



Gujarat Industries Power Co. Ltd.

Surat Lignite Power Plant

SO_x-NO_x 2020

Virtual Conference-Expo-Awards

Issues and Challenges:

Implementation of New Environmental Norms

Index

- GIPCL Company Profile**
- SLPP Process & CFBC Technology**
- Plant Performance Since Inception**
- Salient features of CFBC Boiler**
- Compliance of New Environmental Norms**
- Major Issues and Challenges**

An IMS (9001, 14001, 45001, 50001) Company, Established in 1985

At Baroda



Gas Based Power Plant
145 MW (Year 1992) 165 MW (Year 1997)



112.4 MW Wind Power (2017)

TOTAL: 1084.4 MW



Solar Plants 2X40MW (2017), 75MW (2019)
At Charankha, Gujarat, 100MW (WIP) at
Raghanesda Gujarat



5 MW Solar Plant at SLPP (2012)
2x1 MW Distributed Solar Power cum
Agriculture Pilot Projects-2016
TOTAL SOLAR: 162 MW

At Surat



4x125 MW Lignite Based CFBC Units
Phase-I (Year 2000), Phase II (Year 2010)

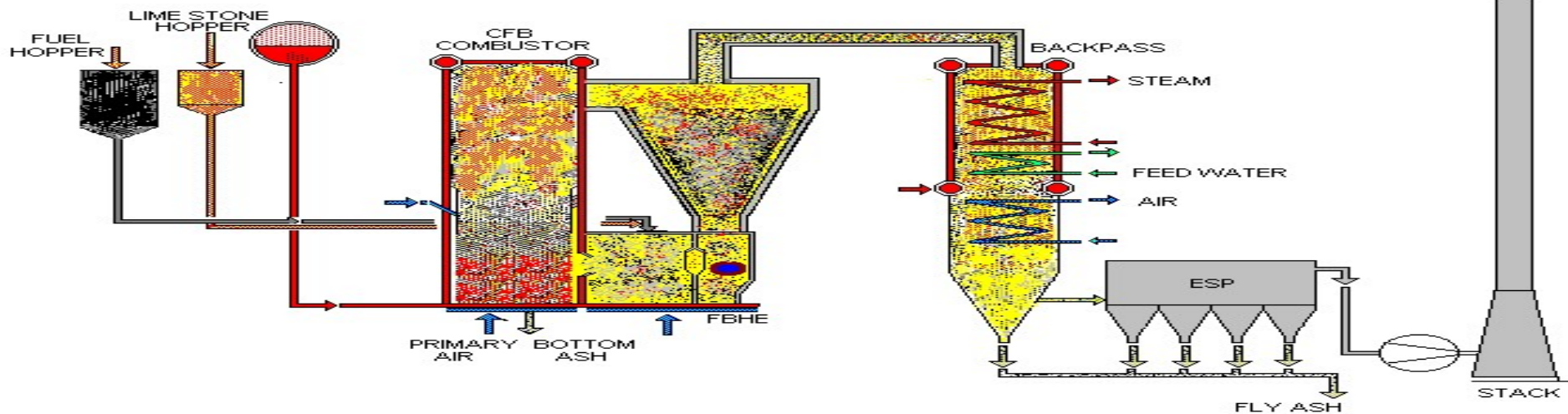
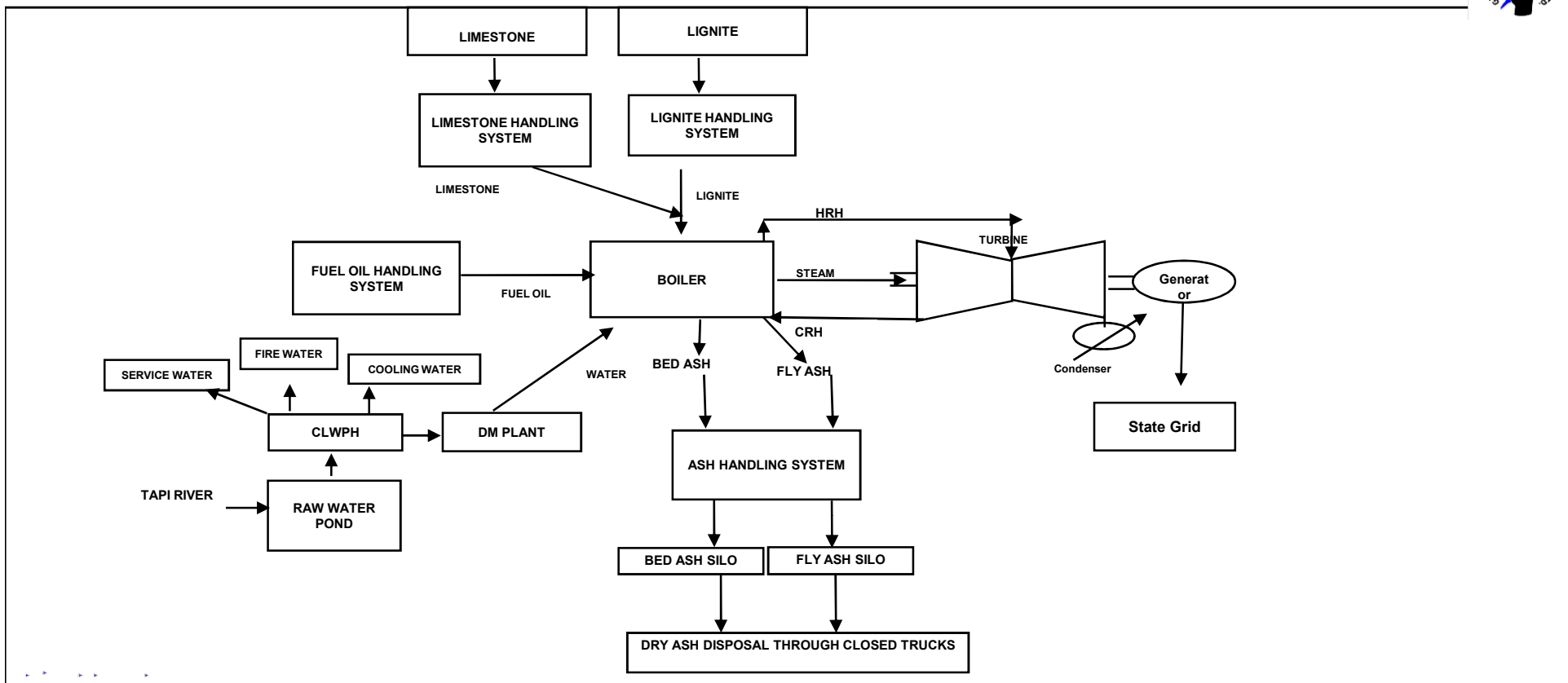


