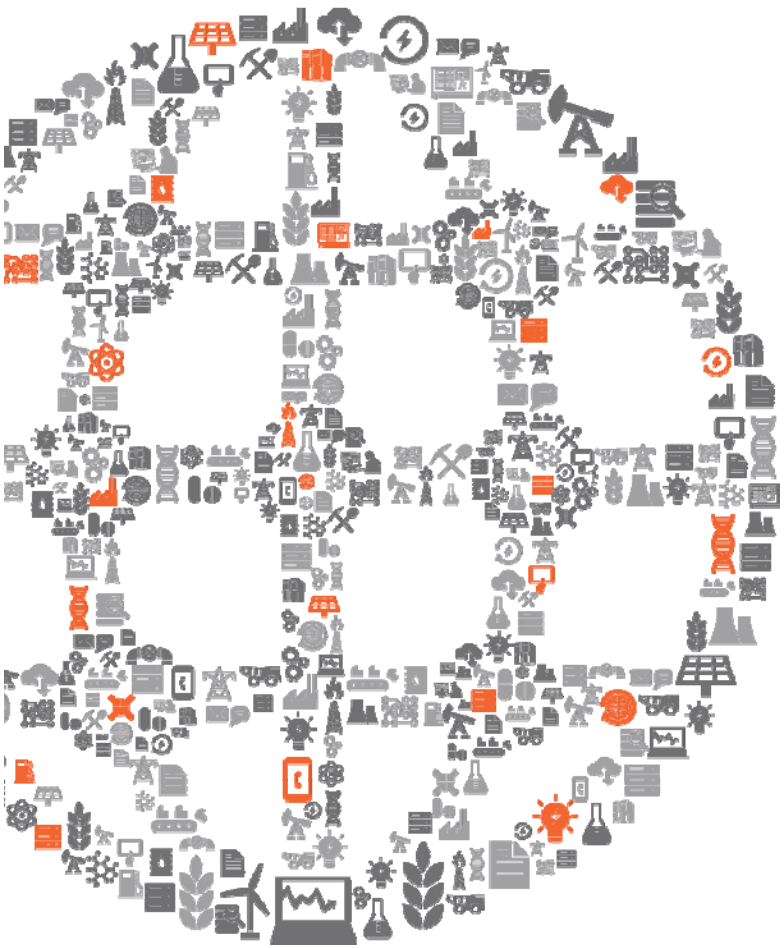
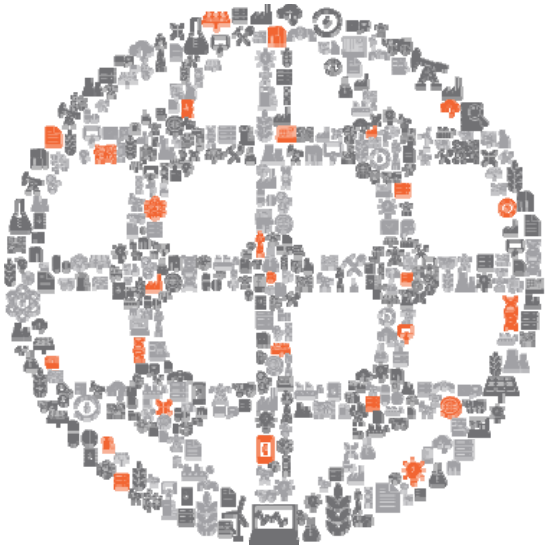


Output Loss Analysis

Capacity Loss Analyzer for a CCGT power station

Presented by : **Diwakar Kaushik, AGM(ERP), NTPC Ltd., NOIDA**

Raj Pal Singh, DGM(ERP), NTPC Ltd., NOIDA



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REGIONAL SEMINARS

The Power of Data

THRIVING IN A WORLD OF CHANGE

I N D I A

August 22 - 23, 2013
Mumbai, India

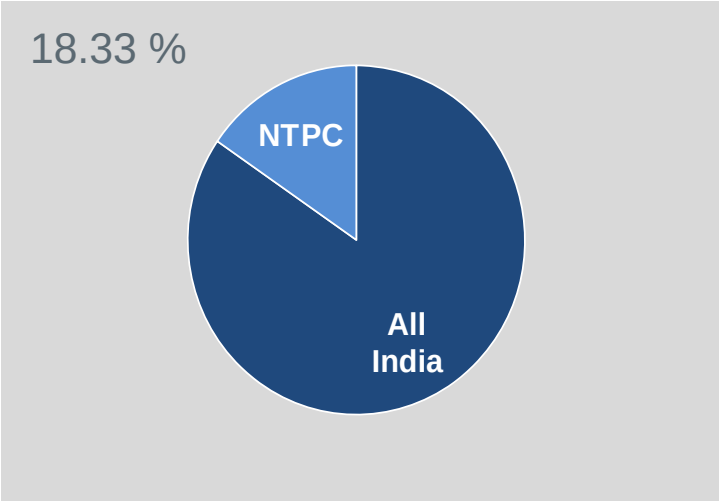
AGENDA

- About NTPC
- PI System implementation in NTPC
- Business Challenge
- Solution - OLA (Output Loss Analysis)
- OLA – Configuration, Process Flow & displays
- OSISoft Products employed
- OLA – Results / Benefits
- Future Roadmap
- Summary
- Conclusion

