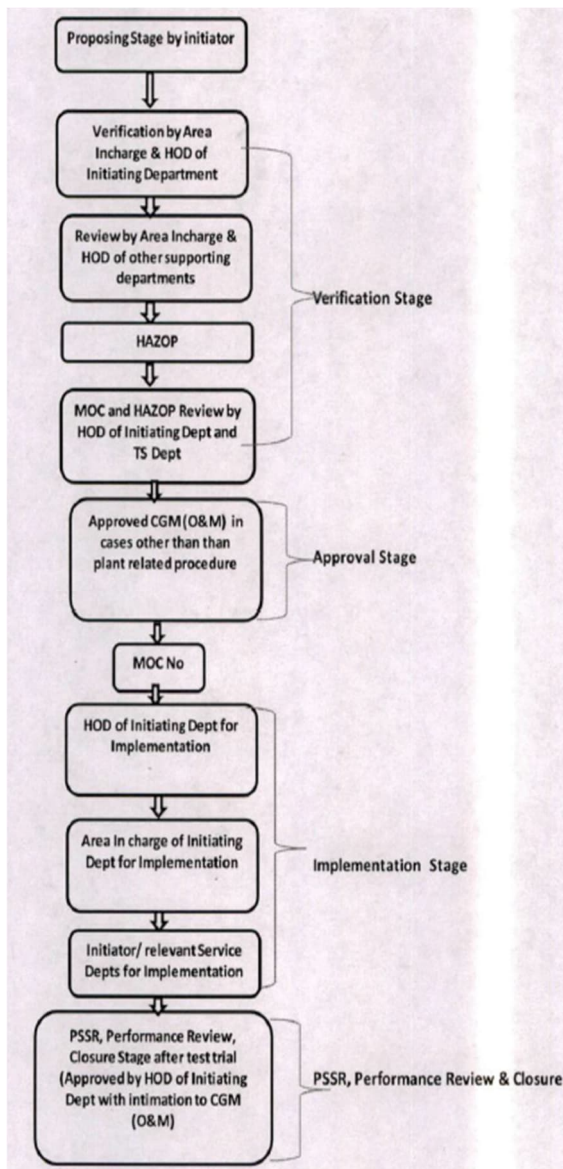
However, during discussions with the site team, it was unclear whether the site tracks any MoC dashboard or key performance indicators (KPIs) related to the MoC process. Therefore, it is suggested to develop a MoC dashboard to monitor the status of all MoCs and identify the stage each one is currently in (stage gate process). Introduce and report KPIs to monitor the performance and health of its MoC system such as:

- Total number of open MoCs, with some details showing when they were originally raised.
- The number of MoCs raised in the review period.
- The number of completed MoCs with open and overdue close-out actions.

This has been raised as an observation 26.03.

Client Comments: INSERT RESPONSE HERE

Below is the MoC implementation flow diagram:



All site personnel are authorised to propose a change, with the initiator's change request forwarded to the Area in Charge of the initiating department for first pass review, who forwards the change request to Area in Charge of all maintenance functions, Technical Services and Fire & Safety departments for review and comments. Any other department, if required, is also requested to participate in the first review stage. A HAZOP is then conducted for the change, which is then reviewed by the Head of Department of initiating department and Technical Services department. A MoC number is then assigned to the change. The change is then formally approved by the CGM (O&M) for implementation. The change is then implemented by the initiator /

relevant service department and the change is commissioned. As part of the closure stage, the initiating department HOD approves the closure, and information is also passed to the CGM. Performance review is then carried out one month after closure by the initiating department and technical services with approval provided by HOD of initiating department.

During the survey a sample MoC with document number ECU/PFOQF/process/PMO/017 (installation of FV-2501 at the cracker downstream) was reviewed and it was noted that the all the checklists and supporting documents were found satisfactory and signed off.

Marsh's Position Paper on good MoC practice is available to download [here](#); that for Pre-Start-up Safety Reviews is available [here](#).

Maintenance Organisation

Each of the mechanical, electrical and instrumentation maintenance departments is led by a General Manager (Head of Department).

Below are the staffing details of maintenance departments:

Department	Mechanical	Instrumentation	Electrical
Executive	68	40	38
Non-executive	22	25	24
Contractor	500	82	191

The electrical department oversees electrical maintenance as well as the operation and maintenance (O&M) of the CPP. At the time of 2026 survey no vacancies were reported in maintenance department.

Contractor staff work under the supervision of BCPL staff.

Experience and Training

The Manager level staff has experience level of

5 – 15 years, while the Senior Manager level staff is more than 10 years experienced. The technicians are also 5 – 15 years experienced.

The graduate engineers follow the same induction process as Operations engineers, with a basic safety induction followed by one month of training covering all relevant maintenance functions such as workshops, IOP, CPP, bagging etc. The engineer is then allotted the relevant section, and a mid-year performance review is conducted followed by final review at the end of one year. It was noted that the site follows a refresher training program for all the department personnel through which SOPs and SMPs are discussed with a monthly target to complete at least three per department and the attendance is recorded.

Performance

Monthly Performance Reports (MPR) are published at the end of each month highlighting the major activities carried out by civil, mechanical, electrical, instrumentation and CPP maintenance functions. During 2026 survey discussions it was noted that Maintenance team reports PM compliance, PM and CM orders, and budget monitoring as KPIs to management. See previous [Risk Improvement Recommendation 22.04](#) for further details on this topic. The PM compliance for mechanical maintenance was reported to be at 99% whereas for electrical maintenance it was at 97% against the target 100%. TRC compressor overhauling is overdue at the time of 2026 survey. GT-1 overhauling was done in 2023, and GT-2 overhauling was done in 2024.

Resources

A central workshop is utilised by the maintenance teams at Lepetkata plant. The workshop is equipped with two lathe machines and high-speed rotor balancing facilities (mechanical maintenance), drilling and milling machines, LT motor rewinding and HT motor seal bearing and overhaul facilities (electrical maintenance) along with bench test and instrumentation calibration facilities (instrumentation maintenance).

Budgets

Below are the details of the approved budgets for the FY 2025-26.

Department	Budget, INR million
Mechanical	889.7
Instrumentation	145.8
Electrical	132.6

The maintenance teams have reported that there are no concerns with respect to budget in maintenance activities.

Philosophy

Maintenance department follows a mix of preventive and predictive maintenance-based philosophy. The site has performed a critical analysis base on factors such as production, safety, redundancy, downtime, etc. It was noted that around 20% of the equipments are marked as category A (critical) and rest 80% are divided into two categories B and C. Based on the critical analysis Preventive Maintenance (PM) and Condition Monitoring schedules are fixed.

It was noted that the site uses SAP based Computerised Maintenance Management System (CMMS) for planning and orders are generated on quarterly, half yearly and annual basis. The equipments categories A, B and C are also marked on SAP.

The condition monitoring schedules are as below:

- A category: weekly.
- B Category: fortnightly.
- C Category: once in two months.

Deviation forms are raised for managing deferrals, which are signed by Operations and Maintenance department and approved by CGM (O&P); these are reviewed on monthly basis. The deferral forms include due date of maintenance, new proposed date of maintenance, type of deviation (Operational or Maintenance) and reason for deviation. During the 2026 discussions it was noted that the risk assessments are not being attached with deviation forms. Post survey, site shared deviation approval form for Refrigeration Compressor LOP. It was noted that the form as details such as due date, proposed new due date and any maintenance activity last done

along with reasons for deviation. The deviation was approved by GM – HOD (LLDPE-Process). See previous [Risk Improvement Recommendation 2024.04](#) for more details on the topic.

BCPL follows Breakdown analysis report for analysis of Breakdown maintenance of equipment. One sample report was reviewed (LLDPE Pellet Classifier 117-GN-849). It was noted that the report has details of breakdown, analysis and probable reasons for breakdown along with remedial measures and suggestions.

The site has Annual Maintenance Contracts (AMC) with OEMs. There are total 61+ AMC contracts currently in place across all three maintenance departments.

The site follows an obsolesce plan based on Operations and Management (O&M) guidelines and OEM recommendations. During the 2026 survey discussions, it was reported that Windows has been

updated on most of the DCS computers Human Machine Interface (HMI) and DCS is 80% up to date. It was reported that Off sites and GSU DCS upgradation is pending and expected to be completed by June 2026.

The bad actors list is being maintained at unit level, and it was informed that the same are being tracked on SAP too.

Planning

BCPL informed that a turnaround for the Lepetkata complex was taken in 2023 and the next one is planned in 2028. It was reported that the site tries to align the turnaround cycles with overhauling of compressors (TRC and CGC) as these are major and critical single line equipments. It was noted that most of the critical compressors overhauling was done in 2023.

Electrical Maintenance

Components	Frequency	Type of inspection	Comment
Switchgear	Monthly Yearly	Thermography Maintenance and Simulation test	HT Breaker feeder modules and ACB feeder modules.
Circuit Breakers	Monthly 5 yearly 5 yearly or Turnaround	Thermography Capital overhauling Major Overhauling	For 132 KV breakers LT and HT circuit breakers
Motors	Yearly 3 Yearly	Maintenance RLA of HT motors	Both HT and LT motors Remaining Life Assessment (RLA)
Emergency Diesel Generators (EDG)	2 yearly Fortnightly Turnaround	PM check "No Load" test Load test	Also, regular maintenance is performed by OEM, Cummins. During 2026 survey discussions, it was noted that EDG "No Load" testing is done every fortnightly for 15 minutes and Load testing is done during turnaround. See Risk Improvement Recommendation 26.01 for more details of this topic.
Transformers	Half yearly Yearly Yearly (> 2.0 MVA) 2 yearly (< 2.0 MVA) 5 yearly	BDV, moisture Maintenance DGA General Oil testing Tan Delta test	Furan analysis is done on risk based. Both HT and LT Conducted in BCPL lab with few parameters being tested by third party lab.
Switchyard	Yearly	Maintenance & checking RLA	

	5 yearly		
Earthing	Six monthly	Testing & Maintenance of Continuity	
UPS	Yearly	Maintenance and checking along with OEM testing	Battery voltage and physical check is done on monthly basis.
Battery Banks	Monthly	Checking & maintenance	Including monitoring of cell parameters.
	Yearly / 2 yearly	Capacity test	Lead Acid batteries once in two years. Ni-Cd batteries yearly.
Cathodic Protection	Quarterly	Measurement	Done by third party agency
Cables	Half yearly	Physical Inspection and Thermography	Physical inspection of cables, cable trays and thermography of HT/LT cable joints.

Mechanical Maintenance

Components	Frequency	Type of inspection	Comment
Gas Turbines (GTG)	12,000 hours	Combustor Inspection	Including boroscopic inspection. GT-1 CIBI was done in 2025.
	48,000 hours	Major Inspection	GT-2 MI was done in 2024.
Compressors	16,000	Minor	CGC and TRC.
	48,000	Major	
Steam Turbines	Yearly / Turnaround	Maintenance, checking and testing	
Lube oil	Half yearly	WDA, NAS, Moisture and TAN	Samples sent to third party agencies
All rotating equipment	Weekly (Category A), Fortnightly (Category B), two monthly (Category C).	Vibration monitoring	Using handheld vibration measurement devices. Performed by third party agencies who analyse the results and submit the recommendations to BCPL for taking corrective actions.

Pump change over schedule is maintained with the Operations department for regular changeover of running equipment. The mechanical maintenance department has reported no issues with the major single line rotary machines.

Instrumentation Maintenance

Components	Frequency	Type of inspection	Comment
Trip systems	Trip systems	Turnaround	Full loop test. Executed as part of PSSR. ECU furnace interlock testing is done every six months.
Alarm loops	Yearly (All other units except ECU)	PM	Risk Based PM is followed in ECU. Interlock and complex loop tags (Critical): yearly Standalone tags (non-critical): Two yearly
Smoke detectors	See Emergency Response , later		
Flame detectors	See Emergency Response , later		
Gas detectors	See Emergency Response , later		

Civil

During 2026 survey it was noted that few equipments in ECU such as Ethylene Reflux drum and other nearby columns needs to be labelled. It is suggested to identify equipments in all the process units where the labelling/stencilling is required and carry out fresh labelling to help in clear identification of process equipments. Therefore, previous observation 22.01 on this topic has been marked in progress.

Client Comments: INSERT RESPONSE HERE

Contractors

Contractors are screened based on previous work experience in oil and gas facilities, work practices and HSE metrics along with the cost metrics.

All contractor staff is trained by Fire & Safety department on half day safety training before allowing to work at the site.

Documentation and Records

Maintenance records are held in both paper and digital format.

Spares

Total spares, including operational spares, capital spares and insurance spares are listed and tracked individually by the relevant maintenance functions. The maintenance functions have reported that they have not faced any issues with availability of spares.

Spare rotors are provided for major rotating equipment, such as Cracked Gas Compressor (CGC), Tertiary Refrigerant Compressor (TRC) and Recycle Gas Compressors. The larger rotors are stored vertically, under nitrogen atmosphere, whereas small rotors such as HDPE/LLDPE extruder rotor is kept horizontally, as per OEM guidelines, on relevant supports. The machines are kept in the central warehouse, which is more than 1.0 km from the nearest process units, and a three-monthly PM plan is in place for regular checking and rotation of the rotors. Other spares include dry gas seals, mechanical seals for pumps and bearings along with the associated shaft cartridges. Spare cracking furnace tubes are also stocked in the warehouse.

The electrical maintenance team has created PM plans for preservation of spare motors.

Inspection Organisation

The current departmental strength is four including one Deputy General Manager (DGM), two Senior Managers and one Senior Engineer. The inspection department is headed by DGM and reports to GM (HOD) – Maintenance, who further reports to the COO. Therefore, the site is yet to separate the reporting of Inspection team from Maintenance. This was the subject of one of the previous [Risk Improvement Recommendation 20.04](#) which remains in progress. The department at Lepetkata is also responsible for inspection of Lakwa and Duliajan plants.

The BCPL inspection staffs are supported by contract manpower (approx. seven to eight staff), and support staff from BCPL contract manpower (five staff). The inspection agencies hired by BCPL are:

- Edlipse Corporation: Used for NDT.
- Industrial Quality Engineering: Radiography and stress relieving.
- Santhala Power: Thermography.
- Assam Factory Rule compliance engineer.

There is a two-year based contract in place with each agency.

Experience and Training

BCPL inspection staffs are Mechanical engineers by background, with experience level of 10 – 14 years in industry, however not solely in inspection function.

Inspection staff is trained in NDT Level 2 and MT & PT Level 2. Training and certification in API-510, API-570, etc. has not been provided. Therefore, the previous [Risk Improvement Recommendation 20.04](#) remains in progress.

Performance

Monthly performance report is published by the inspection function, where major jobs planned for the month vs. completed jobs and other highlights are

presented to the management. The team reports below KPIs to the management:

- Plant equipment availability.
- Budget utilization.
- Planning vs Execution.
- Documentation and reporting
- Statutory and audit Compliance.

A recommendation has been made to expand the KPIs to measure the Inspection performance. This will maintain uniformity in measurement at each unit level and also help in reviewing the performance as per set targets. See previous [Risk Improvement Recommendation 22.04](#) for further details.

There were no inspection overdues at the time of the 2026 survey.

Philosophy

The plant currently follows a mix of time based and statutory requirement driven inspection programme.

BCPL conducts statutory inspections of all storage vessels in accordance with PESO guidelines and SMPV rules. All pressure vessels undergo inspection as per Section 31 of the Assam Factories Act. Internal inspections of furnaces are performed following OISD-133 guidelines, while storage tank inspections at the site adhere to OISD-129 guidelines. For thickness inspections of process pipelines, the site complies with OISD-130 guidelines.

During 2026 survey discussions it was noted that the 100% collection of baseline inspection data for pipelines and vessels has been completed (total 803

equipments). Corrosion mechanisms and corrosion loops are yet to be identified for the site. Dead legs and small-bore piping are inspected during regular piping inspections. However, a separate list identifying these dead legs and small-bore pipes has not yet been compiled. See previous [Risk Improvement Recommendation 22.05](#) on this topic for more details. The site is performing trending and corrosion rates analysis in excel sheet and the same is being tracked. The remnant and half-life analysis is yet to be calculated. See previous [Risk Improvement Recommendation 20.05](#) for more details on this topic.

During 2026 survey discussion it was noted that that there were no Inspection overdues. BCPL informed that in case of deferment, Maintenance PM deviation approval procedure can be used for deferment approvals. The risk assessments are not being attached with the deviation approval form. It is recommended to follow formal risk assessment process as part of maintenance PM deviation approval or Inspection deferral approval as per the recommendation and report the high-risk deferrals as part of PSM KPI. See previous [Risk Improvement Recommendation 2024.04](#) for more information.

The inspection department emails the inspection report and recommendations to Maintenance department for replacement of piping/painting and insulation breaks along with any other observations which require maintenance. The site has not defined any Integrity Operating Windows (IOWs).

The department generates monthly performance report, which highlights major jobs and other inspection work completed in the year.