Captive Lignite & Limestone Mines

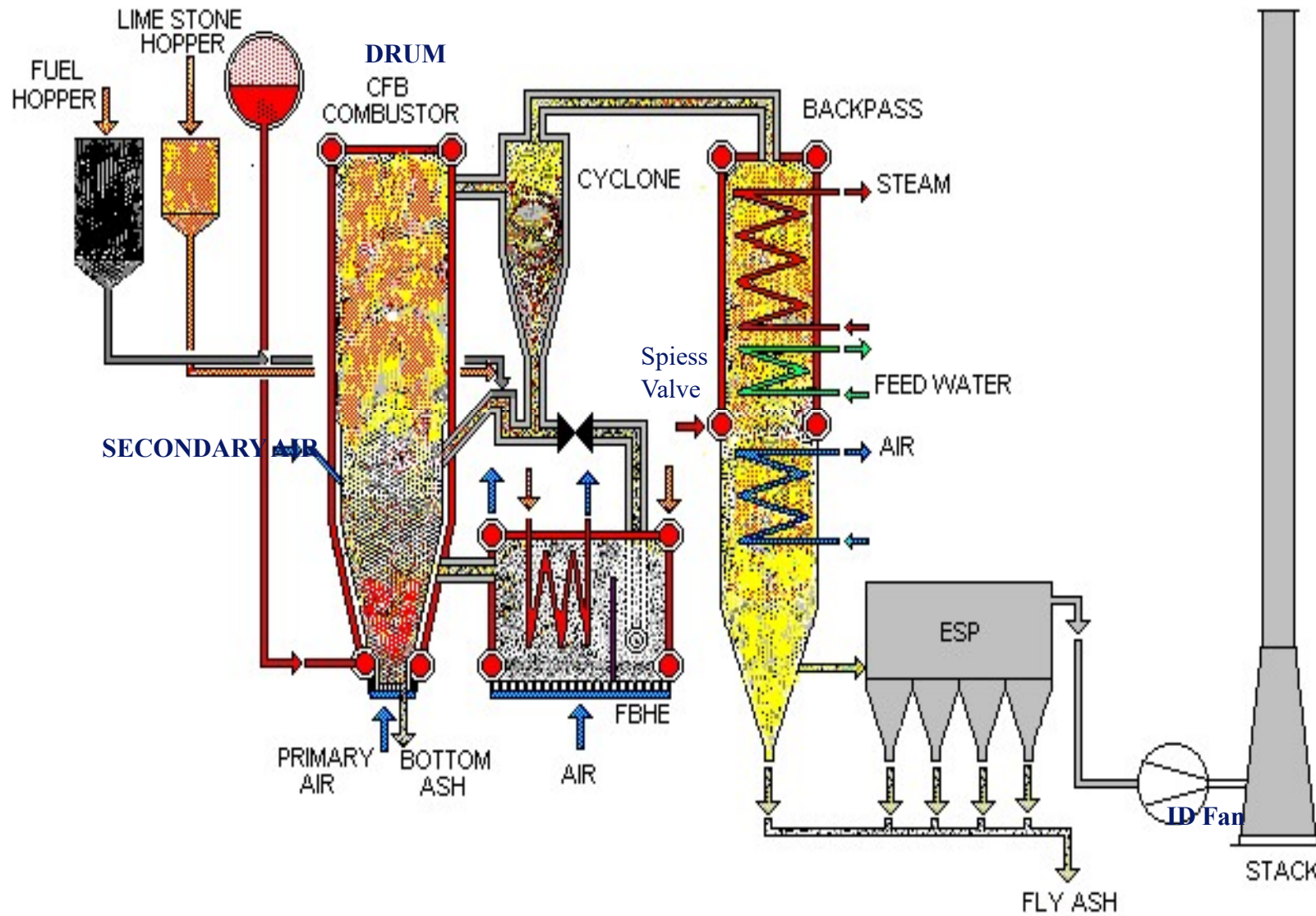
Accreditation for Integrated Management System (IMS) under ISO certifications:

The Company has successfully maintained standard guidelines for **Integrated Management System (IMS)** covering **ISO:9001:2015**, **ISO:14001:2015** and **BS ISO 45001:2018** certification for Quality Management System (QMS), Environment Management System (EMS) and Occupational Health and Safety Management Systems (OHSMS) and **ISO 50001:2018** for Energy Management System (EnMS) Certification for its Power Stations at Vadodara and SLPP. The company is one of the first group of Power Plants to have implemented and obtained ISO 50001:2011 Certification for Energy Management System. After Surveillance Audit for all the standards successfully conducted and accredited by TUV India Ltd., validity of certifications is till **Yr 2022**.