The following table defines the frequencies that are used for inspection of the different items of equipment:

Component	Interval	Type of Inspection	Comments
Process piping	Once in 3 or 4 years	Thickness measurement	Thickness monitoring as per OISD-130. Once in 3/4 years as per class. Class-1 and 2 every three years. Class -3 (utilities) every four years.
Pressure vessels	Half yearly	External visual inspection and UT	Statutory inspection as per Assam Factories Rules Section 31.
	Five yearly	Internal	As per SMPV Rules and guidelines issued by Operations and Technical Services.

Boilers	25 Years of Service or 100,000 run hours Annual	Residual Life assessment as per IBR act 1950 Statutory IBR Inspection	Boilers/HRSG/Furnace Internal inspection of boiler, including hydrotest, UT measurement, visual checks and other NDT tests. Metallography is also done for boiler tubes.
Pressurised storage tanks	Five yearly 10 Yearly	Internal Inspection of spheres as per PESO guidelines. Internal Inspection	Horton spheres and Hydrogen bullets. This includes UT measurement, Dye Penetration Test (DPT), Magnetic Particulate Test (MPT), hydrotest and settlement checks. Pentane storage bullets.
Cracking Furnace	Four Yearly	Internal Inspection	Tube bulging, hardness tests, thickness tests and OD checks. Metallography is done on ad-hoc basis.
Atmospheric storage tanks	Five Yearly 10 Yearly	External Inspection Internal Inspection	

Piping

BCPL informed during 2026 survey that they are following OISD-130 standards for piping / pipeline thickness survey. Classification of piping is done by the respective process departments.

It was reported that 100% baseline inspection data for piping have been completed and the site has started tracking corrosion rates for the sections where at least two data points are available. Any piping loops, where reduced thickness is observed, undergoes three monthly inspections. These are highlighted in the paper records and permanent repair is carried out. The Thickness Measurement Locations (TML) are marked on isometrics and also in field. Inspection windows are being created in insulated piping, where it is not provided in design.

Pressure Vessels

Post Internal and External inspection “fit for use” certificate is issued by competent person, and the site has reported that all the vessels have “fit for use” certificates.

The inspection team has reported that internal inspection of all equipments has been completed as of March 2026.

It was reported that the measured thickness of the GSU unit's Regeneration column (11-CC-102) was

found to be below the expected value and will be closely monitored for any further reduction at the next thickness survey.

Boilers / Heaters

The inspection requires shutdown and The IBR inspection can be extended based on running condition and assessment by the external boiler inspector. As of the 2026 survey, neither the HRSG nor the Utility boiler has reached 25 years of service or 100,000 running hours.

The decision to change the tubes of Cracking furnace is based on the four years' inspection results. It was reported that the Heater 1 and 2 coils were replaced in 2025 and Heater 3 and 4 coils replacement is planned in 2026 and 2027 respectively.

Thermography of cracker furnaces and boilers is conducted on a quarterly basis. It is also conducted for equipment operating at more than 200°C.

The Operations department records the Tube Metal Temperature (TMT) of all operational furnaces, in each shift, using in-house temperature guns and the readings are noted in a checklist. Furnace firing adjustment is done based on the readings. The decoking cycle of each furnace is maximum 60 days.

Pressurised Storage Tanks

The inspection parameters of spheres such as original thickness, minimum recorded thickness, corrosion allowance, and minimum calculated thickness are measured. No issues have been reported in the spheres which have been inspected till now.

Atmospheric Storage

All three naphtha tanks were internally inspected in 2021. Inspection techniques such as Acoustic Emission Test (AET) and Magnetic Flux Leakage (MFL) tests are used.

Pipelines

Yearly patrolling based visual inspection is conducted for all pipelines. Quarterly Cathodic protection checks are conducted and five yearly based CIPL survey and DCVG survey are conducted. Six yearly anode bed survey is also planned for the pipelines.

Relief Valves

Relief valves are 'pre-pop' tested on a two-yearly basis (with separate yearly frequency for welded and sphere PSVs as per SMPV rules). It was reported that if any PSVs subject to regulatory requirements are unavailable for testing, the site may perform a Trevi test on those PSVs when a shutdown or turnaround is not scheduled in the foreseeable future.

During the 2026 survey discussions, it was noted that the site conducts PSV testing which includes pre-pop tests followed by calibration by third party contractors. It was reported that currently site does not include pre-pop test details in the PSV testing certificate. Post survey, the site has shared a sample PSV test certificate. The certificate has details such as job done (internal inspection, cleaning, spare and observations) and calibration details, but the details of pre-pop test were not available. The site may refer to API 576 for guidelines on the inspection and repair of pressure relieving devices. See previous [Risk Improvement Recommendation 22.06](#) for more details on this topic. The instrumentation maintenance department are responsible for pre-pop testing and reported no issues of late popping (popping at higher pressure) due to the clean service fluids handled at the plant. The workshop team maintains centralised record of relief valve testing.

The Operations team maintains a 'live' list of all relief valves in the plant, with the last test date and next test

date also recorded in it. This helps to provide another check on the maintenance department, which is responsible for calibration of the relief valves. This is considered a good risk mitigation practice at BCPL.

Civil Structures

Not discussed during the 2026 survey.

Corrosion Under Insulation or Fireproofing (CUI / CUF)

Inspection pockets have been created in insulated piping for piping and CUI inspection. Thermography is also planned for insulated piping and equipment. PECT and digital radiography tests are used for thickness measurement.

Corrosion Under Pipe Supports (CUPS)

During 2026 survey discussions, it was noted that piping supports are identified and listed. ECU Cold Section piping supports inspection report was reviewed. There were 58 locations identified across six pumps in the section and inspection recommendations were part of the report along with pictures of the damaged piping supports. Therefore, previous [Risk Improvement Recommendation 2024.05](#) on this topic has been closed.

Positive Materials Identification (PMI)

The site has a X ray based Niton analyser, which is used for PMI of material. PMI is conducted on 100% of the alloy materials and SS materials.

Temporary Repairs

The maintenance department is responsible for installing temporary repairs on piping in the plant, the inspection department is consulted in case of any requirement, however it is not mandatory as per BCPL requirements. A specialised agency, NIICO, has been appointed for online sealing/clamping works at BCPL. BCPL reported during 2026 survey there were no temporary repairs in hydrocarbon (HC) piping and equipment which is a positive feature. However, there are one to two temporary repairs in utility service which will be attended in the next planned shutdown.

Documentation and Records

During the 2026 survey discussions, it was noted that the Inspection records are being maintained in both hard copies and soft copies (excel). Inspection work orders are being generated in SAP. And Inspection records and data migration to SAP is under progress. The site has no plans to procure Asset Integrity Management software to manage inspection records and activities. Therefore, previous [Risk Improvement Recommendation 2024.03](#) on this topic has been marked in progress.

Occupational Safety

Occupational safety at BCPL is led by the Fire & Safety team. monthly HSE meetings are conducted at the site, led by the COO (O&M). The Safety Committee meets on a quarterly basis and discusses the open action items and HSE issues. The site HSE policy is signed by the CGM (O&M) and the COO.

There is a near miss portal in *BCPL Connect*, which is used by all staff to report any near miss and incidents in the plant. Investigations are conducted by senior staff from Fire & Safety department and also involve the PSO of the concerned area. Recommendations are recorded on the *BCPL Connect* platform and tracked to completion.

The site ensures compliance of HSE rules through various means. During the 2026 survey, below points were noted.

- Speed limit boards were installed at various locations at the site.
- Usage of mobile phones except intrinsically safe ones is prohibited in the process plant areas and

display boards were installed at various locations at the site.

- Usage of PPEs is being ensured and monitored.
- Process Areas have been demarcated, and vehicles are being restricted and not allowed in process areas. It was noted that vehicles parked near Central Control Room were not fitted with spark arrestors.
- No Health and Safety Induction was provided to the survey team during entry to the plant premises.

Therefore, previous [Risk Improvement Recommendation 2024.01](#) by others has been marked in progress.

Physical Security

No undue risk exposures were highlighted with respect to Security during the 2026 survey.

Security at the plant is provided by Central Industrial Security Force (CISF), which is an independent agency under the central government and is responsible for security of all government enterprises.

The full perimeter of the plant is protected by 3 m high brick wall, topped with barbed wire. Further data is held on file by Marsh.

Cyber Security

Not discussed during the 2026 survey, however it has been reported that the DCS and PLC system is physically separated from the plant internet system.

There are multiple firewalls in place for cyber monitoring of the BCPL assets.

Section Five

Emergency Control

Emergency Response

Organisation

The Fire & Safety (F&S) department at BCPL Lepetkata plant is headed by DGM (currently vacant) with one Chief Manager (deputed from GAIL) and four Senior managers. The department consists of 14 executive staff and 34 non-executive staff. At the time of 2026 survey it was reported that the organization has three vacant positions one at DGM level and two at Senior Engineer level. The department is supported by 26 contract staff, who are used mostly for maintenance of fire-fighting equipment and vehicles.

Each eight hours shift consists of at least 13 staff dedicated for firefighting. This includes a Fire Shift-In-Charge (SIC) supported by two Driver cum Pump Operator (DCPO), two operators and four firemen along with four contractor staff. Back up is provided by maintenance team, auxiliary fire squad (consisting of CISF Security staff) and trained operations staff in each plant.

The administration building is the designated ECC (Emergency Control Centre) and is led by the COO. The support team includes Security Head, Finance Head, HR Head and Technical Head. The Central Control Room is the designate Emergency Control Room, led by CGM (O&M) and is supported by Senior Managers and Managers of technical departments. The ECC is equipped with hot line to F&S department and Central Control Room (CCR), walkie-talkie sets, important contact number list, and site plot plan.

The site fire-fighting team is initially led by plant Operations SIC, who is the Incident Controller. The responsibility is then handed over to the associated Head of Department (Operations).

Experience and Training

The fire SIC holds a bachelor's degree in Fire Engineering. The experience level of SIC ranges from

5 – 8 years. All the staff in the firefighting team experience ranges from 6 – 7 years.

Monthly live fire-fighting training is provided to staff, with the intention to cover all BCPL staff in one year. The CISF security team is also trained in fire-fighting measures. monthly training is provided to firemen on SOPs and firefighting techniques. It was noted that two department personnel participated in advance fire training (external) in January 2026.

The site has a fire training ground, adjacent to the Fire & Safety building. The ground is equipped with vessels, storage tanks and pipe racks installed for hands-on training of the staff on firefighting.

Mutual Aid

There are 12 Mutual Aid partners of BCPL, including Oil India Limited (OIL), ONGC, Coal India Limited (CIL), BVFCL and Dibrugarh Power Station.

Regular meetings are conducted between the Mutual aid partners. BCPL also maintains the resources available for firefighting and medical support at the mutual aid partners such as fire tenders (appliances), number of beds, doctors and manpower (fire crew).

Mutual aid partners respond to the site emergency during a Level 3 drill; the last such drill was conducted in 2025.

The nearest Mutual aid partner is district fire brigade team at around 17 km from the Lepetkata plant, with response time of around 25 – 30 minutes.

Emergency Plans

Based on the consequences and scope, emergency in the plant is categorised as:

- Level 1: Fire confined to within a process area; the individual plant team will control the fire.
- Level 2: Fire affecting two or more process plants; the Emergency Control Centre will be

actuated in this case, and the Head Operations will assume charge.

- Level 3: Major emergency, require external support.

BCPL has prepared a single page document for the emergency response management and control. The sheet contains all the emergency contact numbers, roles and responsibility matrix in case of Level 1, 2 & 3 emergencies and the details of incident controller. This single page document with all the relevant information is handy and can be referred easily to understand the responsibility matrix of senior management and other staffs, which is a positive feature.

An Emergency Response and Disaster Management Plan (ERDMP) has also been created for the facility, which lists hazards such as BLEVE etc. A Quantitative Risk Assessment (QRA) update study has been completed in 2019. The ERDMP has been updated based on the QRA results. It was reported that the ERDMP manual is revised every three years and last revision was done in 2024.

Pre-incident plans are used, which identify roles and responsibility of each staff.

It is positive to note that BCPL has developed an application called “BCPL Emergency Response (ER) App”. In case of any incident, this app can be used to send quick audio/visual messages to the selected contacts which include senior management staffs and other key staffs from emergency response team. BCPL also uses another mode of communication called “Exotel communication system” which is an online portal for emergency communication. This mode of communication activates voice calls simultaneously to multiple persons involving senior management team and other key staffs. The Exotel communication system is activated by Fire & Safety control room operator on the instruction of Fire and Safety Shift In-Charge.

Marsh's Position Paper on good practice in this area is available to download [here](#).

Simulations

An annual plan is in place to conduct mock drills in the plant. Minimum one mock drill is conducted per

quarter. BCPL conducts emergency mock drills as per below frequency:

- Level – 1 emergency: Quarterly.
- Level – 2 emergency: Half-yearly.
- Level – 3 emergency: Yearly.

District authority and nearby mutual aid are also involved while conducting Level 3 emergency mock drill. Post drill analysis is conducted, and drill observations/recommendations are recorded. The recommendations are updated on the *BCPL Connect* system for tracking and closure. One staff in the Fire & Safety team is dedicated for tracking the recommendations.

Drills are also conducted during silent hours (evening and nighttime).

Fire Walls and Fireproofing

All column skirts are fireproofed with concrete, including foundation bolts. The pipe racks in the ECU unit were fireproofed till 10 to 15 m height. The horizontal vessels sit on concrete saddle supports. Cracking furnaces sit on fireproofed concrete supports.

All the spheres are coated with fireproofed concrete till the top, including the support legs and outlet line from the bottom.

All ROIVs in the ECU and sphere storage area were noted to be covered with metal-based fire covers.

All transformers are located outside the substations, with full length firewall separating the transformers.

Fire and Gas Detection

Fire Detection

It was reported that there are two numbers of flame detectors installed in LLDPE extruder hall. Tag nos. of the detectors are 117-FD-4001 and 117-FD- 6101. Post survey the site has confirmed that there are four fire detectors installed in the ECU compressor house, two at the CGC compressor and two at the TRC compressor. The site has provided pictures of fire detectors present in the ECU compressor house, and the same are held on file by Marsh. Therefore, previous

[Risk Improvement Recommendation 2024.11](#) by others on this topic has been closed.

Linear heat detection cable is installed on rim seals of the floating roof naphtha tanks.

Smoke detectors are installed in all buildings, including administration building, firewater pump house, SRRs and fire and safety building. The control room is equipped with smoke detectors on the roof and also in the underfloor area.

Gas Detection

The central control room HVAC air intake system is equipped with two gas detectors, which will alarm and close the inlet dampers in case of gas detection.

Gas detection is installed at various locations in the ECU unit, including cracking furnace area and light hydrocarbon service pumps. During the 2026 survey discussions it is unclear if the compressor house in the ECU is equipped with any gas detectors. If available, request site to kindly provide the tag numbers and photographs of the gas detectors. This is the subject of previous [Risk Improvement Recommendation 20.03](#) which has been marked in progress.

Gas detection is also provided at C2+ pumping area (near the mechanical seal of each pump), individual spheres (near the valve flanges) and loading/unloading station.

Gas detectors are installed in GTG enclosures and are linked to tripping of machine.

Fire and Gas Alarms

Fire and gas alarms are transmitted to the individual unit's control room on separate screen adjacent to the

DCS consoles. It was noted that in ECU there were five faulty gas detectors in the last six months. It was not clear whether the impairment procedure was followed to address the non-availability of gas detectors. See new [Risk Improvement Recommendation 26.02](#) for more details on this topic.

Firewater System

The Lepetkata complex has a gridded, above ground network of fire water pipeline throughout the complex. Raw water is used as fire water in the complex. There are sectioning valves present in the network to isolate a specific section of fire water system. At the time of 2026 survey visit to BCPL firewater pump house, it was noted that the lock open tags / car seals were not installed on the discharge isolation valves of main firewater pumps as well as on diesel supply line isolation valve to diesel driven firewater pumps. This is also an open recommendation from the 2020 survey. There for previous [Risk Improvement Recommendation 20.01](#) on this topic has been marked in progress.

Header pressure is maintained at 12.5 kg/cm² and the system is designed for a minimum residual pressure of 7.0 kg/cm² at the remotest point of the site. The header pressure is monitored centrally, also pressure gauges are mounted on hydrants at various locations, including that outside the central control room, for monitoring by the plant team.

There are two firewater reservoirs of total capacity 36,000 m³. The firewater reservoir is fed from the Raw water intake.

The following table provides details about the fire water pumps and system capability:

Description	Location	Drive	Capacity		Comments / Pump starting mechanism
			Vol (m3/h)	Press (barg)	
Jockey (x3)	Fire water pump house	Electricity	125	11	One pump was in manual and running. Rest of the two pumps were in auto.
Main pumps (x4)	Fire water pump house	Diesel	1,000	11	Auto start: Pumps A/B auto starts at 11.5 kg/cm ² and C/D auto starts at 11 kg/cm ²

Main pumps (x4)	Fire water pump house	Electricity	1,000	11	Auto start: Pumps A/D auto starts at 10.5 kg/cm ² and B/C auto starts at 10.0 kg/cm ²
Site maximum demand			4,834	m ³ /h	Simultaneous fire in ECU and HDPE/LLDPE plant (Indian regulation-OISD 116, requires fire water system to be designed based on two simultaneous fires)

BCPL has eight main firewater pumps including four electric and four diesel driven pumps. The availability of equal number of electric and diesel driven pumps at Lepetkata plant is a positive feature.

There is a separate record register maintained for each main firewater pump. The operator stationed in firewater pump house records parameters such as diesel tank level, amperes of electric pump, etc. every shift.

During 2026 survey visit, it was noted that the local panel of diesel driven firewater pumps had fault alarms activated. The local panel had active alarms of low-low lube oil pressure, engine run status. Electronic level gauges installed on all four diesel tanks to monitor the diesel level. At the time of the 2026 survey all the level gauges were reading greater than 70%.

It was reported that to meet the maximum firewater demand, the site operates firewater pumps in both manual and automatic modes. According to the Emergency Response and Disaster Management Plan (ERDMP), a total of five main firewater pumps should be maintained in automatic (working) mode, with an additional three in manual (standby) mode, to achieve the maximum firewater demand of 5,000 m³/hr. Additionally, two jockey firewater pumps should be in automatic mode and one in manual mode. However, during the site visit to the firewater pump house, it was observed that only four firewater pumps (two diesel and two electric) were in automatic mode, which is below the minimum requirement of five pumps in automatic mode. It is suggested to ensure that the minimum required number of firewater pumps are maintained in automatic mode. It was noted that BCPL firewater pump house is manned by one operator round the clock, who can communicate with the Operations and Fire & Safety teams using telephone and walkie-talkie system. During previous this has been raised as on

observation 22.02. This has been marked as in progress.

Client Comments: INSERT RESPONSE HERE

Fixed Protection Process Equipment

Manually activated sprinkler protection is provided to all major columns, including the tallest de-propaniser and de-ethaniser columns till the top. The associated reflux pumps and bottom pumps are also provided with manual sprinkler system. However, fixed fire water protection is not provided for critical compressors and associated lube oil skids. This is subject of previous [Risk Improvement Recommendation 20.03](#) which remains in progress.

Major transformers are also equipped with manually activated sprinkler firewater system and deluge with High Velocity Water Spray System (HVWS).

223 Monitors, 783 hydrants and 12 Long range monitors are spread throughout the plant and at the individual unit perimeter.

Gas Turbines (GT) 01 and 02 are installed with CO₂ flooding system.

Buildings

Automatic Argonite based flooding protection system is installed at the Central Control Room (CCR), Utilities Control Room, SRR 1,2, and 3. The system is maintained in manual as the manned locations/buildings are required to be maintained in manual. Inergen flooding system is installed in CPP control room. Novec flooding system is installed in data centre located in Admin building.

Other buildings, including Fire & Safety office, workshops and administration building, are equipped with fire water risers and hydrants to the top floor. Handheld extinguishers are also installed at these buildings.

Dry chemical application system is installed in TEAL storage area to provide protection against TEAL fire.

Storage

Semi fixed foam system is installed on naphtha tanks. Foam pourers are provided near Hydrogenated Pygas (HPG), Raw Pygas (RPG), Wash Oil and slop tanks. Cooling rings are also provided on the tanks for cooling the tank in case of fire in adjacent tank. The area is provided with fire hydrants and monitors to facilitate firefighting.

The fireproofed spheres are each provided with fire water rings at different elevations, covering the full sphere, and connected to two fire water supply

headers. Medium Velocity Water Spray (MVWS) system along with deluge valves are installed on spheres.

During 2026 survey, it was noted that the surrounding vegetation has been cleared and pathways have been cleared. New access pathways / pipeline crossover bridges have been constructed to provided unrestricted access. This was the subject of previous [Risk Improvement Recommendation 2024.10](#) which has been marked closed.

The product warehouse is equipped with fire water sprinklers and around 164 DCP extinguishers.

Import / Export Facilities

Fire water deluge is installed at the unloading gantries. Further back up is provided by fire water monitors and hydrants.

Mobile Equipment

The following fire appliances are available on site:

Truck	Year	Firefighting media		
		Water	Foam Concentrate	Powder
Multipurpose Foam Tender-01		4,000 l	2,000 l	1,000 kg
Multipurpose Foam Tender-02		4,000 l	2,000 l	1,000 kg
Foam Nurser-01	-		10,000 l	-
Foam Nurser-02	-		10,000 l	-

- One Emergency Rescue vehicle is available at site.

The site maintains stock of 3% AFFF foam at the Lepetkata plant. This stock is used regularly during 'live fire' trainings, and no issues have been reported in the foam stock.

Testing

BCPL conducts start test of main firewater pumps twice every week. Each diesel driven firewater pump is run for 30 minutes, and each electricity driven firewater pump is run for 10 minutes. There is a separate record register maintained for each main firewater pump. The operator stationed in firewater pump house records parameters such as diesel tank level, amperes of electric pump, etc. every shift.

The following table demonstrates the current programme of testing for emergency equipment:

Equipment	Test Frequency	Comments
Site Electric and Diesel Fire water pumps (start test)	Two times per week	Diesel engines run for 30 minutes and electrical pumps for 10 minutes.
Site fire water pumps performance test	Annually	Not fully in line with NFPA 25. This is subject of previous Risk Improvement Recommendation 2024.07 .
Flammable Gas Detectors	Half yearly	Calibration and PM. Site targets to perform thrice in a year.
Smoke Detectors	Half yearly	Calibration and PM. Site targets to perform thrice in a year.
Fire Extinguishers	Monthly Quarterly	Visual inspection Maintenance
Site alarm system	Weekly	Test of siren
Fire Detectors	Half yearly	Calibration and PM. Site targets to perform thrice in a year.
Manual Call Points	Quarterly	Check and test
Argonite system (Control Rooms and SRRs)	Half yearly	Testing SOVs (virtual activation testing or logic testing), with isolation valves provided to prevent release of inventory.

Section Six

Insurance Values

Property

The values that follow have been provided by BCPL for Lepetkata plant for 2025-26 policy period and are based on a valuation that was carried out by Protocol International Loss Adjusters (report dated 27 January 2022). These values are assumed as of 01 July 2025. The values have not been verified by Marsh.

Property, plant and equipment	INR 107,738 million	USD 1,184 million
Machinery	INR 97,301 million	USD 1,069 million
Pipeline (outside plant)	INR 13,065 million	USD 144 million

Notes:

1. Rate of Exchange USD/INR = 91 has been assumed.

For the purposes of further evaluation, the following distribution of value has been assumed by Marsh. This is based on extrapolating values based on 2022 valuation report. For few items mention in the below table, the values are as per Marsh estimates:

Plant ID ¹	Plant name	Plant category	Plant value ² (INR million)	Comments
1	ECU	Process Plant	24,283	
2	HDPE-LLDPE	Process Plant	12,242	
3	PP	Process Plant	5,504	
4	GSU-C2+	Process Plant	7,692	
5	Steam and Power	Process Plant	24,168	
6	Utilities	Process Plant	5,593	Marsh estimate
7	Central Control Room	Blast Resistant Building	3,107	Marsh estimate
8	Other Infra	Process Plant	100	Marsh estimate
9	SRRs	Blast Resistant Building	2,486	Marsh estimate
10	Other buildings	Buildings and Cooling Towers	3,729	Marsh estimate
11	Offsite storage	Tankage	18,328	
		Total	107,231	

Note:

1. The numbers relate to areas on the diagram shown later in the [Loss Estimates](#) section.

Machinery Breakdown

No specific machine values were given, and Marsh estimates have been used for the Estimated Maximum Loss assessment.

Business Interruption

The current insurance policy Business Interruption Indemnity period is 12 months, with a total Business Interruption Sum Insured of INR 6,500 million.

Liability

No values have been declared for liability.

Policy Limits

The limit of Underwriters' liability in excess of the underlying retention at the time of the 2026 survey is as shown below:

Policy Limit	Value (INR million)
Basis of Indemnity	All property – Reinstatement value basis
Schedule of sub limits:	
Public authorities clause (each and every loss)	50
Firefighting expenses (each and every loss)	50
Property not in insured's premise (any one location, each and every loss)	50
Leakage and Overflow (each and every loss)	500
Contamination and co-mingling of stocks (each and every loss)	200
Catalyst and consumable (including lining and refractory) whilst in process (each and every loss)	500
Riot, Strike, malicious damage including civil commotion (each and every loss)	Actual
Spontaneous combustion clause (each and every loss)	500
Expediting expenses (each and every loss)	100
Immediate repairs (each and every loss)	50
Minor works (anyone project & in aggregate)	50
Inadvertent omission (each and every loss & in aggregate)	50
Architect's surveyors and consulting engineer's fee (each and every loss)	50
Temporary removal of property (each and every loss)	500
Expenses towards loss prevention/minimisation (each and every loss)	250
Deliberate damage (each and every loss)	100
Shutdown/start-up expenses (each and every loss & in aggregate)	500
Plans, documents and computer records (each and every loss)	50
Removal of debris and demolition including clean up expenses (each and every loss excluding foreign debris)	100
AICOW	50
Customers, suppliers and utilities extension (only direct and first tier customers and suppliers)	Named: 20% of Limit of Indemnity (BI sum insured/loss limit). Unnamed: 10% of Limit of Indemnity (BI sum insured/loss limit)

Please refer to the policy for more details on sub limits.

Section Seven

Exposures and Loss Estimates

It should be noted that Loss Estimates are intended as a guide only and are not intended to cover every possible eventuality; refer also to the Marsh [Underwriting Report Framework](#) for the technical basis of the loss estimates.

Property Damage Estimated Maximum Loss

Fire & Explosion

Explosive, highly flammable, and flammable materials handled include:

- Rich Gas.
- Lean Gas.
- Hydrogen.
- TEAL.
- C2+.
- Ethane.
- Propane.
- Ethylene.
- Propylene.
- Pentane.
- Pygas.
- Naphtha.
- Butene-1.
- Diesel.

Inherent hazards at the facility are typical for this type of operation with fire and / or explosion potential existing in most of the units:

- There is potential for jet fires from hydrocarbon vapor or gas releases at high pressure from gas compression systems such as in the GSU process units and ECU.
- Jet fires as a result of high-pressure hydrogen releases.
- Damage from knock-on fires resulting from a major machinery breakdown incident (e.g. compressor failure).
- There are major inventories of Ethylene and Propylene in the Process Area / storage areas. Release and accumulation of these flammable hydrocarbons within confined and / or congested areas can lead to a vapour cloud explosion (VCE) if ignition were to occur.
- Spill fires from equipments or vessels for example following losses of containment from C2 splitter, C3 splitter, Demethanizer, etc.
- Vessel disintegration event from a failure of a high-pressure vessel or from an exothermic runaway reaction.
- Spill fires when loading trucks for products export.
- Boiling liquid expanding vapour explosions (BLEVEs) associated with the LPG storage spheres and the road despatch areas.
- Fires associated with atmospheric storage tanks.
- Fires following leaks from piping and pipeline distribution systems.
- Explosions within Ethylene pipelines as a result of the ARCO effect (rapid compression of the ethylene leading to temperatures above 400 °C at which point an exothermic decomposition reaction occurs which can burst the pipe – which can be initiated by opening an isolation valve too quickly).

- Fires in infrastructure buildings (for example, warehouses, control rooms, offices, substations and laboratories).

Overall, in our opinion, these are well proven technologies presenting **typical** risks for petrochemical complex operations.

Vapour Cloud Explosion (VCE)

Damaging overpressures and subsequent knock-on fires can arise from Vapour Cloud Explosions within congested and / or confined structures. An assessment of the damage resulting from such scenarios has been made using the Marsh BLAST powered by MaxLoss® (Marsh BLAST) software.

The following process areas and inventories have been identified as generating the most significant Vapour Cloud Explosion scenarios.

Source ID	Source Type	Description	Material Components		Source Parameters		Liquid Source Only	
			Name	Weight ² (%)	Temp ² (°C)	Pressure ⁴ (barg)	Inventory (kg)	Inventory ³ (m ³)
1	Liquid	Propylene Fractionator 1 Bottom	PROPANE	99.0	58.5	23.4	26,773	45.5
			PROPYLENE	1.0				
2	Liquid	Propylene Fractionator 2 Bottom	PROPANE	28.2	50.5	19.6	38,071.1	63.1
			PROPYLENE	71.8				
3	Liquid	Propylene Frac Reflux Drum	PROPANE	0.1	41.0	17.6	27,161.5	44.6
			PROPYLENE	99.9				
4	Liquid	Ethylene Fractionator Bottom	ETHANE	99.45	-11.0	18.0	23,152.9	42.4
			ETHYLENE	0.45				
			PROPANE	0.05				
			PROPYLENE	0.05				
5	Liquid	Ethylene Fractionator Reflux Drum	ETHANE	1.0	-33.0	17	20,424.2	35.9
			ETHYLENE	99.0				
6	Liquid	De-ethaniser Bottom	BUTANE	40.0	70.4	22.0	12,922.4	21.8
			ETHANE	0.01				
			PROPANE	60.0				

Notes:

- Column inventory is considered as volume in 5 m height of column and vessel inventory is considered as volume in 70% of vessel.
- Material composition and temperature were provided by BCPL.
- Inventory details were provided by BCPL post 2026 survey.
- Operating pressure have been adjusted to model liquid inventory release for VCE EML calculation in Marsh BLAST software.

These scenarios generate vapour clouds with the following parameters, for loss modelling:

Source ID	Cloud Parameters			
	Source Type	Mass in Cloud (kg)	Cloud Radius (m)	Cloud Drift (m)
1	Liquid	14,448.5	45.5	101.7
2	Liquid	19,827	49.9	109.7
3	Liquid	13,000.5	43.1	99.5
4	Liquid	8,984.7	39.4	92
5	Liquid	7,941.4	36.8	88.8
6	Liquid	7,163.9	35.9	86.5

From the above, the case that results in the largest loss is a release from the Ethylene Fractionator Reflux Drum (Marsh BLAST source number 5). For this case the relevant structure information is as follows:

Congested Area	Congestion	Confinement	Area (m ²)	Height (m)	Fraction Covered by the Cloud
4	Medium	3D	3,212.2	15	0.18
7	Medium	2D	1,114.4	25	0.99

The location of the centres of the explosions that contribute to the largest loss and the energy contribution from the individual blast sites, as calculated in Marsh BLAST is summarised in the table below:

Blast Site	Congested Areas	Blast Centre – X (m)	Blast Centre – Y (m)	Explosion Energy (J)
1	4	828.7	813.1	6.24E+10
2	7	805.1	818.1	1.98E+11

The Marsh BLAST model for this loss scenario estimates an overall flame speed of **Mf = 4.847** (as a multiple of the speed of sound). This overall flame speed is used to calculate the overpressures associated with different levels of damage. The overpressures resulting from the separate blasts are calculated based on the individual blast site's maximum flame speed as per the Baker-Strehlow-Tang (BST) method.