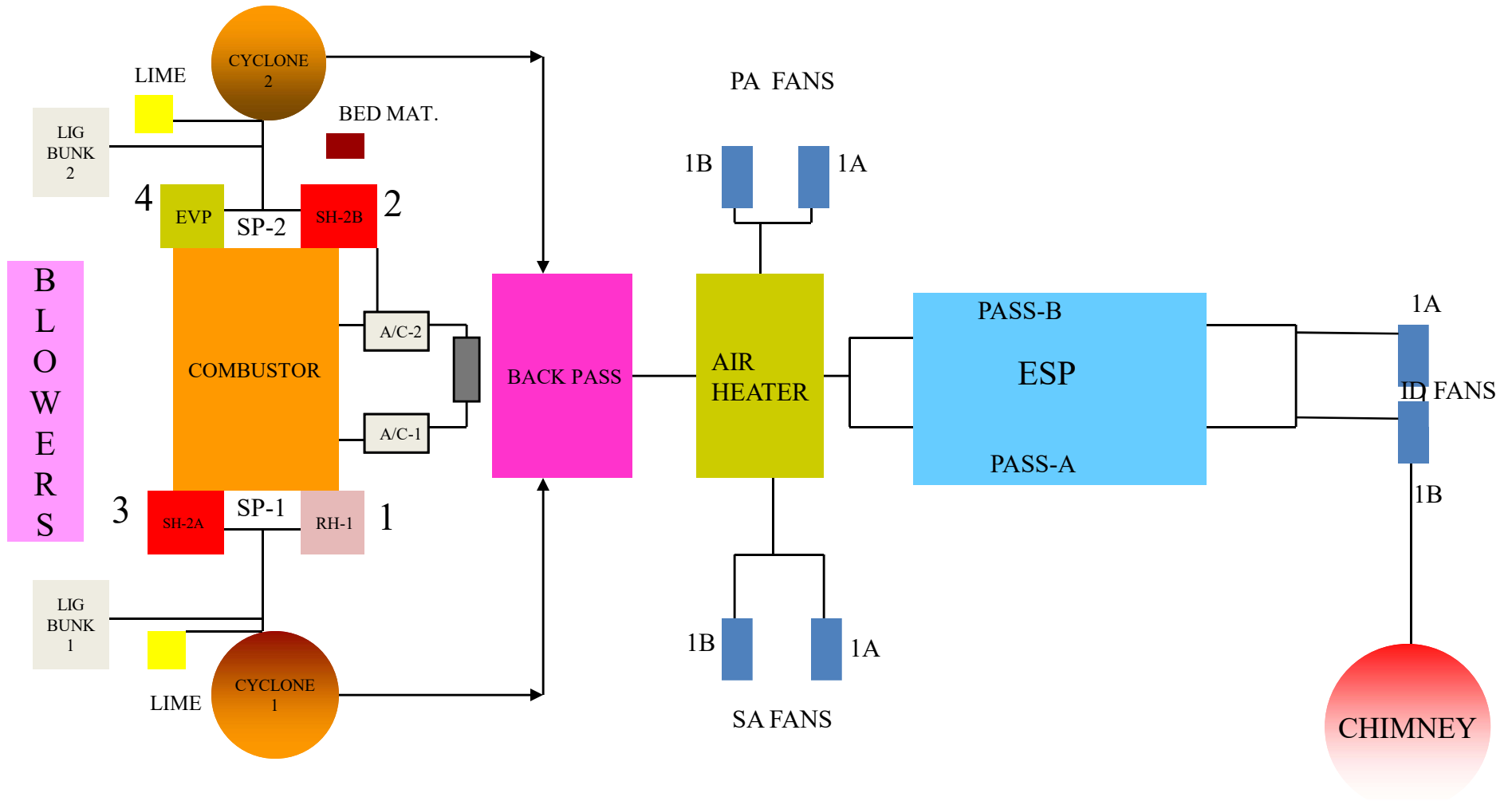




Flow Diagram of CFBC Boiler

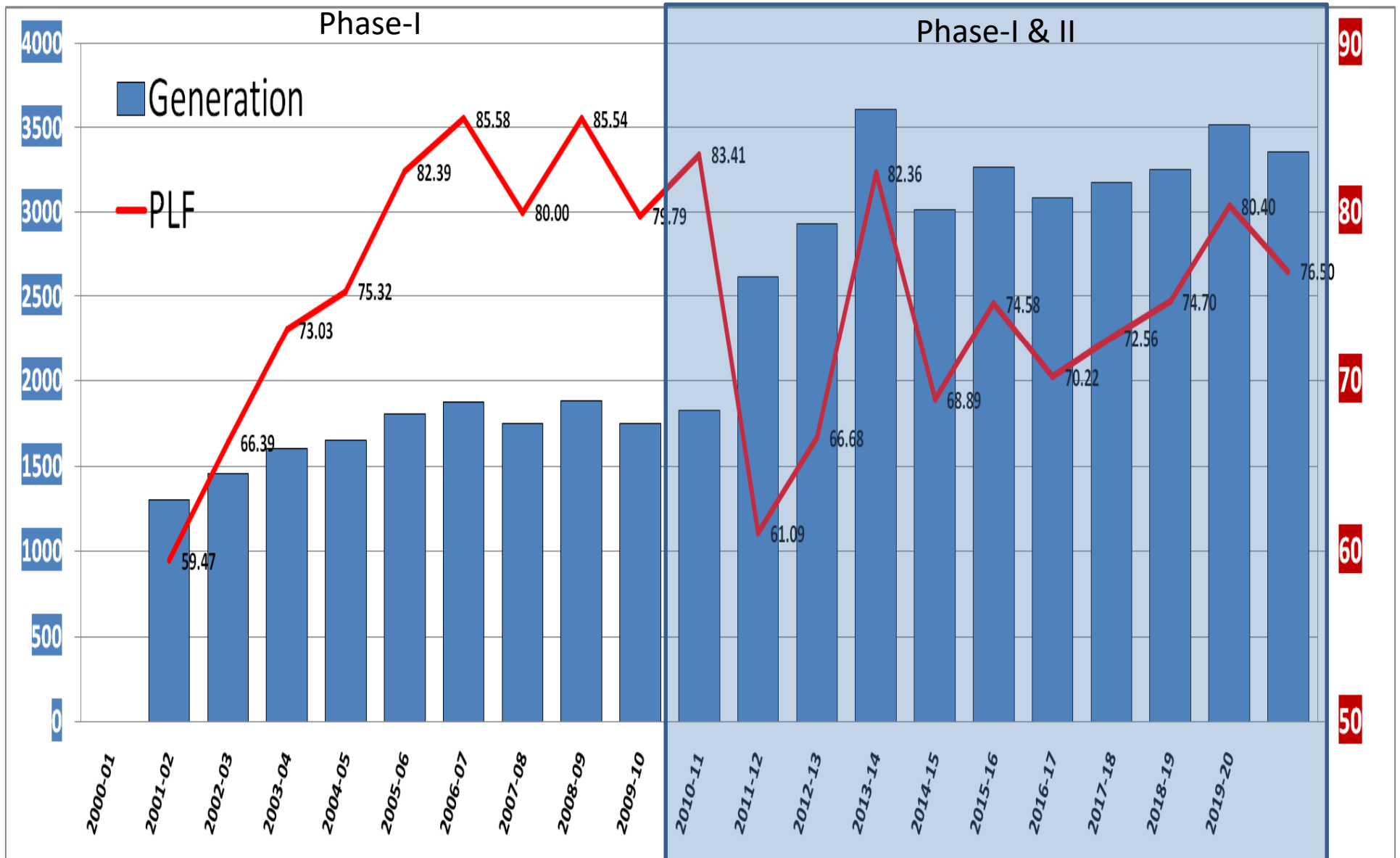


STEAM GENERATOR LAYOUT



SLPP All Units: Track Record

Consistent Average Performance (PLF 75.9% & 82.9% Availability)
Above National Average Since Inception



CFBC Boiler

- ❖ **Environment Friendly Circulating Fluidized Bed Combustion (CFBC) technology based Boilers.**
- ❖ **Boiler Supplied by BHEL; Designed by LLB, Germany.**
- ❖ **Main Operating Parameters :**
 - **Capacity : Phase-I : 390 T/hr,
Phase-II : 405 T/hr**
 - **Pressure : 132 kg/cm²**
 - **Temperature : 540 Deg C.**
- ❖ **Ph-I Design Lignite : 24% Moisture and 4240 kCal/kg GCV.**
- ❖ **Ph-II Design Lignite : 45% Moisture and 2900 kCal/kg GCV.**
Actual Lignite GCV : about 2500-2800 kcal/kg, moisture about 48-52%.
- ❖ **HFO for Unit Start-up & Secondary fuel.**

Salient features of CFBC Boiler

Pros. :

- Suitable for low grade fuel like lignite having low GCV.
- Environment Friendly: In-Situ Sulfur Capture, Low NOx generation.
- High combustion efficiency.
- Fuel Flexibility (Type & Quality).
- Simplified Fuel Preparation & Feeding.
- No requirement of pulveriser.
- High Sustainability under Cyclic Loading.
- High Operation Stability.
- Quick Restart under Hot Box-Up condition.
- FGD (Flue Gas De-sulphurization) not required.