For this calculated flame speed, the levels of overpressure that generate levels of damage in different types of structure as modelled in the Marsh BLAST software are summarised in the table below:

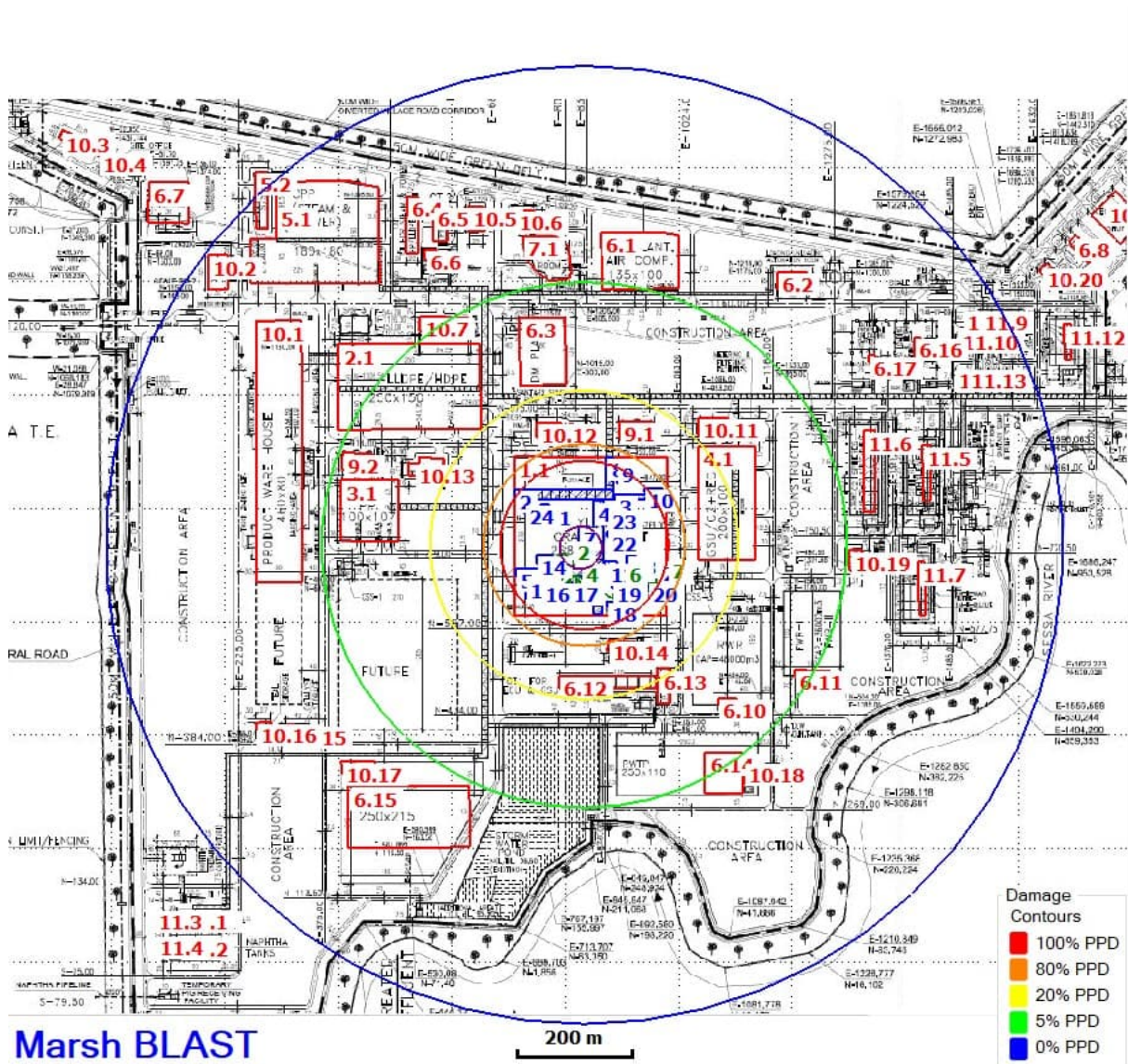
Overpressure (barg)	Process Plant Damage (%)	Heavy Machinery Damage (%)	Buildings & Cooling Towers Damage (%)	Tankage Damage (%)	Blast Resistant Damage (%)
0.042	0	0	50	0	0
0.085	5	0	100	50	0
0.160	20	0	100	100	0
0.269	80	40	100	100	20
0.336	100	80	100	100	100

Process Plant Damage percentage contours for this case are shown overleaf:

This case results in the following damage estimates:

Plant ID	Plant Name	Process Plant Damage Zone (%)					Plant Damage (INR Million)
		0	5	20	80	100	
1	ECU	-	-	150.79	2,689.05	2,0167.73	23,007.57
2	HDPE/LLDPE	-	437.98	-	-	-	437.98
3	PP	-	275.2	-	-	-	275.2
4	GSU/C2+	-	191.46	772.56	-	-	964.02
6	Utilities	-	54.14	59.72	-	-	113.86
10	Other Buildings	752.83	213.94	32.87	0.55	-	1,000.19
Total Value		752.83	1,172.73	1,015.93	2,689.6	20,167.73	25,798.82

Therefore, the VCE loss estimate is **INR 25,798.82 million**.



Other process areas and inventories identified as possible VCE source terms have also been modelled. The most significant exposures are summarised in the following table and further detail is available upon request.

Source No	Description	Total Damage (INR million)
1	Propylene Fractionator 1 Bottom	23,729.97
2	Propylene Fractionator 2 Bottom	24,603.10
3	Propylene Fractionator reflux drum	23,879.55
4	Ethylene Fractionator Bottom	23,077.69
6	De-ethaniser Bottom	10,478.78

Alternative Loss Scenarios

Alternative scenarios including Jet Fire, Vessel Disintegration, Spill Fire, Tank Fire and Natural Perils were also considered. The maximum loss from one of these scenarios would be unlikely to exceed that of a Vapour Cloud Explosion.

Conclusion

Based on the above, the worst case is the Vapour Cloud Explosion scenario.

We propose a 60-month inflation allowance based on:

- An event occurring on the last day of the next insurance period i.e. 30 June 2027.
- 36 months rebuild period.
- Values based on 01 July 2025.

The assumed annual rate of inflation is 4%, which gives a total inflation cost of INR 5,589.40 million.

The following additional costs are also assumed:

	% of Plant Damage	Additional Cost (INR million)	Comments
Debris Removal	6	1,547.93	UW exposure is capped at INR 100 million based on debris removal sub limit.
Studies	1.5	386.98	
Emergency Response	2	515.98	UW exposure is capped at INR 50 million based on Firefighting expenses.
Inventory / Catalyst Loss	1	257.99	
Start-up Cost	4	1,031.95	UW exposure is capped at INR 500 million based on start-up expenses sub limit
Total Other Costs	14.5	3,740.83	

The total loss value calculation is thus built up as follows:

	Value (INR million)
Plant Damage	25,798.82
Inflation Cost	5,589.39
Other Costs	3,740.83
Total Loss Value	35,129.03

Therefore, the suggested 'ground up' **Property Damage Estimated Maximum Loss is INR 35,000 million** (to two significant figures). This is equivalent to USD 380 million at conversion rate of USD/INR = 91.

UW's exposure is capped by sub limit on debris removal, firefighting expenses and start-up costs at **INR 33,000 million** (to two significant figures). This is equivalent to USD 360 million at conversion rate of USD/INR = 91.

Machinery Breakdown Estimated Maximum Loss

The following exposures to high value or critical items are considered:

Rotating Machinery

Key items of rotating equipment as follows:

Unit	Item	Estimated Value (INR million) ^{1,2}	Comments
ECU	Charge Gas Compressor	1,354	14.88 MW machine
ECU	Tertiary Refrigerant Compressor	1,547	17 MW machine
GSU	Lean gas Compressor	1,365	15 MW machine
Power plant	GTG (x2)	2,047.5 each	22.5 MW machine
Power Plant	STG	190	14 MW machine
PP- extruder	-	-	-
HDPE/LLDPE	Extruder	728	8.0 MW

Notes:

1. Based on Marsh assumption.
2. Exchange rate USD/INR = 91.

Steam Generators

Key items are as follows:

Unit	Item	Estimated Value (INR million)	Comments
Utility boilers (x2)	Boiler	1,560	240 TPH Boiler

Furnaces / Waste Heat Boilers

Key items are as follows:

Unit	Item	Estimated Value (INR million) ¹	Comments
ECU	Cracking furnaces		
Utility	HRSB		

Fixed Equipment Items of High Value

Items that have been identified include the following:

Unit	Item	Estimated Value (USD million)	Comments
ECU	Cold Box		Long delivery times
Utilities	Flare stack		

Catalysts

The following units have been identified containing catalysts of high value.

Unit	Item	Estimated Value (INR million)	Comments
ECU	Acetylene Hydrogenation		

Conclusion

In the absence of information on value of individual items, we would suggest a catastrophic failure of one GTG at the power plant would be the maximum loss event and assess the Machinery Breakdown 'ground up' Estimated Maximum Loss at **INR 2,000 million** (to two significant figures). This is equivalent to USD 22 million at conversion rate of USD/INR = 91.

Business Interruption Estimated Maximum Loss

In this section of the report the potential for Business Interruption following a Property Damage and Machinery Breakdown insured peril related loss incident is considered. The analysis considers losses in the following areas, with reference to the site [Process Flow Diagram](#):

Loss at a Supplier

The following loss scenarios for feedstocks and raw materials are considered:

Material	Supplier	Mode of supply	Loss scenario	Unmitigated loss ¹	Mitigations	Mitigated loss
Naphtha	Indian refineries	Rail	VCE at NRL	40% of BI loss for 24 months period	Multiple suppliers of naphtha.	Increased cost of working

Material	Supplier	Mode of supply	Loss scenario	Unmitigated loss ¹	Mitigations	Mitigated loss
C2+	Lakwa Plant (fed by gas supplied from ONGC)	Pipeline	Fire at ONGC plant	10% BI loss for 18 months period.	Naphtha + Rich gas from Duliajan can help run the plant at lower capacity	10% BI loss for 18 months period = INR 6,500 million x 0.1 x 18/12 = INR 975 million
Rich gas	Duliajan plant (fed by gas supplied from OIL)	Pipeline	Fire at OIL plant	100% of BI loss for 12 months	None. Naphtha + C2+ (Lakwa) can help run the plant at lower capacity; however, fuel gas will be a constraint for the complex operations.	100% of BI loss for 12 months = INR 6,500 million x 12/12 = INR 6,500 million

Note:

1. Based on Marsh assumption.

Hence, the “ground up” **Suppliers Extension Business Interruption Client exposure is INR 6,500 million** (to two significant figures) for a period of 12 months.

The Underwriter's exposure resulting from a total loss of rich gas from Duliajan feedstock as a consequence of a catastrophic event at the OIL Duliajan site would give a 'ground up' **Suppliers' Extension Business Interruption Estimated Maximum Loss of INR 1,300 million** (to two significant figures) due to limit on Customers, suppliers and utilities extension (only named). This is equivalent to USD 14 million (based on conversion rate of USD/INR = 91).

Loss at a Customer

The polymer products are sent out to multiple parties throughout the country. There is an open market available for selling the polymer products, hence BI loss, due to loss at customer is considered low. The HPG (Hydrogenated Pyrolysis Gasoline) is also dispatched to the plants of three oil marketing companies, hence BI loss potential is considered low.

Loss of Import / Export Facilities

The key logistics facilities associated with the site are presented in the [Process Flow Diagram](#) in [The Risk](#), earlier in this report. Further details are also held on file.

The following loss scenarios for Import / Export Facilities are considered:

Facility	Material	Loss scenario	Unmitigated loss	Mitigations	Mitigated loss
Rail unloading	Naphtha	Fire at unloading facility	40% of BI loss for 12 months period	None	40% of BI loss for 12 months period = INR 6,500 million x 0.4 x 12/12 = INR 2,600 million.
Importing pipeline	Naphtha	Pipeline damage	40% of BI loss for two months period	None	40% of BI loss for two months period.
Import pipeline	C2+	Pipeline damage	20% of BI loss for two months period	None	20% of BI loss for two months period.
Import pipeline	Rich gas	Pipeline damage	100% of BI loss for two months period	None	100% of BI loss for two months period.
Export pipeline	Lean gas	Pipeline damage	100% of BI loss for two months period	None	100% of BI loss for two months period.

Loss of Process Units

The following table sets out a number of potential Loss of Process Unit scenarios:

Plant area	Loss scenario	Unmitigated loss	Mitigations	Mitigated loss
ECU	VCE in ECU resulting in plant shutdown for 36 months	100% of BI loss for 36 months	None	100% of BI loss for 36 months. See below for further analysis of this case.
PP	Fire in PP Unit, resulting in plant shutdown for 18 months.	100% of BI loss for 18 months	Polymer grade propylene can be sold in open market; however, it will take around three months to convert the unloading facility to loading facility. Also, the facility will not be able to handle full capacity, hence assuming plant operates at 50% capacity during this time.	100% BI loss for three months followed by 60% BI loss for remaining 15 months.
HDPE/LLDPE	Fire in HDPE plant, resulting in plant shutdown for 18 months.	100% BI loss for 18 months.	None	100% BI loss for 18 months.

Plant area	Loss scenario	Unmitigated loss	Mitigations	Mitigated loss
GSU	VCE in GSU, resulting in plant shutdown for 18 months.	100% BI loss for 18 months.	None. Fuel gas for the complex is supplied by the Lean gas sent back to OIL; hence the complex cannot run in absence of GSU	100% BI loss for 18 months.

The most significant Business Interruption exposure is considered to be a VCE in ECU unit; refer to the annotated physical damage drawing under [Property Damage Estimated Maximum Loss](#).

For this loss, the following rebuild times are suggested for the facilities at the Lepetkata site, intended only as a guide:

Plant / Area	Assumptions	Interruption Period (months)
ECU	Plant significantly damaged	36
GSU	Some damage at one end	6
ECU-Cooling Tower	Significantly damaged	9

Note:

1. Refer to the Marsh [Underwriting Report Framework](#) for the basis of damage levels suggested above.

Given the rebuild periods estimated above as well as values taken from the [Insurance Values](#) section, the following phases and loss estimates have been identified during a possible restart programme for the Lepetkata site:

Phase (months)	Description	Estimated Loss for the Phase (INR million)
1 – 3	Whole site shutdown for initial investigation and debris removal =INR 6,500 million x 3/12	1,625
4 – 18	Whole site shutdown for ECU and GSU repairs =INR 6,500 million x 15/12	8,125
19 – 36	Whole site shutdown for ECU repair =INR 6,500 million x 18/12	9,750
Total		19,500

Note:

1. This calculation is based on values received for 2025-26 policy period and has not been adjusted for inflation and growth.

Hence, the **Physical Damage ‘ground up’ Business Interruption Estimated Maximum Loss for the client is INR 20,000 million** (to two significant figures). This is equivalent to USD 220 million at conversion rate of USD/INR = 91.

The **Physical Damage ‘ground up’ Business Interruption Estimated Maximum Loss for Underwriter is INR 6,500 million** (to two significant figures) is capped by indemnity period 12 months. This is equivalent to USD 71 million at conversion rate of USD/INR = 91.

Loss of Key Machinery

The site has a number of critical equipment items, which in the event of failure, could lead to shutdown of a processing unit. The following items could suffer a Machinery Breakdown event:

Plant area	Machine	Unmitigated loss	Mitigations	Mitigated loss
Power Generation	GTG	50% of BI for 18 months	The other GTG can be run on full load, additional steam for STG will be supplied by auxiliary boiler and firing in HRSG, with the rest power be imported from grid.	Increased cost of working
ECU	Cracked gas compressor	100% of BI loss for 18 months	None	100% of BI loss for 18 months = INR 6,500 million x 18/12 = INR 9,750 million.

Therefore, the **Machinery Breakdown ‘ground up’ Business Interruption Estimated Maximum Loss for the client is INR 9,800 million** (to two significant figures). This is equivalent to USD 110 million (at conversion rate of USD/INR = 91).

The Machinery Breakdown ‘ground up’ Business Interruption Estimated Maximum Loss for Underwriter is **INR 6,500 million** (to two significant figures) is capped by indemnity period 12 months. This is equivalent to USD 71 million at conversion rate of USD/INR = 91.

The MB – BI EML case and the MB EML case are originating from different loss scenarios.

Loss of Storage Facilities

The following table sets out a number of potential loss scenarios:

Storage	Loss scenario	Unmitigated loss	Mitigations	Mitigated loss
Naphtha	Tank fire / mechanical failure	There are three naphtha tanks at Lepetkata complex, hence loss of one tank will decrease the redundancy margin, however, not affect the company BI number.	Multiple naphtha tanks	None
C2+	Tank fire / mechanical failure	Multiple C2+ tanks at site	Multiple C2+ tanks at site	None
Intermediates, ethylene/propylene	Tank fire / mechanical failure	Multiple C2+ tanks at site	Multiple C2+ tanks at site	None

Loss of Utilities

The following table sets out a number of potential loss scenarios:

Utility	Loss scenario	Unmitigated loss	Mitigations	Mitigated loss
Steam	Loss of an individual site boiler	There are N+1 steam boilers and Business Interruption potential is considered low	-	-
Electricity	Failure of power supply from grid	10% of BI loss for three months	Available power generation at the site is sufficient to run the plant	None
Electricity	Failure of site gas turbine generator	50% of BI loss for 18 months	The other GTG can be run on full load, additional steam for STG will be supplied by auxiliary boiler and firing in HRSG, with the rest power be imported from grid.	Increased cost of working
Water	Failure of feed pipeline from water pumping station	100% of BI loss for one month	Plant reservoir can provide back up	None
Fuel	Loss of lean gas pipeline	100% of BI loss for two months period.	None	100% of BI loss for two months period = $\text{INR } 6,500 \times 2/12$ $=$ $\text{INR } 1,083 \text{ million}$
Air	Loss of single air compressor	There are N+2 air compressors and Business Interruption potential is considered low		None
Nitrogen	Loss of nitrogen plant	100% of BI loss for three months period	Use of backup storage and further nitrogen cylinders can be procured from open market	None
Effluent Treatment Plant	Loss of ETP	100% BI for six months period.	Effluent can be gathered and sent to an offsite treatment facility	None
Flare	Loss of flare stack	100% BI for nine months period	None	100% BI for nine months period. $=$ $\text{INR } 6,500 \text{ million} \times 9/12 =$ $\text{INR } 4,875 \text{ million}$

Section Eight

Risk Improvement Recommendations

2026 Risk Improvement Recommendations

The following recommendations were discussed at the site wrap-up meeting with the management team on 18 March 2026 and are submitted for consideration. They are categorised according to the criteria as laid down in the Marsh [Underwriting Report Framework](#):

26.01	Improvements in EDG testing.			
Ranking	Consequence: F3	Likelihood: C	Category:	3
Observations and Issues	During 2026 survey discussions regarding Emergency Diesel Generator (EDG) testing below observations were noted: • “No Load” testing of EDG is done every fortnightly for 15 minutes. • Load testing is done during turnaround. EDGs are crucial as they provide a backup power source during power outages or emergencies, ensuring operation of critical safety and control systems. Performing “No load” test for short duration may not allow the engine to reach optimal operating temperature and may result in internals damage. Regular testing of EDGs is essential to verify their readiness and functionality, ensuring they will perform effectively when needed to protect personnel, assets, and the environment.			
Recommendation(s)	It is recommended that BCPL: • Increase the duration of “No Load” test to a minimum of 30 minutes. • Refer NFPA 110 guidelines for EDG load testing, which specify testing at 30% of the rated capacity monthly or 75% annually. The guideline helps verify that the EDG can perform safely and reliably under actual load conditions during an emergency and regular load testing as per NFPA 110 helps identify potential issues early, supporting effective maintenance and minimizing unexpected failures.			
Facility Response	Client to enter response			
Response plan	Client to enter next steps to be taken, timescale and ownership			
26.02	Develop an impairment procedure for faulty and isolated fire protection and detection equipment.			
Ranking	Consequence: F4	Likelihood: C	Category:	2
Observations and Issues	During the 2026 survey site visit, it was noted that the deluge system in LLDPE unit near Satellite Rack Room SSR-3 was in isolated condition. It was also noted that in ECU there were five faulty gas detectors in the last six months. It was not clear whether the impairment procedure was followed to address the non-availability of deluge system and gas detectors. A fire impairment procedure is a separate system to manage such cases. It requires that in case of impairment, there should be formal approval and authorization process, mitigations must be identified proactively while the protection is impaired and a dedicated system for taking back it in line. All parties including owner unit, maintenance team, fire and safety team, and senior management have key roles to play in managing fire impairment procedure.			
Recommendation(s)	It is recommended that BCPL:			

- Develop and implement a Fire Impairment Procedure to formally risk assess any item of fire protection equipment that is taken out of service for maintenance, repair or removal.
- The procedure should include the following features:
 - A clear definition of scope, in terms of equipment types to be covered (detection, protection etc.)
 - A risk assessment and interim mitigation measures. And Fire Impairment form displayed in the control room providing details of the impairment including risk assessment and interim mitigating measures.
 - Definition of authorization and review requirements.

Facility Response

Client to enter response

Response plan

Client to enter next steps to be taken, timescale and ownership

Review of Previous Recommendations

Following discussions with the site, a summary of recommendations raised during previous surveys is as follows:

Risk Improvement Recommendation		Status	Closed in (DATE)
2024.01	Ensure compliance with site HSE rules	In Progress	
2024.02	Ensure only 'As Built' P&IDs are provided within control room and other areas where P&IDs are used.	In Progress	
2024.03	Improve Inspection Documentation Management	In Progress	
2024.04	Implement Inspection Deferment Procedure	In Progress	
2024.05	Repair damaged piping supports	Completed – ITEM CLOSED	2026
2024.06	Improve management of SCE isolation valves	In Progress	
2024.07	Compare Fire Water Pump Performance results with pump design performance curve	In Progress	
2024.08	Provide continuous gas monitoring for Hot Work permit to work activities	Superseded by 22.03	2026
2024.09	Secure and Tag Process Isolation Valves used as part of maintenance activities process isolation plans in position	No Progress	
2024.10	Ensure access to all fire water monitors and hydrants	Completed – ITEM CLOSED	2026
2024.11	Provide Fire Detection in ECU Compressor House, LLDPE Extruder Hall and PP Extruder Hall	Completed – ITEM CLOSED	2026
2024.12	Hose Management Improvements	In Progress	
2024.13	Improve Management of Change close out check list	In Progress	
2024.14	Improve Fixed Fire Protection Coverage on ECU	Superseded by 20.03	2026
2024.15	Develop Business Continuity Plan	No Progress	
22.01	Improvements in incident investigation closure	In Progress	
22.02	Perform formal risk assessment (RA) while carrying out trip interlock override	In Progress	
22.03	Continuous Gas testing during hot work in plant area	No Progress	
22.04	Develop Maintenance and Inspection KPIs	In Progress	
22.05	Inspection Improvements	In Progress	

22.06	Ensure that the Pre-pop tests conducted on PSVs are clearly recorded in the test record sheets and include the test pass/fail criteria in the PSV testing procedure	No Progress	
22.07	Provide latest "As Built" P&IDs in the central control room	Superseded by 2024.02	2026
20.01	Install Lock Open/Lock Close system for management of critical valves associated with process and fire water facilities	In Progress	
20.02	Improvements in Emergency Operating Procedures (EOPs)	In Progress	
20.03	Improvements in the fixed fire protection system at the main compressors and associated lube oil skids	In Progress	
20.04	Review Inspection reporting line, resources and competency management	In Progress	
20.05	Inspection trending and analysis	In Progress	
20.06	Conduct annual performance test of fire water pumps as per NFPA 25 requirements	Superseded by 2024.07	2026

Those recommendations either closed or withdrawn during the 2026 survey are detailed below, along with those which remain either open or rejected from previous surveys. This also include the 2024 insurance survey recommendations by other agency, where recommendations were categorised as High, Medium and Low.

2024.01	Ensure compliance with site HSE rules		
Ranking		Priority	High
Observations and Issues	The following were noted: During the January 2024 site survey of the BCPL Petrochemical the following non-compliances with site health and safety rules and unsafe activities were noted. - Personal Protective Equipment was not always being worn in process plant areas, e.g. safety shoes were not always being worn. An employee was seen cycling through the LLDPE plant without wearing any PPE and should not have been cycling through a process plant area. - Vehicles were being driven well above the site's 20 km/hr speed limit. - Mobile phones were being used within process plant areas, even though signage at access gates to the process plant areas specified 'No Mobile Phones'. - Vehicles were being driven in restricted areas without spark arrestors being fitted. Road access points to restricted areas had signage showing that spark arrestors should be installed on vehicles accessing through the vehicle access points. - No Health and Safety Induction was provided to the survey team. - A person was seen riding on the side of a forklift truck within the PP/PW storage warehouse. - A small flatbed truck with no side rails was being driven very slowly along a site road with a number of fire suppression cylinders loaded on the back of the truck. The cylinders were not secured and were free to roll on the back of the truck.		
Recommendation(s)	The following are recommended: It was a significant concern to the risk engineer that so many non-compliances with health and safety rules were noted during the brief site visit. It is recommended that BCPL strictly enforce compliance with site health and safety rules. If a health and safety procedures/rules non-compliance culture is allowed to develop, then a non-compliance culture with other BCPL systems of work and procedures could also develop.		
Facility Response	- Usage of PPE is regularly being monitored and cycling inside OSBL is strictly prohibited. - Safety speed boards are installed. Awareness is being created through campaigns and trainings.		

- Usage of mobile phone except Intrinsically safe Phone is strictly prohibited at site and usage of other means of communication like PA system, Walkie talkie are ensured.
- Barricading of the Restricted Roads along with prohibited signage have re-ensured. Checking has been increased to ensure no recurrence.
- Safety Induction Video is available for visitors. Action has been taken to play the safety video at the digital displays at the entrances of the admin building, Control Room, etc.
- Training, counselling and supervision have been increased and since then such incidents have been reduced.
- The incident has been internally investigated, and removable railings have been installed in all the vehicles carrying materials.

2026 Status	In Progress
Marsh Comments	During the 2026 survey, it was noted that: • Speed limit boards were installed at various locations at the site. • Usage of mobile phones except intrinsically safe ones is prohibited in the process plant areas and display boards were installed at various locations at the site. • Usage of PPEs is being ensured and monitored. • Process Areas have been demarcated, and vehicles are being restricted and not allowed in process areas. It was noted that vehicles parked near Central Control Room were not fitted with spark arrestors. • No Health and Safety Induction was provided to the survey team during entry to the plant premises.
Client Response	Client to enter response

2024.02	Ensure only 'As Built' P&IDs are provided within control room and other areas where P&IDs are used.		
Ranking		Priority	Medium
Observations and Issues	The following were noted: • P&IDs within the control room were not 'As Built' P&IDs, they were BDEP (Basic Design Engineering Package) P&IDs. • Similarly, in the Technical Services department the hard copy of the P&IDs being used were not 'As Built' P&IDs, however the Technical Services department had access to electronic red lined marked up P&IDs. • It is understood that BCPL are still in discussion with Engineers India Ltd to provide the 'As Built' P&IDs.		
Recommendation(s)	The following are recommended: • BCPL should ensure that only the latest versions of P&IDs are used throughout the complex e.g. in the control room for planning process isolations etc, with the Technical Services department for completing engineering reviews etc. • Red Lined P&IDs should be available to all assets and old versions of P&IDs should be removed. • BCPL should be provided with 'As Built' P&IDs by EIL. • Any Engineering Changes / Management of Changes completed since the assets were constructed, which have changed the 'As Built' P&IDs should be red lined on the P&IDs, with the 'red lined' P&IDs provided to all users of P&IDs. • P&IDs should be formally reviewed on a planned frequency to ensure that the latest versions of P&IDs are being used across the complex.		
Facility Response	The updated as-built P&IDs and pen-marked P&IDs after MOCs have been shared with all the users.		
2026 Status	In Progress		

Marsh Comments	During 2026 survey it was noted the P&IDs available in control room are stamped "Controlled" and "As Built". Few P&IDs reviewed were observed to be updated with Revision-6 "Updated with HAZOP recommendations (2019)" and MoCs implemented till 2024. It was not clear whether site replaces the old P&IDs with Red lined marked P&IDs or hand drawn P&IDs with changes after a MoC is implemented.
Client Response	Client to enter response

2024.03	Improve Inspection Documentation Management		
Ranking		Priority	Medium
Observations and Issues	The following were noted during the review of BCPL inspection documentation at the time of the January 2024 survey. - BCPL have not implemented an integrated computerised Inspection Management System for scheduling, tracking and storing historical inspection data. All inspection activities are scheduled using spreadsheets, with inspection data stored on paper within ring binders. - At the time of the January 2024 survey, it was requested that BCPL provided a list of all pressure vessels which were overdue inspection. This information was not readily available and was not provided to the survey team. - From reviewing historical inspection documents the following were noted: - A ring binder contains hundreds of process piping nodes inspection records for the ECU. There does not appear to be any logical order used for the collation of the processing piping node inspection records, no index or check sheet summarising the last inspection date of each process piping node and the next scheduled date when the process piping node is scheduled inspection. - Similarly, a ring binder contains many Pressure Vessel inspection certificates, with no index or check sheet summarising the last inspection date of each pressure vessel and the next scheduled date when the pressure vessel is scheduled inspection. - Some ECU Furnace inspection data was missing.		
Recommendation(s)	The following are recommended: - From reviewing the BCPL historical inspection records, it was clear that the very import historical inspection records were being filed in a disorderly manner, with some missing inspection records. It is critical that BCPL maintain all historical process piping system, pressure vessel and storage tank inspection records in order, such that they can easily be accessed and technically reviewed. BCPL should also ensure that a database is maintained for each process piping node, pressure vessel and storage tank detailing the last inspection date, external/internal inspection frequencies and the next scheduled external/internal inspection date. - Due to the size and complexity of the BCPL Petrochemical Complex, BCPL should implement a computerised Inspection / Asset Integrity Management System for scheduling all inspection activities, recording all historical inspection records and managing deferred inspection activities. The Inspection / Asset Integrity Management System will provide clear oversight of assets due for inspection such that they can be included within planned turnaround scopes of work and clear oversight on assets which are overdue inspection. The system will minimise the potential that critical inspection activities are missed.		
Facility Response	- External Inspections are done for all the pressure vessels. - Ring binders have been updated, and indexation of ring binder is done. - The maintenance and inspection records have been computerized in MS-Excel. - With the implementation SAP S4/HANA, integration of maintenance and inspection records of vessels is being started. Conversion of manual data related		

to inspection of piping, pressure vessels, furnaces, etc., to system data will be done in phased manner.

2026 Status	In Progress
Marsh Comments	During the 2026 survey discussions, it was noted that: • Inspection records are being maintained in both hard copies and soft copies (excel). • Inspection work orders are being generated in SAP. Inspection records and data migration to SAP is under progress. • There were no inspection overdue at the time of the survey. • The site has no plans to procure Asset Integrity Management software to manage inspection records and activities.
Client Response	Client to enter response

2024.04	Implement Inspection Deferment Procedure		
Ranking		Priority	High
Observations and Issues	The following were noted • Not all pressure vessels requested for internal inspection during the 2023 major turnaround were inspected, due to process constraints not allowing internal inspections. A list of pressure vessels that were not internally inspected was not provided at the time of the meeting with the inspection department. No formalised inspection deferment procedure has been implemented by BCPL.		
Recommendation(s)	The following are recommended: • BCPL should ensure that a fully formalised, documented inspection deferral/postponement risk assessment is completed for any required inspection deferral/postponement, which should include. – Review by a multi-disciplined team of Technical Authorities – Documentation of the justification for deferring the inspection activity, e.g. historical inspection data, previous corrosion rates, fitness for service assessment, remnant life calculations. – A documented risk assessment to evaluate the potential increased risks associated with not completing the required inspection activities on time or in accordance with the defined scope of work. – The deferral process should document what mitigations and/or alternative inspection activities are to be implemented during the deferral period. These should be clearly communicated to the organisation. – Escalation of high-risk deferrals to senior management for their approval and monitor inspection deferrals as a PSM KPI. – Clear definition of the maximum duration of a deferral, the escalation/extension process and maximum allowable number of subsequent extensions that can be made. • BCPL should ensure that any required postponement/deferral of a scheduled inspection activity is completed well in advance of the scheduled inspection activity. It may be the situation where the technical inspection postponement/deferral risk assessment concludes that the scheduled inspection cannot be deferred/postponed. • BCPL should complete regular audits of Deferred/Postponed Inspection activities to ensure that the deferment is compliant with BCPL Deferment procedures.		
Facility Response	• External inspection of all pressure vessels is being carried out as per schedule under Assam Factories Act. • Internal inspection is opportunity based. Wherever the vessel cannot be handed over due to process limitations, additional tests like UT, thickness measuring, etc., are done.		

2026 Status	• In Progress
Marsh Comments	During 2026 survey discussion it was noted that: • There were no Inspection overdues at the time of the survey. • BCPL informed that in case of deferment, Maintenance PM deviation approval procedure can be used for deferment approvals. • The risk assessments are not being attached with the Deviation approval form. • Post survey, site shared deviation approval form for Refrigeration Compressor LOP. It was noted that the form as details such as due date, proposed new due date and any maintenance activity last done along with reasons for deviation. The deviation was approved by GM – HOD (LLDPE-Process). • It is recommended to follow formal risk assessment process as part of maintenance PM deviation approval or Inspection deferral approval as per the recommendation and report the high-risk deferrals as part of PSM KPI.
Client Response	Client to enter response

2024.05	Repair damaged piping supports		
Ranking		Priority	High
Observations and Issues	The following were noted • During the January 2024 visit to the Ethylene Cracker Unit, it was noted that the ECU Ethylene Fractionator Reflux Pump discharge piping system support was not anchored to the ground, as the anchor bolts had corroded away.		
Recommendation(s)	The following are recommended: • BCPL should complete a full audit of all piping supports to ensure that their mechanical integrity is not compromised. Where piping system supports are no longer fit for service, repairs should be completed. Piping supports have an engineering purpose to provide structure support for piping systems, minimising the potential for movement or vibration of the piping system. Movement / Vibration of piping systems can increase the potential for cyclic fatigue failure of the piping system or small more component installed on the piping system.		
Facility Response	Repairing of the mentioned anchor supports have been done. Survey has been conducted to identify all such points and rectification actions have been taken.		
2026 Status	Completed – ITEM CLOSED		
Marsh Comments	During 2026 survey discussions, it was noted that piping supports are identified and listed. ECU Cold Section piping supports inspection report was reviewed. There were 58 locations identified across six pumps in the section and inspection recommendations were part of the report along with pictures of the damaged piping supports.		

2024.06	Improve management of SCE isolation valves		
Ranking		Priority	High
Observations and Issues	The following were noted: • No operating routines are scheduled for confirming the position and locking/securing of safety critical equipment isolation valves, with the following examples noted: - During the site visit to the ECU, it was noted that the isolation valves installed upstream of the Emergency Depressurisation Valves 8305 and 6902 were in the open position but were not secured in position.		