Cons. :

- Huge refractory work (around 1500 MT in each Boiler).
- Higher unit outage duration owing to huge refractory.
- High Auxiliary Power Consumption.
- Maintenance intensive Boiler and Approach and Access issues for Maintenance.
- High erosion in Boiler.

Compliance of New Environmental Norms

- **Online monitoring facility at very first instance of SPCB/ CPCB**
- **Continuous monitoring of environmental parameters and immediate actions on exceedance**
- **Review of environment parameters on daily basis in Daily Plant Meeting, Monthly, Six Monthly & Annual Basis through various meetings**
- **Maintaining Boiler Operating Parameters**
- **Meeting NO_x emission due to Low Combustor Temperature and stage combustion**
- **Meeting SO₂ emission Norms with Limestone dosing**
- **Refurbishment of existing ESP fields and Revival of Dummy ESP fields in Phased manner to comply with New Environmental Norms**
 - **Phase-I (2x125 MW; commissioned in year 2000): 100 mg/Nm³ against design of 150 mg/Nm³**
 - **Phase-II (2x125 MW; commissioned in year 2010): 50 mg/Nm³ against design of 100 mg/Nm³**

Compliance of New Environmental Norms

Sr.No.	Industry	Parameter	Standards	Actual
1	2	3	4	
"25.	Thermal Power Plant	TPPs (units) installed before 31 st December, 2003*		SLPP Phase – I (2 X 125 MW); Commissioned in Year 2000
		Particulate Matter	100 mg/Nm ³	70 to 90 mg/Nm ³
		Sulphur Dioxide (SO ₂)	600 Mg/Nm ³ (Units Smaller than 500 MW capacity units)	Well below the notified limits (remains < 100 mg/Nm ³)
		Oxides of Nitrogen (NO _x)	600 Mg/Nm ³	Well below the notified limits (remains < 40 mg/Nm ³)
		Mercury (Hg)	0.03 mg/Nm ³ (For units having capacity of 500 MW and above)	Not Applicable

Compliance of New Environmental Norms

Sr.No.	Industry	Parameter	Standards	Actual
1	2	3	4	
"25.	Thermal Power Plant	TPPs (units) installed after 1 st January, 2003, up to 31 st December, 2016*		SLPP Phase – II (2 X 125 MW); Commissioned in Year 2010
		Particulate Matter	50 mg/Nm ³	40 to 60 mg/Nm ³
		Sulphur Dioxide (SO ₂)	600 mg/Nm ³ (Units Smaller than 500 MW capacity units)	Well below the notified limits (remains < 120 mg/Nm ³)
		Oxides of Nitrogen (NO _x)	300 450** mg/Nm ³	Well below the notified limits (remains < 40 mg/Nm ³)
		Mercury (Hg)	0.03 mg/Nm ³	< 0.03 mg/Nm ³

*TPPs (units) shall meet the limits within two years from date of publication of this notification.

** Revised as per GSR-662(E) dated 19/10/2020 by MoEF & CC.

Compliance of New Environmental Norms

Sr.No.	Industry	Parameter	Standards	Actual
1	2	3	4	SLPP (Ph-I &II)
"5A.	Thermal Power Plant (Water consumption limit)	Water consumption	<ul style="list-style-type: none"> ➤ All plants with Once Through Cooling (OTC) shall install Cooling Tower (CT) and achieve specific water consumption up to maximum of 3.5 M³/MWh within a period of two years from the date of publication of this notification. ➤ All existing CT based plants reduce specific water consumption up to maximum of 3.5 M³/MWh within a period of two years from the date of publication of this notification. 	Well below the notified limits (< 3.0 M ³ /MWh)

Screenshot of CPCB Webpage: Boiler-1 Average Emission for FY 2019-20

Yokogawa x +

← → ↻ yilcloud.yilrc.net/#/landing/industryReports/dynamicReportIndustry

YOKOGAWA
Dashboard ▾ Live Status ▾ Regulator Reports ▾ Industry Reports ▾ Calibration ▾ Work Flow ⁰

← Back / View Custom Report

Industry Name Gujarat Industries Power Company Limited (Surat Lignite Power Plant) Address VILLAGE NANI NAROLI TALUKA MANGROL, DISTRICT SURAT GUJARAT City Vadodara

District Vadodara State Gujarat Category Power Plant

Station STACK_1_Boiler_Phase1_Unit1,STACK_2_Boiler_Phase1_Unit_2,STACK_3_Boiler_Phase2 Parameters STACK_1_Boiler_Phase1_Unit1-SO2,STACK_1_Boiler_Phase1_Unit1-PM,STACK_1_Boiler_Phase1_Unit1-NOx Report Format Tabular

Criteria yearly Date From 2019/04/01 00:00:00 To 2020/03/31 11:37:56

Tabular view

Time X STACK_1_Boiler_Phase1_Unit1-SO2 - (mg/Nm3) Raw X STACK_1_Boiler_Phase1_Unit1-PM - (mg/Nm3) Raw X

STACK_1_Boiler_Phase1_Unit1-NOx - (mg/Nm3) Raw X

Search...

S. No	Time	STACK_1_Boiler_Phase1_Unit1-SO2 - (mg/Nm3) Raw	STACK_1_Boiler_Phase1_Unit1-PM - (mg/Nm3) Raw	STACK_1_Boiler_Phase1_Unit1-NOx - (mg/Nm3) Raw
1	2019-04-01	59.11	84.08	21.61

Screenshot of CPCB Webpage: Boiler-2 Average Emission for FY 2019-20

Yokogawa

yilcloud.yilrc.net/#/landing/industryReports/dynamicReportIndustry

Dashboard Live Status Regulator Reports Industry Reports Calibration Work Flow

Back / View Custom Report

Industry Name
Gujarat Industries Power Company Limited (Surat Lignite Power Plant)

Address
VILLAGE NANI NAROLI TALUKA MANGROL, DISTRICT SURAT GUJARAT

City
Vadodara

District
Vadodara

State
Gujarat

Category
Power Plant

Station
STACK_2_Boiler_Phase1_Unit_2

Parameters
STACK_2_Boiler_Phase1_Unit_2-SO2,STACK_2_Boiler_Phase1_Unit_2-PM,STACK_2_Boiler_Phase1_Unit_2-NOx

Report Format
Tabular

Criteria
yearly

Date
From 2019/04/01 00:00:00 To 2020/03/31 11:54:51

Tabular view

Time X STACK_2_Boiler_Phase1_Unit_2-SO2 - (mg/Nm3) Raw X STACK_2_Boiler_Phase1_Unit_2-PM - (mg/Nm3) Raw X
STACK_2_Boiler_Phase1_Unit_2-NOx - (mg/Nm3) Raw X

S. No	Time	STACK_2_Boiler_Phase1_Unit_2-SO2 - (mg/Nm3) Raw	STACK_2_Boiler_Phase1_Unit_2-PM - (mg/Nm3) Raw	STACK_2_Boiler_Phase1_Unit_2-NOx - (mg/Nm3) Raw
1	2019-04-01	61.39	79.24	13.65