	- Not all PSV isolation valves are secured in position; some PSV isolation valves have car seals installed. Noting all PSV isolation valves were in the correct position at the time of the September 2024 survey. - Fire water system isolation valves, including ring main and deluge system isolation valves, although in the correct position were not secured in position. • BCPL stated that they do car seal PSV isolation valves, however compliance with car sealing all PSV isolation valves in the correct position was not evident at the time of the September 2024 survey.
Recommendation(s)	The following are recommended: • BCPL should complete a full audit of all safety critical equipment isolation valves installed across the asset, e.g., PSV isolation valves (upstream/downstream valves), EDP Valve (upstream/downstream isolation valves) and fire water system isolation valves (ring main and deluge systems) and make a list of all safety critical equipment isolation valves (check list). The audit should include a review of P&IDs where NO (Normally Open) and NC (Normally Closed) isolation valves are detailed. • BCPL should ensure that all safety critical equipment isolation valves are secured in the correct position. • BCPL should implement operator routines to complete periodic audits of safety critical equipment isolation valves using a formalised check list, to ensure that they are maintained and secured in the correct position.
Facility Response	• "Car seal" provided and complied. • Car seal provided in all Gas Line PSV U/S & D/S Isolation valves. • LO/LC is maintained as per P&ID requirement for safety critical equipment and monitored on regular basis. • Audit done and checked.
2026 Status	In Progress
Marsh Comments	During 2026 survey site visit it was noted that: • In ECU few PSVs isolation valves were found to be in Car Sealed condition and the site has developed LO/LC register, and yearly audit is being conducted to ensure healthiness of Car seal. • Firewater deluge isolation valves, sectional isolation valves, firewater pumps discharge isolation valves are not being Car sealed.
Client Response	Client to enter response
2024.07	Compare Fire Water Pump Performance results with pump design performance curve
Ranking	Priority Medium
Observations and Issues	The following were noted: • Flow performance testing of the fire water pumps is completed twice per year as required by OISD standards. It is noted that BCPL are not plotting the actual fire water pump performance against the fire water pump design performance curve during the performance testing of the pumps. Only tabulated performance data is recorded.
Recommendation(s)	The following are recommended: • All fire water pumps should undergo an annual flow performance test in accordance with NFPA 25 standard to demonstrate that the pumps can still achieve their performance standard. Actual pump performance achieved at various flow conditions e.g. 0%, 100%, 150% should be plotted against the original design pump performance curve. By plotting the actual pump performance against the design pump performance BCPL can easily see whether a fire water pump is achieving its design performance.

	It is recommended that BCPL set a performance standard for fire water pump flow performance acceptance test. If the fire water pump does not achieve the pre-defined acceptance criteria, then a work order should be raised to rectify the sub-performance of the pump, a risk assessment completed, and appropriate risk mitigations implemented. NFPA 25 recommends that if a fire water pump does not achieve 95% of its design flow rate at multiple flow conditions at rated speed, then the pump should be repaired.
Facility Response	Performance test of the Fire Water Pumps was conducted. For the current year, the performance test is planned in April 2025, and the pump performance graph will be plotted based on the results.
2026 Status	In Progress
Marsh Comments	During 2026 survey discussions it was reported that the site has conducted annual performance test of firewater pumps as per the OISD guidelines. Post survey site has shared annual firewater pumps performance test report. It was noted that the data is being plotted as curves, but it was not clear from the curves whether the OEM curve is mentioned and used for comparison. In evaluation section it was mentioned that "Net pressure at each flow point was more than 95% of original manufacturers pump curve". It was also observed that in at least one pump evaluation it was reported "Net pressure at 100% flow was more than 95% of original manufacturers pump curve but at 150% flow its only 86%" and the result was "Acceptable performance". It is recommended to follow NFPA 25 for annual firewater pumps testing. If performance deteriorates below 5% of the design curve, pumps should be overhauled.
Client Response	Client to enter response

2024.08	Provide continuous gas monitoring for Hot Work permit to work activities		
Ranking		Priority	High
Observations and Issues	The following were noted: Continuous gas monitoring is not required in hot work activity areas. Only spot gas testing is completed before commencing hot work activities.		
Recommendation(s)	The following are recommended: BCPL should provide continuous gas monitoring in areas where hot work activities are being undertaken which could be exposed to a hydrocarbon gas or liquid releases. Continuous gas monitoring should be specified on the Hot Work PTW. The weakness in spot gas testing before a hot work activity commences, is that immediately after a gas test is completed an explosive atmosphere could develop.		
Facility Response	Fixed gas detectors are installed all over the plant near all possible hydrocarbon leak sources with real-time monitoring system. F&S personnel with portable gas detectors are deployed to for continuous checking of LEL near the hot work area.		
2026 Status	Superseded		
Marsh Comments	BCPL reported that gas testing is being done before issuing the permit. During the 2026 survey site visit it was noted that continuous or Intermittent gas testing is not being done for hot jobs in critical areas. For example, one hot work job (Hot work in heater area in ECU) was reviewed and it was noted that there was no portable gas detector available or fire & safety personnel to measure the explosivity (LEL) in the hot job area. The above points were captured in the 22.03 Marsh Risk Improvement Recommendation. Therefore, this recommendation is being superseded with Marsh Risk Improvement Recommendation 22.03.		

2024.09	Secure and Tag Process Isolation Valves used as part of maintenance activities process isolation plans in position		
Ranking		Priority	High
Observations and Issues	The following were noted - For process / mechanical isolations blind lists are developed with blinds marked up on a P&ID. The rating of the blinds is also defined. - It is noted that a list of process isolation valves to secure into position before line breaking to install blinds is not developed. When process isolation valves are used as an isolation, the process isolation valve is only closed and is not locked/secured and tagged into position.		
Recommendation(s)	The following are recommended: - During the planning of process isolations required to complete maintenance activities, P&IDs should be used and marked up to identify all of the process isolation valves which need to be closed or opened as part of the isolation plan, together with the locations of blinds to be installed. - Process isolation valves to be closed or opened should be listed in sequenced order, together with blind installation sequence and verified (double verification) that they have been moved and secured/installed in the correct position. It is important that process isolation valves are in the correct position prior to flange opening for the installation of blinds. - Process isolation valves used for isolation purposes for maintenance / required to enable blinds to be installed should be secured and tagged in position to minimise the potential for accidental movement of the valve during line break / maintenance activities. - Similarly, during de-isolation the correct sequence of removing blinds and moving process isolation valves to their operational position should be pre-defined to minimise the potential for a loss of containment incident occurring when flange joints are broken in order to remove blinds.		
Facility Response	The practice was in place with approved SOPs. However, deviations were identified and action taken to address the deviations.		
2026 Status	No Progress		
Marsh Comments	During 2026 survey site visit it was noted that: - For process / mechanical isolations blind lists are used with blinds marked up on P&IDs. The rating of the blinds is also defined along with the details of when the blinds are installed/removed. It was noted that in LLDPE for a vessel isolation plan/blind list mark-up old P&ID (September 2009 BDEP) were being used. - Marked up P&ID was missing for the permit reviewed in ECU (hot work: FF-103 insulation repair job inside furnace). - The isolation valves that are being closed/open for the line break activity are not being marked on the P&IDs. - It is noted that a list of process isolation valves to secure into position before line breaking to install blinds is not developed (minimum isolation philosophy HSG 253). It was reported that when process isolation valves are used as an isolation, the valves are only closed & tagged and is not locked/secured into position. - Marsh Position Paper on Process Isolations has been shared with BCPL for their reference.		
Client Response	Client to enter response		
2024.10	Ensure access to all firewater monitors and hydrants		
Ranking		Priority	High

Observations and Issues	The following were noted During the 2024 site visit to the propylene storage spheres (4 x spheres) it was noted that a number of the fire water monitors positioned around the spheres would be difficult to access, due to vegetation, pipelines and uneven terrain which would hinder quick and easy access to the fire water monitors.
Recommendation(s)	The following are recommended: It is recommended that BCPL ensures continuous, unrestricted access to all fire water monitors, fire water deluge valve stations and other firefighting system equipment installed across the complex. All vegetation should be removed/managed which hinders access. Where access restrictions prevent easy access to firefighting systems, e.g. trenches/pipelines hinder access, then provisions to allow easy access should be provided, e.g. access walkways over trenches/pipelines. If access cannot be provided to monitors, then remotely activated monitors should be considered.
Facility Response	The surrounding vegetation has been cleared and pathways have been cleared. New access pathways / pipeline crossover bridges have been constructed to provided unrestricted access.
2026 Status	Completed – ITEM CLOSED
Marsh Comments	It was noted that the surrounding vegetation has been cleared and pathways have been cleared. New access pathways / pipeline crossover bridges have been constructed to provided unrestricted access.

2024.11	Provide Fire Detection in ECU Compressor House, LLDPE Extruder Hall and PP Extruder Hall		
Ranking		Priority	Medium
Observations and Issues	The following were noted - The ECU large compressor house which accommodates the business-critical Cracked Gas Compressor and Tertiary Refrigerant Compressors has no fire detection /flame detection coverage covering the compressor or their associated lubrication oil systems. - The LLDPE Extruder Hall has no fire detection / flame detection coverage.		
Recommendation(s)	The following are recommended: BCPL considers installing automatic fire detection systems covering process plant areas, with initial focus on providing automatic fire detection in high fire risk and business critical process plant areas, e.g. ECU Compressor House, LLDPE and PP Extruder Hall. A fire in these business-critical areas needs to be quickly identified at its inception in order that actions can be taken to quickly respond to the onset of the fire in order to minimise the potential for fire escalation and the magnitude of consequential property damage and business interruption losses.		
Facility Response	There are 04 nos. flame detectors installed in compressor house in ECU, 02 in TRC area and 02 in CGC area. Tag nos. of the detectors are 113-GD-0067, 113-GD-0109, 113- GD-0066, 113-GD-0065. There are 02 number flame detectors installed in LLDPE extruder hall. Tag nos. of the detectors are 117-FD-4001 and 117-FD- 6101		
2026 Status	Completed – ITEM CLOSED		
Marsh Comments	It was reported that there are two numbers of flame detectors installed in LLDPE extruder hall. Tag nos. of the detectors are 117-FD-4001 and 117-FD- 6101. Post survey the site has confirmed that there are four fire detectors installed in the ECU compressor house, two at the CGC compressor and two at the TRC compressor. Site has provided pictures of fire detectors present in the ECU compressor house, and the same are held on file by Marsh.		

2024.12	Hose Management Improvements
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Ranking	Priority	Medium
Observations and Issues	The following were noted During the 2024 survey, it was noted that there were a significant number of flexible hoses in use for steam, water and air services. The hoses inspected during the survey did not have unique identification tags and it could not be confirmed whether the hoses were still 'fit for service'.	
Recommendation(s)	The following are recommended: - BCPL should complete a full audit of all hoses installed across the assets and confirm that all hoses have unique identification tags and up to date inspection / hydrotesting history. Any hoses which do not have unique identification tags, inspection records or overdue inspection/hydrotesting should be removed from service and re-inspected/tested. - BCPL should ensure that contractors cannot bring hoses on to site without the hoses being inspected/tested, certified and provided with a unique identification tag. - BCPL should maintain an up-to-date database of all hoses located across the BCPL assets. Each hose should have a unique identification, pressure/temperature/service rating.	
Facility Response	Hose Segregate with Tag Plate done.	
2026 Status	In Progress	
Marsh Comments	It was reported that hoses segregated and tags installed on the hoses. Hose register is being maintained and details of date of inspection/hydrotest is tracked. Post survey, site has shared hose register of ECU. It was noted that the register has details such as hose tag numbers, size, tested date and remarks where the hose is located. There were no details of the due date of the next testing date.	
Client Response	Client to enter response	

2024.13	Improve Management of Change close out check list	
Ranking	Priority	Medium
Observations and Issues	The following were noted The BCPL Management of Change (MoC) process does not have a formalised MoC Close Out Checklist to ensure that all important documents are updated, new equipment, piping systems are populated to inspection / maintenance management systems, operator training is provided etc.	
Recommendation(s)	The following are recommended: - BCPL include a close out check list in the MoC process, in order to minimise the potential for human error and important documents not being communicated to the operation, maintenance and inspection teams. It is recommended that a close out check list is completed prior to the close out of each MoC. The MoC should only be considered to be closed once the close out check list has been completed. Examples of MoC close out checks that should be completed include: - PHA, HAZOP, SIL study and other safety review recommendations addressed/closed. - P&IDs, Cause and Effect and other applicable engineering drawings updated and distributed to the relevant departments. - Operational procedures have been updated and training provided. - Pre-Start Up Safety Review (PSSR) has been completed. - New equipment installed has been populated into the maintenance management systems and maintenance routines defined. - New equipment installed has been populated into inspection plans and inspection frequencies defined.	

	BCPL should set a target completion KPI, for the timely close out of MoCs and associated documentation following commissioning of the MoC and monitor as a PSM KPI. Some operators have a 30-day KPI for the close out of MoCs following commissioning.
Facility Response	BCPL has MOC closure reports are in place which includes the purpose of the MoC is being satisfied or not. The updated MOC closure has been reviewed under PSM implementation.
2026 Status	In Progress
Marsh Comments	During 2026 survey discussions it was noted that the site has developed new MoC procedure along with detailed Close out form in checklist format. Implementation of the new MoC procedure is under progress. It was noted that the site is yet set a target completion KPI, for the timely closure of MoCs and associated documentation following commissioning of the MoC and monitor as a PSM KPI.
Client Response	Client to enter response

2024.14	Improve Fixed Fire Protection Coverage on ECU		
Ranking		Priority	Medium
Observations and Issues	The following were noted - There are no automatic fixed fire water deluge systems installed within the ECU. The ECU is provided with fire water monitors and fire water hydrants. There are no water curtain between the furnaces and neighbouring ECU process plant area. - Ethylene and Propylene service pumps are covered by water spray systems which have to be manually activated. - The business-critical Cracked Gas Compressor and Tertiary Refrigeration Compressor and their associated lubrication oil systems are not covered by fixed fire water deluge systems or sprinkler systems. - Fixed fire protection coverage on the ECU is below the coverage noted on other petrochemical complexes visited in the region.		
Recommendation(s)	The following are recommended: - It is recommended that BCPL review the fixed fire protection philosophy for the ECU. It is noted that a different Cracker Unit within the region has the following fixed fire protection systems: - Deluge of Cracked Gas Compressor, Refrigerant Compressor and lubrication oil systems - Water deluge system / water curtain is installed between the Cracking Furnaces and the neighbouring process plant area. - Ethylene/Propylene Pumps are deluged - Ethylene / Propylene Reflux Drum and Refrigeration Accumulators are deluged.		
Facility Response	Fire Protection System is designed by M/s Engineers India Limited as per OISD-116.		
2026 Status	Superseded		
Marsh Comments	During the 2026 survey site visit it was noted that the CGC and TRC compressors, along with the associated lube oil skids in the ECU compressor house, do not have a fire water deluge or sprinkler system installed. The above points were captured in the 20.03 Risk Improvement Recommendation by Marsh. Therefore, this recommendation is being superseded with Risk Improvement Recommendation 20.03.		

2024.15	Develop Business Continuity Plan
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Ranking	Priority	Low
Observations and Issues	- The following were noted - BCPL have Business Interruption Insurance. No details of a BCPL Business Continuity Plan were available at the time of the September 2024 risk engineering survey.	
Recommendation(s)	The following are recommended: - It is recommended that BCPL proactively develop a Business Continuity Plan (BCP) to potentially minimise the potential business interruption impact on the BCPL petrochemical complex in the event of a loss. The BCP should include, but not be limited to the following scenarios: - Unavailability of Rail Wagon Unloading Gantry. - Unavailability of BCPL Lakwa or Duliajan or neighbouring OIL / ONGC facilities. - Unavailability of C2+ pipeline, rich gas pipeline or lean gas export pipeline. - Unavailability of Naphtha storage tanks. - Unavailability of Flare Stack. - Unavailability of catalyst supplier. - Unavailability of Butene-1 supplier. - Unavailability of business-critical compressor e.g. ECU Cracked Gas Compressor, Refrigeration Compressor. - Cyber security attack. - The business continuity plans should detail the mitigations to be implemented to minimise the impact of the business interruption loss scenario on the BCPL operations e.g., Sourcing of spares / replacement equipment from vendors or third-party operators, identification of alternative customers, identification of alternative suppliers of catalysts etc.	
Facility Response	BCPL already have Risk Management Policy for monitoring the risk as stated in recommendation.	
2026 Status	No Progress	
Marsh Comments	It is recommended that BCPL proactively develop a Business Continuity Plan (BCP) to minimize the potential business interruption impact on the BCPL as part of Risk Management Policy.	
Client Response	Client to enter response	

22.01	Improvements in incident investigation closure				
Ranking	Consequence:	F3	Likelihood	C	Category: 3
Observations and Issues	During the survey discussion, it was observed that some of the incident investigation recommendations were changed from open to close status without completing the assigned task as per the specific recommendation. For example – a sample FIR no. BCPL/LEP/CP/002 “Boiler drum pressure suddenly reduced” was reviewed during survey and the closure comment mentioned was “will be taken up during shutdown” and the FIR was changed to closed status. However, since the activity will be completed in the upcoming March shutdown, the FIR should have been in open condition and only after the completion of recommendation, the FIR should be closed. Another report of FIR on “HRSG-2 tripping due to feed C/V failed to maintain drum level” incident was reviewed in BCPL Connect Portal during the survey. It was observed that the recommendation was closed without mentioning changes to SMP/SOP or any other concrete compliance or evidence.				
Recommendation(s)	- It is recommended that BCPL: - Ensure that all such FIRs and incident recommendations where the actions are not completed, must remain open with a due date and stewardship.				