Screenshot of CPCB Webpage: Boiler-3 Average Emission for FY 2019-20

The screenshot shows a web browser window with the URL `yilcloud.yilrc.net/#/landing/industryReports/dynamicReportIndustry`. The page header includes navigation menus for Dashboard, Live Status, Regulator Reports, Industry Reports, Calibration, and Work Flow. The main content area displays the following information:

- Industry Name:** Gujarat Industries Power Company Limited (Surat Lignite Power Plant)
- Address:** VILLAGE NANI NAROLI TALUKA MANGROL, DISTRICT SURAT GUJARAT
- City:** Vadodara
- District:** Vadodara
- State:** Gujarat
- Category:** Power Plant
- Station:** STACK_3_Boiler_Phase2_Unit_3
- Parameters:** STACK_3_Boiler_Phase2_Unit_3-SO2, STACK_3_Boiler_Phase2_Unit_3-PM, STACK_3_Boiler_Phase2_Unit_3-NOx
- Report Format:** Tabular
- Criteria:** yearly
- Date:** From 2019/04/01 00:00:00 To 2020/03/31 11:54:51

Below the details, there is a "Tabular view" section with a table of emission data. The table has the following columns: S. No, Time, STACK_3_Boiler_Phase2_Unit_3-SO2 - (mg/Nm3) Raw, STACK_3_Boiler_Phase2_Unit_3-PM - (mg/Nm3) Raw, and STACK_3_Boiler_Phase2_Unit_3-NOx - (mg/Nm3) Raw. The first row of data is as follows:

S. No	Time	STACK_3_Boiler_Phase2_Unit_3-SO2 - (mg/Nm3) Raw	STACK_3_Boiler_Phase2_Unit_3-PM - (mg/Nm3) Raw	STACK_3_Boiler_Phase2_Unit_3-NOx - (mg/Nm3) Raw
1	2019-04-01	118.04	55.11	32.89

Screenshot of CPCB Webpage: Boiler-4 Average Emission for FY 2019-20

The screenshot shows a web browser window with the URL `yilcloud.yilrc.net/#/landing/industryReports/dynamicReportIndustry`. The page is titled "View Custom Report" and displays the following information:

- Industry Name:** Gujarat Industries Power Company Limited (Surat Lignite Power Plant)
- Address:** VILLAGE NANI NAROLI TALUKA MANGROL, DISTRICT SURAT GUJARAT
- City:** Vadodara
- District:** Vadodara
- State:** Gujarat
- Category:** Power Plant
- Station:** STACK_4_Boiler_Phase2_Unit_4
- Parameters:** STACK_4_Boiler_Phase2_Unit_4-SO2, STACK_4_Boiler_Phase2_Unit_4-PM, STACK_4_Boiler_Phase2_Unit_4-NOx
- Report Format:** Tabular
- Criteria:** yearly
- Date:** From 2019/04/01 00:00:00 To 2020/03/31 11:54:51

The "Tabular view" section shows a table with the following data:

S. No	Time	STACK_4_Boiler_Phase2_Unit_4-SO2 - (mg/Nm3) Raw	STACK_4_Boiler_Phase2_Unit_4-PM - (mg/Nm3) Raw	STACK_4_Boiler_Phase2_Unit_4-NOx - (mg/Nm3) Raw
1	2019-04-01	117.33	66.87	26.48

Environment Management- Ash Utilization



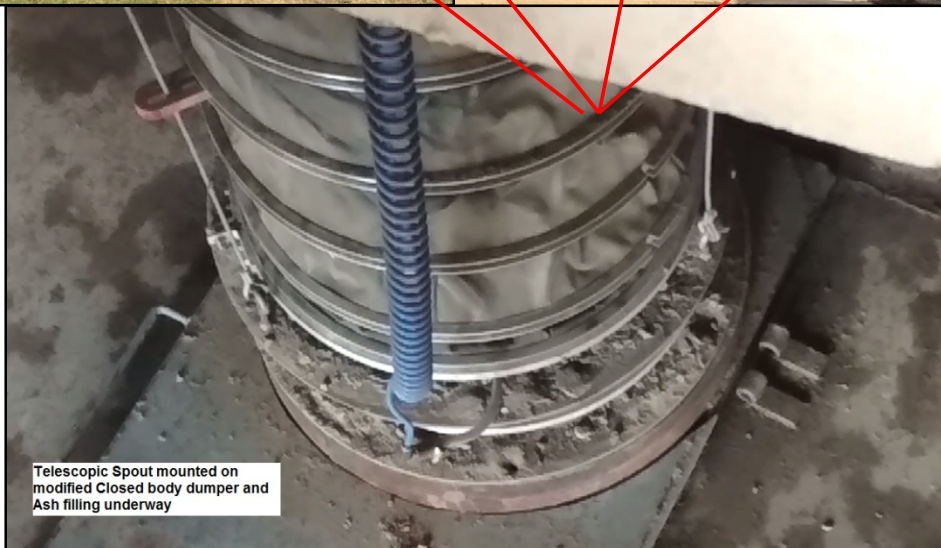
Particulars	UOM	2017-18	2018-19	2019-20
Ash Generated	Tons	565843	603310	570772
Ash Utilization	%	100	100	100
Ash Utilized in Fly Ash Bricks	MT, %	423543	400350	281391, 49.3%
Ash Utilized for Road pavements	MT, %	565843	202960	289382, 50.7%

GIPCL-Surat Lignite Power Plant has achieved 100% ash utilization since 2004 and also got the “National Award for Fly Ash Utilization (first prize)” jointly awarded by Ministry of Power, Ministry Environment & Forests and Department of Science & Technology, Government of India in 2005.

Bagged National Awards for 100% Fly Ash Utilization in succession for 2016, 2017, 2018, 2019, 2020 conferred by Mission Energy Foundation.

Ash Disposal to Outside Parties

The major utilization of Fly Ash is in manufacturing of Bricks, AAC blocks, paver blocks, AC sheets and tiles etc by outside parties. Other use of Ash is for filling of low lying areas, partly in construction of roads etc.



Waste Utilization- Food Waste Management



In Plant premises, we have developed vermin compost project in which **biodegradable waste from Industrial canteen, Guest Houses Mess and kitchen waste from colony residents** is being collected and converted in to Compost. This compost is utilized as a fertilizer in the garden and enhances fertility of soil as well as growth of the plants.



A view of Nursery developed near Industrial Canteen inside the plant – saplings are being grown using Vermi compost produced.



Major Issues and Challenges

- **Quality of Lignite & Limestone: Lignite & Limestone from own captive mines**
- **High Moisture content in Lignite (up to 52%):**
 - **Corrosion in FG Duct, ESP Casing / hoppers & Internals and TAPH Tubes because of Sulphur & Chlorides coupled with high moisture (up to 52%) which increases the dew point of SO_x.**
 - **Problems in Ash Evacuation from ESP hoppers due to moist fly ash**
- **Limestone feeding affects**
 - **Boiler efficiency significantly**
 - **Increases Auxiliary Power Consumption**
 - **Boiler Loading**
 - **Deposition in second pass tubes affecting heat transfer**
 - **HFO Consumption for Raw LS Heating**

Major Issues and Challenges

- **Partial loading of units for ESP maintenance work**
- **Increased planned outage for ESP fields refurbishment**
- **Optimised consumption of Limestone demands accurate measurement of SO₂**
- **Higher Relative Humidity of Ambient Air**
- **Higher rainfall in South Gujarat Region**
- **High Capex & Opex**

Challenge faced in SOx Measurement

❖ Issue: Erratic reading by SOx Analyzer

❖ Observation and Actions taken:

- Higher amount of water collection by Sample cooler
- Checking proper functioning of heat tracing

❖ Solution:

- Use of Permapure dryer (uses nefion tube, a patented technology, in which -30 to -40 Deg C dew point instrument air is supplied in cooler of nefion tube and shell in counter-flow direction. Instrument air absorbs moisture through membrane and outlet sample is almost moisture free) to have flue gas sample having same concentration of SOx/ NOx as inlet

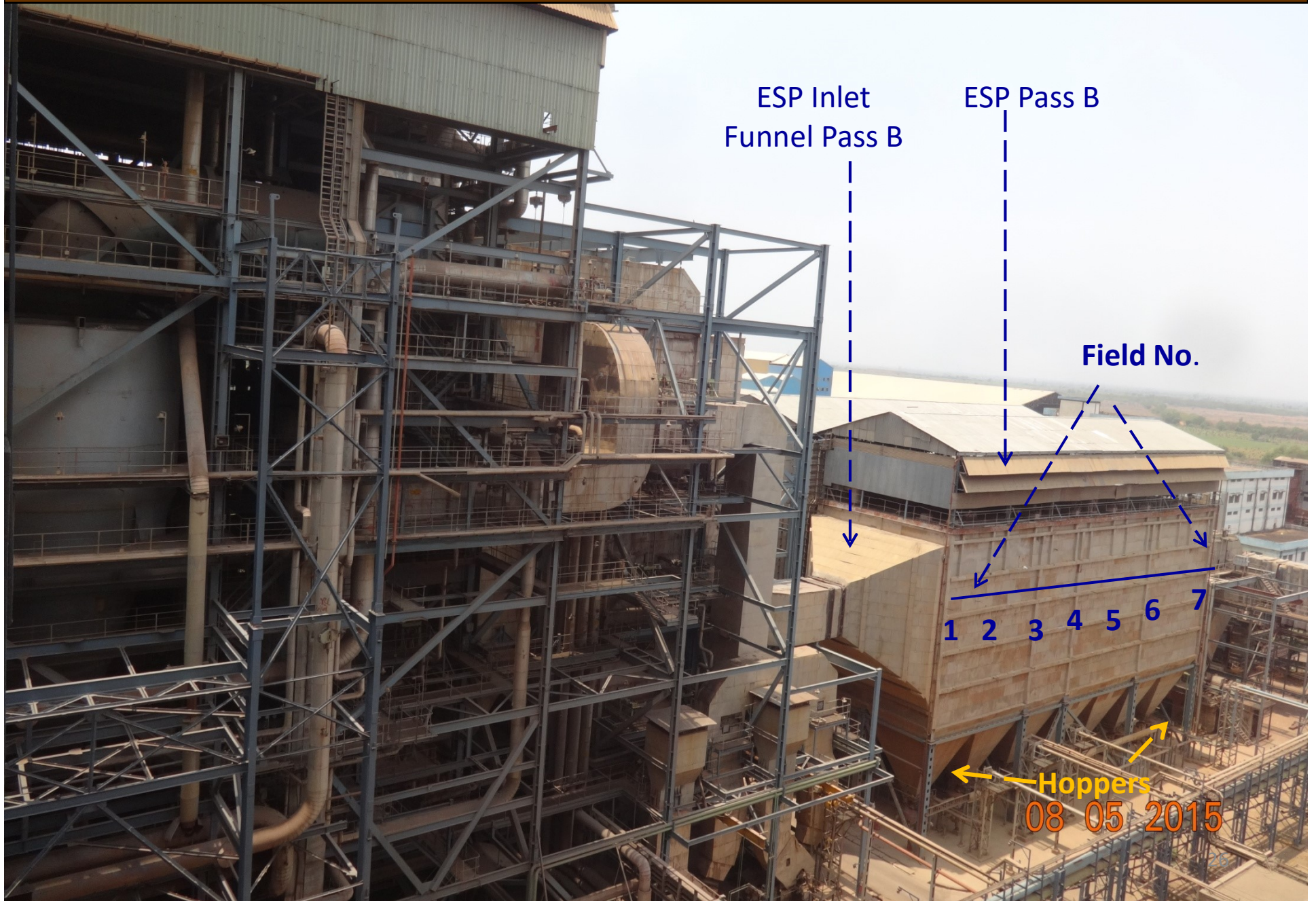
❖ Advantage:

- No requirement of heat tracing from Chimney to Analyzer (approx. 150 meters long): saving of power cost for heat tracing
- Optimization of limestone consumption based on actual reading