	Ensure that close out comments must be supported with compliance report or evidence before closing the recommendations / FIRs.
2026 Status	In Progress
Marsh Comments	Post 2026 survey, site has shared two incident investigation Action taken Reports (ATR). The details of the incident were not clear in both the reports. One incident happened in February 2026 at HPG-2 project site. It was noted that there were three recommendations and the ATR has detailed actions taken with respect to each of the recommendations along with photographs attached as evidence.
Client Response	Client to enter response

22.02	Perform formal risk assessment (RA) while carrying out trip interlock override				
Ranking	Consequence:	F4	Likelihood	C	Category: 2
Observations and Issues	At the time of visit to the central control room (CCR), the trip interlock bypass register was reviewed and following observations were noted: - Risk assessment (RA) column in the trip interlock bypass register has very less space to carry out RA. - The RA column is mostly left blank while bypassing the trip interlock. - The reasons mentioned in the RA column did not capture all the hazards and their mitigations.				
Recommendation(s)	- It is recommended that BCPL: - Prepare a format for formal RA before bypassing trip interlocks identifying the hazards introduced and additional mitigation measures required. - A formal risk assessment is required for all overrides. The nature and level of the risk should inform which disciplines should be involved in the risk assessment and formation of the mitigation plan. Once the risk assessment and initial mitigation plan have been developed, the risk level should be separately reviewed with mitigation in place to confirm that the risk is acceptable - Reference can be made to the Marsh position paper, which represents good practice for management of overrides and trip bypasses: Defeat of Safety Instrumented System Trips and Alarms				
2026 Status	In Progress				
Marsh Comments	During 2026 survey site visit, it was noted that: - In ECU two interlocks are in long-term bypass condition with limited and generic risk mitigation measures. - The space for entering risk mitigation measures in the trip bypass register is very limited. - Long term bypasses are not being routed through Temporary MoC, and mitigation measures are not being reviewed through interdisciplinary committee. - Site has informed that new Interlock bypass procedure is being developed to address the limitations in the current interlock bypass procedure.				
Client Response	Client to enter response				

22.03	Continuous Gas testing during hot work in plant area				
Ranking	Consequence:	F4	Likelihood	C	Category: 2

Observations and Issues	It was reported that gas test is carried out before start of the hot work and during the work based on criticality. At the time of visit to the site, however it was observed that during welding work in ECU unit, gas detector was not available at work site and hence the continuous monitoring of gas presence was not being done. It is industry standard practice to carry out continuous monitoring of gas presence at the work site while performing hot work generating spark.
Recommendation(s)	- It is recommended that BCPL: - Ensure continuous gas monitoring during hot work in plant area using portable gas monitors. - Carry out periodic logging of gas test data in the space provided in work permit while doing the continuous gas monitoring.
2026 Status	• No Progress
Marsh Comments	BCPL reported that gas testing is being done before issuing the permit. During the 2026 survey site visit it was noted that continuous or Intermittent gas testing is not being done for hot jobs in critical areas. For example, one hot work job (Hot work in heater area in ECU) was reviewed and it was noted that there was no portable gas detector available or fire & safety personnel to measure the explosivity (LEL) in the hot job area. It was also noted that there is no space to enter intermittent gas testing results in the permit.
Client Response	Client to enter response

22.04	Develop Maintenance and Inspection KPIs				
Ranking	Consequence:	F3	Likelihood	C	Category: 3
Observations and Issues	During the 2022 survey, BCPL informed that maintenance team prepares unit wise report of maintenance activities on a monthly basis. A sample report has been requested from BCPL and will be reviewed upon receipt. It is industry standard practice to measure the maintenance performance in the form of Key Performance Indicators (KPIs). This will maintain uniformity in measurement at each unit level and help in reviewing the performance as per set targets. Also, it was not clear whether Inspection performance is measured and KPIs are routinely reported, either within the team or to top management. Measurement of maintenance and inspection performance has long been recognized within the process industries as a key leading indicator (metric) of process safety. Without its measurement, it is difficult for management to accurately gauge the quality, and any failings, of its asset integrity arrangements. Maintenance and inspection based on analysis of KPIs can potentially improve equipment availability and integrity. Mechanical integrity failures cause a significant proportion of losses in the oil and gas industry.				
Recommendation(s)	It is recommended that BCPL establish a set of maintenance and inspection related KPIs for all sites, which are reported to management on a monthly basis. Some indicators commonly used include: Maintenance KPIs: • CM:PM ratio (both man-hours based and no. of work orders based). • PM Compliance. • Overdue safety critical PMs (man-hours basis). • Backlog (man-hours basis). • MTBF (mean time between failures) for each category of rotary equipment and MTTR (mean time to repair). • Current number of bad actors. • % Equipment Availability.				

	- Number of critical maintenance work orders overdue and/or deferred and if deferment forms have been raised for all of them. Inspection KPI examples: % Inspections completed vs. planned (including all piping, equipment, vessels, PSVs, pipelines). - Number of overdue Inspections. - Number of temporary repairs / clamps in hydrocarbon service. - Number of deferments raised by Inspection department and number of overdue deferments. - Number of deferments with pending PHAs. - Number of overdue/open inspection department recommendations. - Relief valves failing 'pre pop' tests. - Number of LOPCs related to mechanical integrity. - The KPIs should ensure appropriate stewardship of overdue maintenance and inspection items and highlight where equipment remaining life requires follow up action to ensure asset integrity.
2026 Status	In Progress
Marsh Comments	During the 2026 survey discussions with the site team, it was noted that: - Maintenance team reports below KPIs to the management: - PM compliance. - PM and CM orders. - Budget monitoring. - Inspection team reports below KPIs to the management: - Planning vs Execution. - Documentation and reporting. - Statutory Compliance. - It is recommended to expand the current list of KPIs for Maintenance and Inspection departments as per the above recommendation.
Client Response	Client to enter response

22.05	Inspection Improvements
Ranking	Consequence: F4 Likelihood C Category: 2
Observations and Issues	BCPL has completed external thickness baseline survey for 30-40% of its piping. BCPL has also identified approx. 305 equipment for internal inspection and hydrotest to be completed in the next March 2022 planned shutdown. During the survey discussion with BCPL inspection team, it was observed that BCPL has not developed a short term and long-term targets for completing the baseline inspections, identifying corrosion loops, and dead legs. The inspection documents are mostly paper based with only few documents are maintained in electronic format. It is industry good practice to develop inspection strategies based on the corrosion loops and corrosion mechanism and perform external/internal inspection in a targeted manner.
Recommendation(s)	It is recommended that BCPL should: - Develop corrosion loops and plan inspection strategies based on the identified corrosion mechanisms. - Identify and include inspection of piping dead legs. - Develop short and long-term targets for completing the baseline inspections of piping, and equipment for each unit and import/export pipelines. - Report progress of the targets on monthly basis to the top management.

	Ensure Inspection documentation and records are also maintained in electronic format.
2026 Status	In Progress
Marsh Comments	During 2026 survey discussions it was noted that: 100% collection of baseline inspection data for pipelines and vessels has been completed (total 803 equipments). - Corrosion mechanisms and corrosion loops are yet to be identified for the site. - Dead legs and small-bore piping are inspected during regular piping inspections. However, a separate list identifying these dead legs and small-bore pipes has not yet been compiled. - Planned vs executed inspection activities is being reported as KPI. - Inspection records and documentation is reported to be maintained in both electronic and hard copy format. - Site may refer to API 571 for common damage mechanisms affecting fixed equipments.
Client Response	Client to enter response

22.06	Ensure that the Pre-pop tests conducted on PSVs are clearly recorded in the test record sheets and include the test pass/fail criteria in the PSV testing procedure				
Ranking	Consequence:	F4	Likelihood	C	Category: 2
Observations and Issues	During the survey discussion, BCPL informed that the PSVs are tested every two years and in some cases on yearly basis. The PSV testing includes pre-pop tests followed by calibration by third party contractor and also witnessed by BCPL engineer. However, while reviewing a sample PSV test record, it was noted that there was no recording of pre-pop test. It is industry standard practice to carry out PSV pre-pop test in "as received" condition and have a clear test pass/fail criteria mentioned in the PSV testing procedure. The deviation from the test criteria should be recorded as a near miss incident and must be investigated to understand the underlying reason which would further help in modifying the PSV testing frequency if required to ensure the integrity and reliability of PSV.				
Recommendation(s)	- It is recommended that BCPL should: - Mention the record of PSV pre-pop test (if carried out) in the PSV test certificate. - Mention the PSV test pass/ fail criteria clearly in the PSV testing procedure as per API guidelines. - Record PSV 'pre-pop' test failures as process safety near misses, ensuring appropriate root cause analysis is undertaken. It is suggested these events are also recorded in BCPL "Connect Portal" to ensure appropriate tracking and action close out.				
2026 Status	No Progress				
Marsh Comments	During the 2026 survey discussions, it was noted that the site conducts PSV testing which includes pre-pop tests followed by calibration by third party contractors. It was reported that currently site does not include pre-pop test details in the PSV testing certificate. Post survey, the site has shared a sample PSV test certificate. The certificate has details such as job done (internal inspection, cleaning, spare and observations) and calibration details, but the details of pre-pop test were not available. Site may refer to API 576 for guidelines on the inspection and repair of pressure relieving devices.				
Client Response	Client to enter response				

22.07		Provide latest “As Built” P&IDs in the central control room				
Ranking	Consequence:	F3	Likelihood	C	Category:	3
Observations and Issues	During the visit to BCPL CCR, it was observed that the P&IDs kept in control room were issued post 2012 HAZOP and it was not clear whether the P&ID was issued as a controlled copy post completion of plant construction. The “As Built” P&ID could not be made available for review during the survey. Industry practice is to have controlled and up to date P&IDs available in control rooms, as inaccurate P&IDs could lead to operators making incorrect decisions, for example on isolation, with potential loss as a consequence.					
Recommendation(s)	- It is recommended that BCPL: - Expedite the issue of ‘As Built’ P&IDs and maintain controlled set in the control room. - Include red line marked P&IDs issued as a result of changes (MoCs) in plant (in the interim until the updated P&IDs are issued).					
2026 Status		Superseded				
Marsh Comments	During 2026 survey it was noted the P&IDs available in control room are stamped “Controlled” and “As Built”. Few P&IDs reviewed were observed to be updated with Revision-6 “Updated with HAZOP recommendations (2019)” and MoCs implemented till 2024. It was not clear whether site replaces the old P&IDs with Red lined marked P&IDs or hand drawn P&IDs with changes after a MoC is implemented. The above points were captured in the 2024.02 Risk Improvement Recommendation by others. Therefore, this recommendation is being superseded with Risk Improvement Recommendation 2024.02.					
20.01		Install Lock Open/Lock Close system for management of critical valves associated with process and fire water facilities				
Ranking	Consequence:	F4	Likelihood	C	Category:	2
Observations and Issues	During visit to the ECU unit, it was noted that the inlet and outlet manual isolation valves associated with relief valves were not maintained in locked position. The critical isolation valves should be locked in correct position to prevent inadvertent operation of such valves. Similarly, on visit to the fire water pump house, it was noted that the critical isolation valves, such as fire water pump suction/discharge valves, diesel supply line valves, deluge isolation valves, pressure sensing line valves and sectioning valves throughout the fire water network were not locked in the required position. The fire water system is critical during an emergency; hence, the associated valves should be maintained in locked position, to ensure that the system is always available on demand.					
Recommendation(s)	- It is recommended that BCPL: - List all critical manual isolation valves in the process plants (such as those associated with relief valves and kill systems) and install LO/LC system for such valves. - List all critical manual isolation valves in fire water system (such as fire water pump suction/discharge valves, diesel supply line valves, deluge isolation valves, pressure sensing line valves and sectioning valves throughout the fire water network) and install LO/LC system for such valves. - Conduct regular audit of the status of such valves and rectify any deficiencies. (Industry practice is to conduct such audits every three to six months).					
2022 Status		In Progress				

2022 Marsh Comment	At the time of visit to the ECU unit, it was noted that the car seal was installed on PSV isolation valve and lube oil skid PSV isolation valves to maintain them in open position. At the time of visit to the firewater pump house it was noted that the isolation valves at suction and discharge of main firewater pumps, and diesel supply line valves did not have any car seal / lock open tag installed. It is suggested to carry out regular auditing of such valves and rectify such deficiencies.
2026 Status	In Progress
Marsh Comments	During 2026 survey site visit it was noted that: - In ECU few PSVs isolation valves were found to be in Car Sealed condition and LO/LC register has been developed, and yearly audit is being conducted to ensure healthiness of Car seal. - It is recommended to add other critical valves such as isolation valves of kill systems to the list and increase the audit frequency to every three months (industry standard practice). - Firewater deluge isolation valves, sectional isolation valves, firewater pumps discharge isolation valves and diesel supply line isolation valves are not being Car sealed.
Client Response	Client to enter response

20.02	Improvements in Emergency Operating Procedures (EOPs)				
Ranking	Consequence:	F4	Likelihood	C	Category: 2
Observations and Issues	During visit to the control room, it was noted that the ECU unit maintains updated copy of SOPs and EOPs, however the scenarios considered for EOP is limited to emergency in furnaces and loss of power. EOPs are critical documents and paper-based copies of such documents should be maintained in control room, with easy reach of the control room operators. There have been many incidents in the oil and gas industry, where the loss was escalated due to unavailability of EOPs.				
Recommendation(s)	It is recommended that BCPL: - Include scenario of loss of other utilities such as loss of cooling water, loss of steam, loss of instrument air, loss of fuel gas, DCS failure etc in the EOPs. - Separate out EOPs from the SOPs and provide controlled, updated, signed, indexed and checklist based hard copy of EOPs in the control room.				
Client Response	BCPL has prepared a unit wise pocket manual which contains key steps to be followed by plant engineers during utilities and power failure scenarios. The scenarios listed in pocket manual includes failure of cooling water, nitrogen, and instrument air. This manual is available with all the Operations staff.				
2022 Status	In Progress				
2022 Marsh Comment	It is a positive step to develop pocket manual which is handy and can be easily referred by Operations staff. However, it is suggested to develop a detailed step by step emergency operating procedure for these utility failure scenarios and also include some other scenarios such as loss of fuel gas, DCS failure/blackout etc. Currently the emergency operating procedures are limited to procedures such as loss of power and process compressor trips. At the time of visit to the CCR, it was noted that the EOPs and SOPs are stacked in the same file and has not been indexed.				
2026 Status	In Progress				

20.02	Improvements in Emergency Operating Procedures (EOPs)
Marsh Comments	Updated EOPs are kept in separate folder and are in checklist format. Power failure and Furnace emergency scenarios were available. It was noted that the indexation was missing for the folder. It is recommended to include scenarios of loss of other utilities such as loss of cooling water, loss of steam, loss of instrument air, loss of fuel gas, DCS failure etc. in the EOPs.
Client Response	Client to enter response

20.03	Improvements in the fixed fire protection system at the main compressors and associated lube oil skids				
Ranking	Consequence:	F4	Likelihood	C	Category: 2
Observations and Issues	During visit to the compressor house at ECU unit, it was noted that there is no fire water deluge/sprinkler system provided at the compressor shed of ECU. The shed is well covered on the sides, so as to limit the reach of fire water monitors to the compressor deck. Also, there is limited fire and gas detection coverage provided near the rotary equipment. The lube oil skids of the compressors are located on ground floor of the compressor house and are also not protected by any flame detection / fixed fire water protection system, There have been many incidents of fire in the compressor house and lube oil skids in the oil and gas industry.				
Recommendation(s)	It is recommended that at BCPL: - Review the adequacy of fire and gas detection system on the compressor deck and lube oil skid area at all plants, including ECU unit. Additional fire and gas detectors should be installed where risk justified. Good practice is to install fire and gas detection system close to the rotary equipment, near the compressor seals and flanges. Similarly flame detectors are now installed on lube oil skids for early identification of any fire. - Extend the fixed fire protection system to all critical compressors and associated lube oil skids, including the compressors in ECU unit.				
2022 Status	No Progress				
2022 Marsh Comment	During the visit to the compressor house in ECU unit, it was noted that the compressor platform had one gas detector at some distance from the compressor. BCPL informed that no additional fire and gas detectors have been installed post 2020 survey in TRC/CGC compressor house. There is also no fire water deluge/sprinkler system provided at the compressor shed of ECU. Therefore, the status has been kept as "no progress".				
2026 Status	In Progress				
Marsh Comments	- Post survey the site has confirmed that there are four fire detectors installed in the ECU compressor house, two at the CGC compressor and two at the TRC compressor. Site has provided pictures of fire detectors present in the ECU compressor house, and the same are held on file by Marsh. - It is unclear if the compressor house in the ECU is equipped with any gas detectors. If available, request site to kindly provide the tag numbers and photographs of the gas detectors. - The CGC and TRC compressors, along with the associated lube oil skids in the ECU compressor house, do not have a fixed fire protection system such as fire water deluge or sprinkler system installed. - It is recommended to review the adequacy of fire and gas detection system and fixed fire protection system on the compressor deck and lube oil skids in all process plants, including ECU unit.				
Client Response	Client to enter response				