View of ESP



Side View of ESP



Major Problem faced – Puncture in ESP Casing / Flue Gas duct

Leakages at Hopper Area



ESP outlet funnel end



Puncture in ESP Casing / Flue Gas Duct

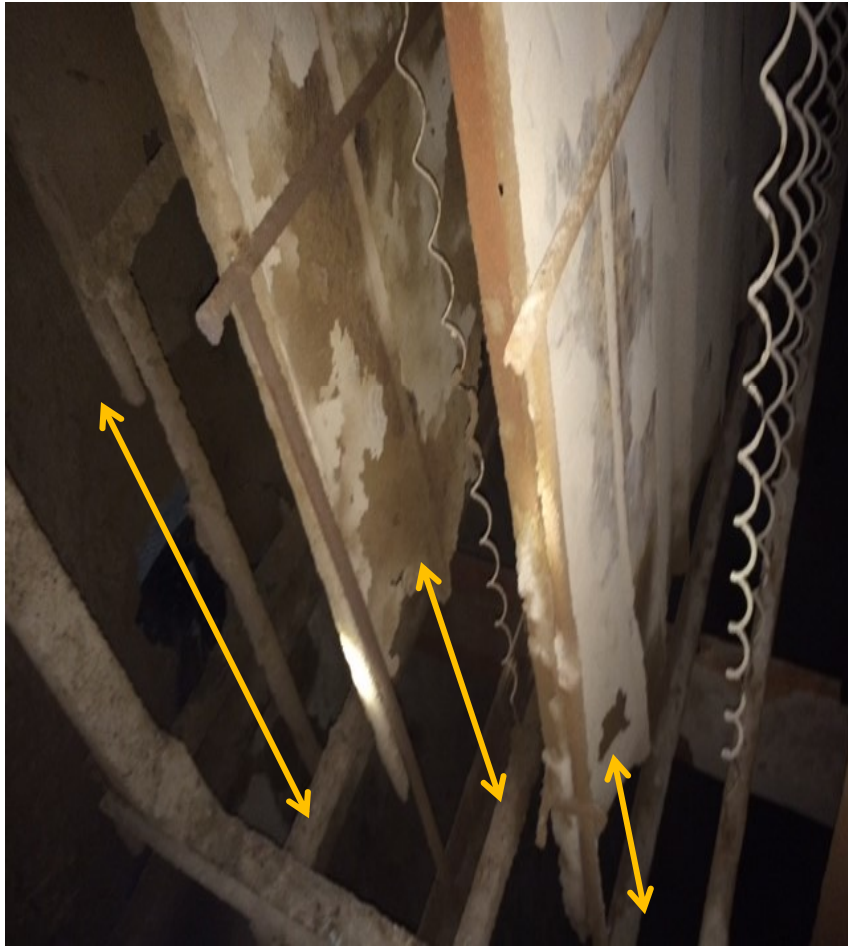
ESP SIDE CASING



ESP SIDE CASING



Corrosion of Collecting Plates



Corrosion of Collecting Plates



ESP OUTLET FUNNEL AT 26 METER



ESP OUTLET FUNNEL AT 11 METER



REPAIR OF ESP casing /Flue gas duct

ID FAN CASING: BEFORE



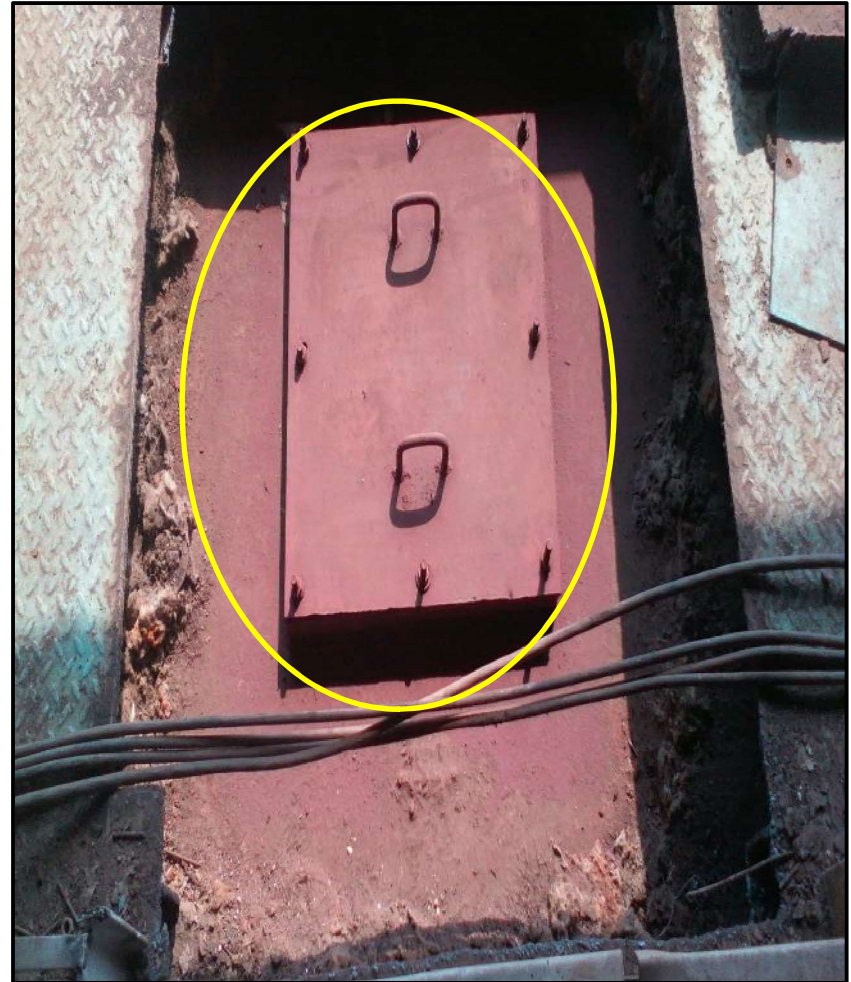
ID FAN CASING: AFTER



ESP INNER ROOF /MHD : BEFORE



ESP INNER ROOF /MHD: AFTER



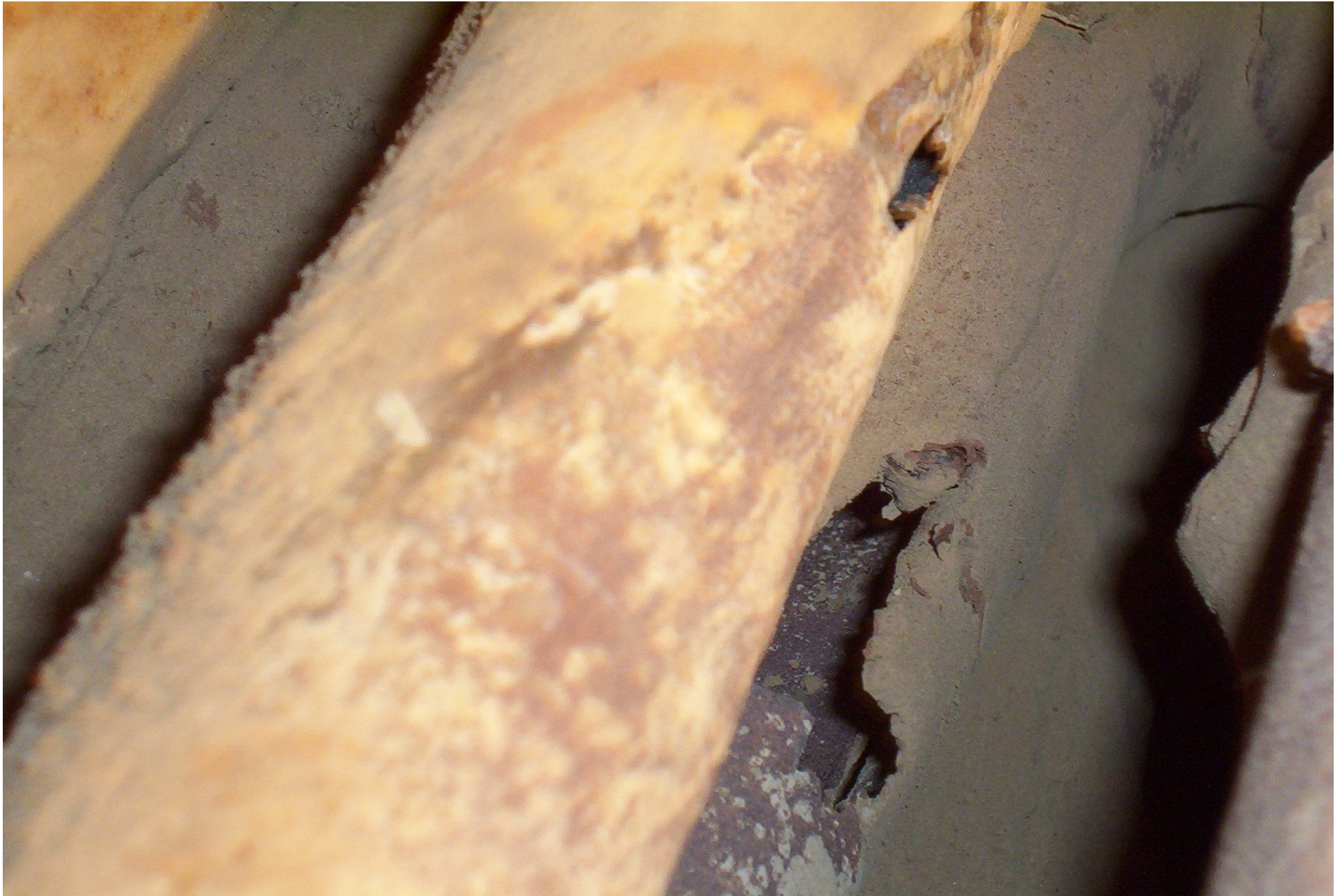
**ESP INNER ROOF CASING PLATE :
BEFORE**



**ESP INNER ROOF CASING PLATE :
AFTER**



APH tube leakages





Awards & Recognition

Awards Received for Environment Management



Outstanding performance in Environment Conservation and Pollution Control-2017 by SGCCI, Surat



Environment Excellence Award-2017

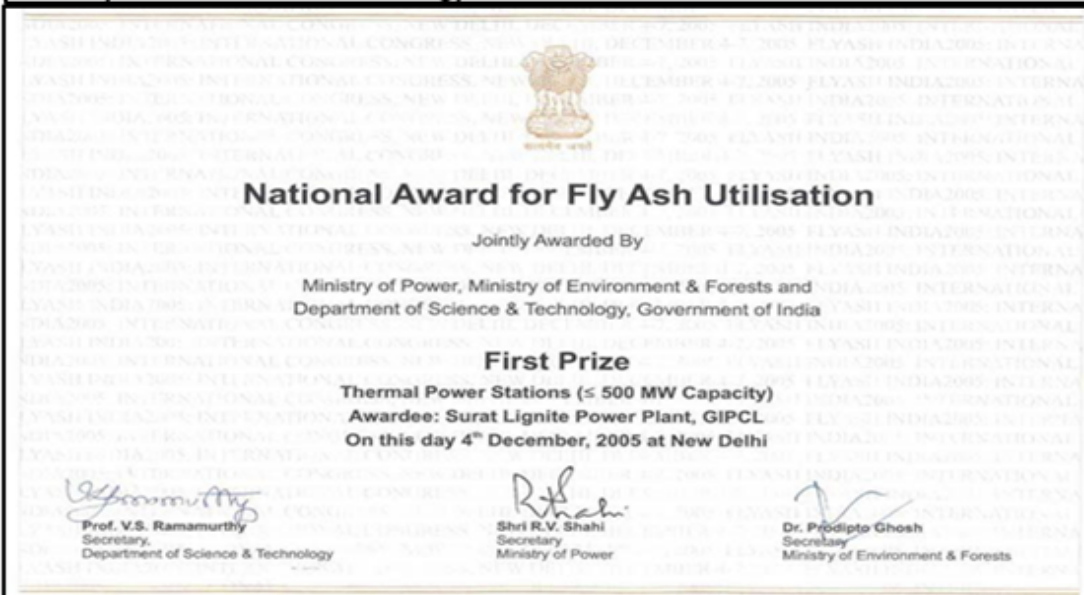


Environment Excellence Award-2018

Awards Received for Fly Ash Utilization & Water Conservation



National Award conferred to GIPCL – SLPP for 100% Ash Utilization Consecutively for three years i.e for 2017, 2018 & 2019 organized by Mission Energy 20Foundation jointly promoted by Ministry of Power (MoP), Ministry of Environment and Forest & Climate Change (MoEF and CC) and Ministry of Science and Technology.



first prize in “**BEST IN WATER USE**”
FY 2015-16

Surat Lignite Power Plant



NURSERY AT VASTAN MINES



SURAT LIGNITE POWER PLANT - GUJARAT INDUSTRIES POWER CO. LTD.
Generating Success



BAMBOO PLANTATION AT NANI NAROLI



GBD - EUCALYPTUS AT VASTAN MINES



BAMBOO PLANTATION AT FARM HOUSE



GBD - EUCALYPTUS AT VASTAN MINES



SURAT LIGNITE POWER PLANT - GUJARAT INDUSTRIES POWER CO. LTD.
Generating Success



GREEN BELT DEVELOPMENT



Road Side At Mangrol Mines Area



Overburden Dump Area At Mangrol Mines Area



CEA Appreciation Letter



तार/Telegrams : 'के.वि.प्रा.' CENTELEC
फैक्स/Fax : 26197267
Telefax: 011- 26715475

भारत सरकार
GOVERNMENT OF INDIA
केन्द्रीय विद्युत प्राधिकरण
CENTRAL ELECTRICITY AUTHORITY
विद्युत मंत्रालय
MINISTRY OF POWER
सेवा भवन, रामाकृष्णा पुरम, नई दिल्ली - 110 066
SEWA BHAWAN, RAMAKRISHNA PURAM, NEW DELHI - 110 066

सं० CEA/TETD-MP/2018/G-3/331
No.

दिनांक 20.03.2018
Dated

Dear Shri N.K. Singh,

This refers to my visit to your 4x125 MW Surat Lignite TPS and Valia lignite mine on 12.03.2018 alongwith two other officers of CEA. I express my sincere thanks for the courtesy extended during the visit and I would like to convey that our visit to the power plant and lignite mine was very fruitful. It was very heartening to note that all the four CFBC units were operating at near full load. The dense green environment created and maintained by SLPP surrounding the plant & facilities is unique in itself. The ambience inside the power plant premises was maintained in very good condition with low noise level and excellent housekeeping.

As regards visit to Valia lignite mine, we convey our appreciation for maintaining good road transport of lignite by dumpers to the power plant situated more than 20 km from the mine, with no dust nuisance and no lignite spillage seen along the route.

I wish that high standards of plant performance and lignite mining would be maintained by SLPP and that these are taken as example cases by the power industry.

Best of luck for all endeavours of SLPP.

Regards

20.3.2018
(Dr. L. D. Papney)
Chief Engineer
TE&TD Division

Shri N. K. Singh,
General Manager,
Surat Lignite Power Plant
Gujarat Industries Power Company Ltd.
Post: Nani Naroli, Taluk: Mangrol,
District: Surat- 394110 Gujarat

Covering of Lignite/ Limestone stock during monsoon





Thanks