20.04	Review Inspection reporting line, resources and competency management				
Ranking	Consequence:	F4	Likelihood	C	Category: 2
Observations and Issues	The Inspection department at Lepetkata plant currently reports in the Maintenance function, which does not provide the required degree of independence to the Inspection department. It is an industry practise now to separate the reporting of the Inspection department from the Operations and Maintenance function. This helps the				

20.04	Review Inspection reporting line, resources and competency management
	department function in an unbiased and independent manner and escalate any issues directly to the management. There are currently only three staff at BCPL Lepetkata plant, who are responsible for all the three assets, Lepetkata, Duliajan and Lakwa plants. Although all inspection activities are outsourced, the department strength looks to be low compared to similar assets worldwide. The staff in the Inspection department is certified in various Level 2 NDT inspection techniques, however, are not certified in globally accepted standards, such as API 510 and API 570. The inspection department is considered as one of the most important departments in any oil and gas plant, as a large number of losses have been co-related to inspection deficiencies. Hence it is important to maintain the department independent, with reasonable manpower strength and adequate competency level.
Recommendation(s)	It is recommended that at BCPL: • Separate the reporting of the Inspection department from Maintenance and Operations, with an independent reporting line to plant management. • Review the existing manpower strength of the Inspection department vs. the expected and planned work scope for all three BCPL assets and adjust the manpower number accordingly. • Review the competency level of the Inspection department staff and train the staff in internationally accepted inspection standards such as API 510 and API 570.
Client Response	The Inspection team is separate from Maintenance function and reports to Inspection General Manager (GM) who further reports directly to Chief Operating Officer (COO). The inspection team is manned by two BCPL staff (one Manager and one Senior Manager), inspection contract manpower (approx. seven to eight staff), and support staff from BCPL contract manpower (five staff). The BCPL officers are trained in API 510 and API 570 standards.
2022 Status	In Progress
2022 Marsh Comment	It was noted that BCPL has separated the Inspection department from Maintenance function with the GM Inspection directly reporting to COO. However, the BCPL inspection staff strength has reduced to two. The manning of inspection team needs to be reviewed considering the BCPL asset size and multiple locations (Duliajan & Lakwa). BCPL should continue to train their new manpower (when inducted to inspection team) in internationally accepted inspection standards such as API 510 and API 570.
2026 Status	In Progress
Marsh Comments	• During the 2026 survey discussions it was noted that: • Inspection department reports to GM-Maintenance. Therefore, the site is yet to separate the reporting of Inspection team from Maintenance. • The current departmental strength is four including one DGM, two Senior Managers and one Senior Engineer. • Inspection staff is trained in NDT Level -2. • Training and certification in API-510 and API-570 is pending.
Client Response	Client to enter response

20.05	Inspection trending and analysis				
Ranking	Consequence:	F4	Likelihood	C	Category: 2
Observations and Issues	The Inspection department considers the retiring thickness of a piping as the Nominal thickness – corrosion allowance. There were some cases noted in liquid nitrogen service in PP plant where the actual thickness was below this retiring thickness, however the inspection team reported that the piping will be changed based on another qualitative analysis. The site is not following a quantitative model for determining the actual retirement thickness of the piping. As the inspection team is very lean organised, efficient use of inspection resources is required. The team is not conducting any remnant and half-life analysis currently.				
Recommendation(s)	It is recommended that at BCPL: - Consider the retirement thickness as the highest amongst the structurally determined minimum thickness as per API 574 and the pressure retention thickness as per ASME B31.6. The piping should be replaced before reaching the retirement thickness. - Remnant and half-life analysis should be conducted, and the next inspection frequency should be determined based on these results.				
Client Response	BCPL has classified the piping into three categories: - Class 1: High temperature service, Flare, Hydrogen - Class 2: Hydrocarbon service - Class 3: Utility services The thickness measurement of these piping has been kept at two yearly for Class 1, three yearly for Class 2, and four yearly for Class 3. BCPL has completed external thickness survey for 30-40% of its piping. BCPL has also identified approx. 305 equipment for internal inspection and hydro test to be completed in the next March 2022 planned shutdown. Any piping loops, where reduced thickness is observed, undergoes three monthly inspections. These are highlighted in the paper records and permanent repair is carried out.				
2022 Status	In Progress				
2022 Marsh Comment	BCPL has not set its short term and long-term targets for completing baseline inspection of equipment. A new recommendation Risk Improvement Recommendation 22.05 has been made for the same. After identifying the corrosion loops, corrosion mechanisms and baseline thickness measurement, BCPL should also focus on remnant and half-life analysis.				
2026 Status	In Progress				
Marsh Comments	During 2026 survey discussions it was noted that: 100% collection of baseline inspection data for pipelines and vessels has been completed (total 803 equipments). - Trending and corrosion rates are being tracked. - Remnant and half-life analysis yet to be calculated.				
Client Response	Client to enter response				

20.06	Conduct annual performance test of fire water pumps as per NFPA 25 requirements
	Consequence: F4 Likelihood D Category: 3
Observations and Issues	During the 2020 survey, it was reported that the site does not conduct the annual performance test of the diesel fire water pumps although a flow meter is installed on the fire water network for conducting the test. Post survey, the site has shared the performance test report for the fire water pumps conducted on 27 December 2019. All pumps are checked at shut-in and 100% flow conditions, however not at 150% flow conditions as per NFPA 25 requirements. The head for diesel pumps at 100% flow is lower than the 5% threshold as per the NFPA 25 requirements, hence the pumps should be overhauled to improve performance. Performance test of the fire water pumps should be conducted on a regular basis to check the healthiness of the pumps.
Recommendation(s)	- It is recommended that BCPL: - Conduct annual performance test of fire water pumps up to 150% flow rate and plotting Net Head vs. flow curve (with speed compensation of Head and flow) as per requirements of NFPA 25 - Pumps should be overhauled if performance deteriorates below 5% of the design curve.
Client Response	All main firewater pumps are annually tested at shut off (0% flow) and 100% flow.
2022 Status	No Progress
2022 Marsh Comment	Post survey, the site has shared the performance test report for the fire water pumps conducted on 14 & 17 August 2020. It was noted that firewater pumps were tested at 150% of the normal flow. The pump discharge pressure was recorded to be within 5% of the designed discharge pressure. However, the tests were not conducted at 0% (churn), 100 % flow and plotted against the design curve as per NFPA 25 guidelines. The annual test needs to be aligned to the NFPA 25 guidelines as mentioned above in the recommendation section.
2026 Status	Superseded
Marsh Comments	During 2026 survey discussions it was reported that the site has conducted annual performance test of firewater pumps as per the OISD guidelines. The above points were captured in the 2024.07 Risk Improvement Recommendation by others. Therefore, this recommendation is being superseded with Risk Improvement Recommendation 2024.07.

Appendix A

Third Party Liabilities

Follow the links for the specific areas of interest given below:

[Site Overview](#)

[Site Location](#)

[Natural Perils Exposures](#)

[Site Layout and Construction](#)

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Liability Exposures

Toxic Hazards

In addition to the Fire & Explosion hazards listed earlier in this report, the Petrochemicals Complex has toxic gas hazards from H₂S from both streams and vessels on the main Petrochemicals Complex site.

Toxic materials handled on site include:

- Pyrolysis gasoline.
- Naphtha.
- H₂S.

The following is a review of the liability exposures associated with the site's operation.

Third Party

Onsite Incident

Separation distances between adjacent plants are such that physical damage to non-BCPL assets by fire spread or radiation is very unlikely. Location of on-site storage is such that there are negligible fire and radiation related exposures to third party property from fires in this area.

Offsite Incident

There are no industrial facilities in close vicinity of BCPL, Lepetkata plant. Hence, damage to BCPL from third party incidents offsite is considered low. Finished product is transported via the public highway. Therefore, there is potential liability of exposures associated with injury/damage to third parties in the event of vehicle accidents during transportation. Also, the underground pipelines connecting the Lepetkata complex to the Lakwa, Duliajan and Lalmati facilities are prone to damage during excavation.

Pollution

Air

Air pollution is possible from fired heaters, from flares, or from vapour releases from plants handling liquids at high temperatures and pressures. Small releases of hydrocarbons from valve stems and flanges have received increasing attention in recent years, and potential liabilities cannot be excluded.

Smoke and fume arising from fires or explosions on site can be the cause of air pollution incidents, although these effects are likely to be transient.

Water

Water pollution is possible due to the failure of the effluent treatment system on site. Liabilities are likely to be moderate given the nature of the materials handled on site.

Solids

Pollution from solids could occur as the result of relief valves discharging from the polymer silos. Depending on wind direction, solids could be expected to be deposited off site. These materials are benign, and potential liabilities are expected to be low.

Product

Although there is a fully equipped laboratory at BCPL for Quality Control, as a supplier of polymers, BCPL potentially has some product liability exposure to customers. Estimating the size of such potential liabilities is outside the scope of this report.

Employees

Employees can be exposed to incidents on the site which result in injury or fatality. Possible major incidents include VCEs, BLEVEs, flash fires, jet fires and toxic releases. There is also the full range of industrial injury incidents that could occur on this site.

Fatalities can occur on exposure to 0.1 bar explosion overpressures, with a 50% fatality rate at the 0.2 bar overpressure level, either directly or via building collapse. Consequently, a number of personnel within the process and utilities plants could be exposed (see BLAST profiles). In the event of fire, both onsite employees and contractors are potentially exposed, although these types of events develop relatively slowly, giving time for personnel to escape. A pipeline hydrocarbon leak followed by a fire or explosion could result in injuries to third parties.

Contractors

Contractors working at the complex are exposed as per "Employees", above.

Construction

There was construction activity at the site for the Butene -1 and HPG -2 projects at the time of the 2026 survey and the personnel could be exposed due to a fire and explosion incident at the Petrochemical complex. Contract personnel could also be injured during construction activities especially during the lifting of heavy equipment, high lifts of more normal equipment, and during the commissioning of equipment.

Conclusion

Liability exposures are at a **typical** level for petrochemical operations.

Appendix B

Site Process Units

The main process units on the Lepetkata site are as follows:

Plant / Unit	Original Design Capacity (t/y)	Current Design Capacity (t/y)	Process Licensor	Comments
GSU (Gas Separation Unit)	6 million SM ³ /d	6 million SM ³ /d	EIL (Open art)	For sweetening the gas and extraction of C2+ components
ECU (Ethylene Cracker Unit)	280,000	280,000	Lummus, US	220,000 t/y ethylene and 60,000 t/y propylene
PPU (Polypropylene Unit)	60,000	60,000	Novolen, Germany	Gas phased polymerisation, utilising single vertically stirred reactor.
LLDPE/HDPE Unit	220,000	220,000	INEOS, UK	

Appendix C

Site Storage

Details of atmospheric and pressurized storage tanks are shown below, along with details of hazardous, toxic and pressurised storage.

Service	No.	Capacity (each) (m ³)	Type	Comments
Naphtha	3	5,000	Floating Roof Tank	25.5m (dia) x 12m (height)
Butene-1	5	475	Sphere	10.5m (dia)
Ethylene	4	1,900	Sphere	16.5m (dia)
Off Spec Ethylene	1	925	Sphere	13m (dia)
Propylene	3	650	Sphere	11.5m (dia)
Off Spec Ethylene	1	650	Sphere	11.5m (dia)
C2+ Liquid	6	1,900	Sphere	16.5m (dia)
C4/C5 Mix	1	475	Sphere	10.5m (dia)
Pentane	1	90	Bullet	3m (dia) x 13m (length)
Hydrogen	2	143	Bullet	2.4m (dia) x 30m (length)
RPG	1	1,000	Fixed Cone Roof cum Floating Roof + Nitrogen Blanketing	18m (dia) x 12m (height)
HPG	2	2,212	Tank	
Pyrolysis Fuel Oil (CBFS)	2	350	Cone Roof Tank	8m (dia) x 8m (height)
Slop Oil	2	574	Tank	
Liquid Nitrogen	1	530	Vertical Bullet	

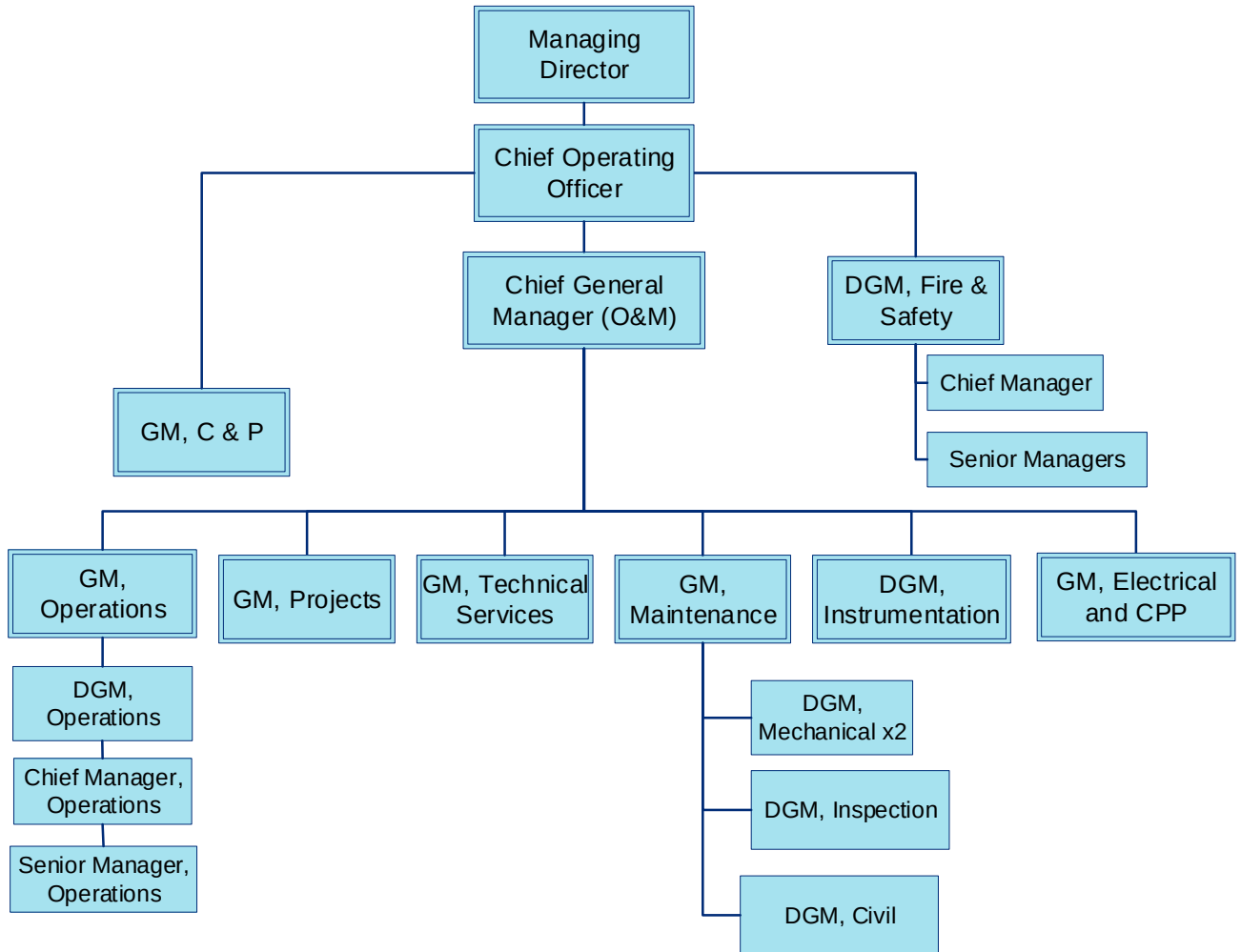
There are also a number of silos on site for both powder and pellets.

There is one warehouse used for storage of packed pellet material.

Appendix D

Site Organisation Chart

The Site Organisation is as follows:



Appendix E

Site Photographs

The site photographs provided by BCPL are shown below:



Appendix F

Safety Key Performance Indicators

MONTH	HSE INDEX FY:2025-26		
	LEPETKATA	LAKWA	DULIAJAN
Apr/25	98	97	100
May/25	96.5	98	99
Jun/25	96.5	97	99
Jul/25	99	97	98
Aug/25	95	99	99
Sep/25	97	99	99
Oct/25	97	79	95
Nov/25	97	97	98
Dec/25	93	98	97
Jan/26	95	98	98
Feb/26	80	98	100
Mar/26	96	100	100
Avg	96.63888889		

Rating: Score	Rating
100	Excellent
≥98 & <100	V. Good
≥96 & <98	Good
≥94 & <96	Fair
≥90 & <94	Poor

Reportable incidents during FY 2025-2026

S No	Date	Incident brief	Locations
1	17.10.2025	Incident occurred during static running of Fire Tender	Lakwa Plant
2	19.02.2026	Incident occurred during Work at Height job	HPG-2 project



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