About NTPC

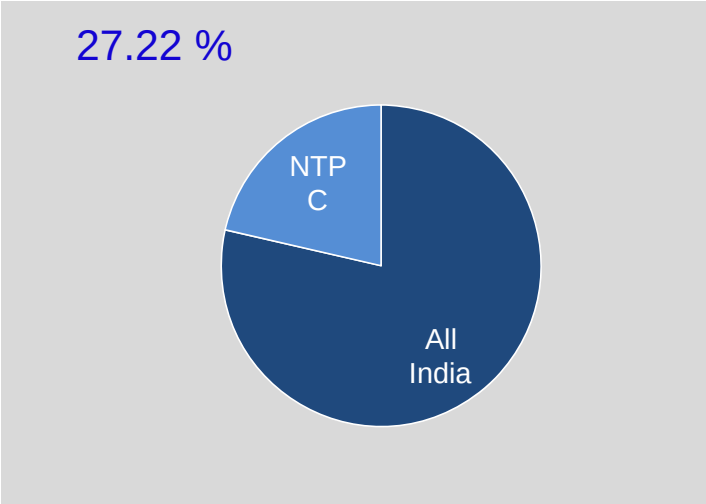
Total Capacity*

41,184 MW



Generation*

246.99 BU



NTPC Contributes More Than One-fourth of India's Total Power Generation with Less Than One-fifth Capacity

- Set up in 1975 with 100% ownership by government of India
- The largest power generation company in India, with comprehensive in-house capabilities in building and operating power projects
- Target of 1,28,000 MW capacity by 2032
- 3820 MW of new commercial capacity addition in 2012-13

** Including Joint Ventures*

About NTPC

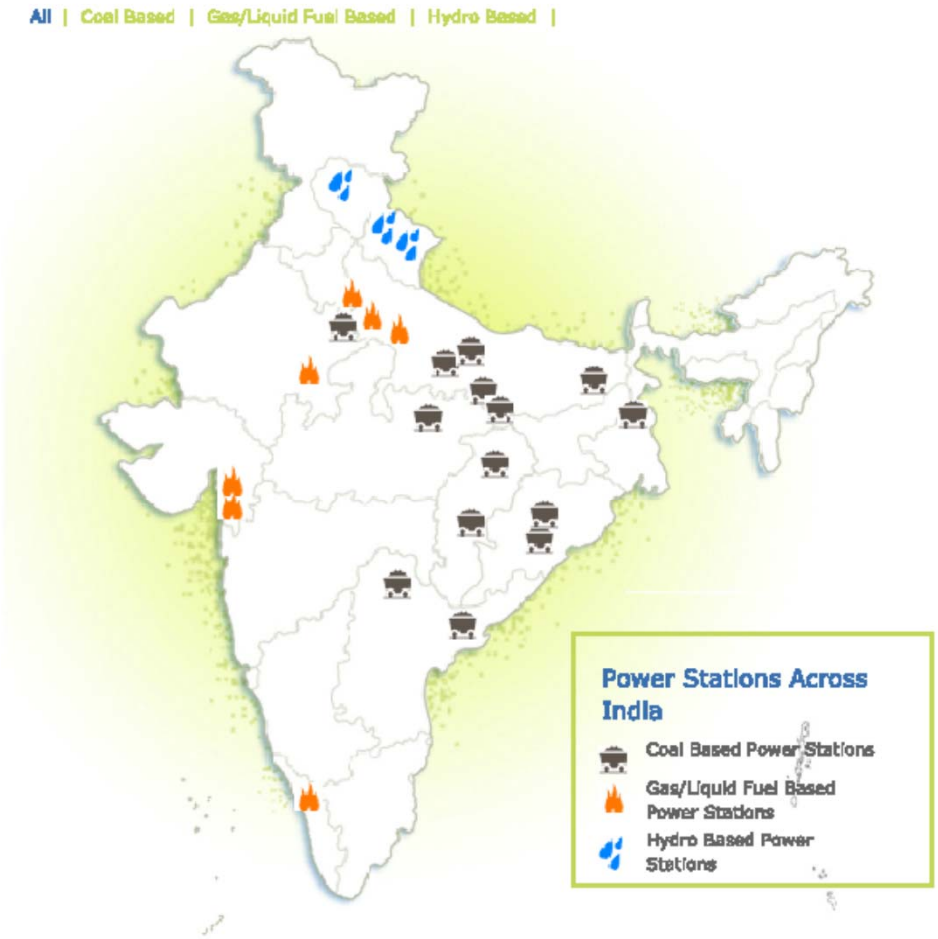
Stature

- Awarded “Maharatna” status in May 2010
- No.1 Independent Power Producer globally in 2012 as reported by Platts in its top 250 Global Energy Company Rankings
- 3rd overall in ‘India’s best companies to work for 2012’, a study by The Great Places to work Institute India & The Economic Times.
- The most respected company in Power Sector for the year 2011 by Businessworld.
- Ranked 348th largest company in the world as per Annual Ranking of top 2000 companies in the world by Forbes in 2011

About NTPC
Performance 2012-13

- NTPC has achieved a generation of **232.028** BU against a generation of **222.068** BU in 2011-12, a growth of **4.49** %.
- **Three** NTPC coal stations are amongst the **top five** stations of the country in terms of PLF.
- NTPC coal PLF is **83.08** % against all India PLF (incl. NTPC) of **69.93** %. .
- NTPC coal stations have achieved Availability of **90.20** % against GOI-MOU target of **90.00** %.

NTPC – Presence in India



Type of Plant	No.
Coal based	**16** (31855MW)
Gas / Liquid Fuel based	**07** (3955 MW)
Renewables	**02** (10 MW)
JV's (Coal & Gas)	**07** (5364MW)

PI System implementation

PI System implemented in NTPC at

- 16 Coal stations
- 7 Gas stations
- Corporate office

Business Challenge

- The problem of output loss with time is a inherent feature of gas turbines.

- A part of this loss could be irrecoverable owing to mechanical reasons, but rest is possible to recover.

- The recoverable loss area wise breakup is not available in the conventional DCS systems, hence difficult to identify & optimize.

Solution - OLA (Output Loss Analysis)

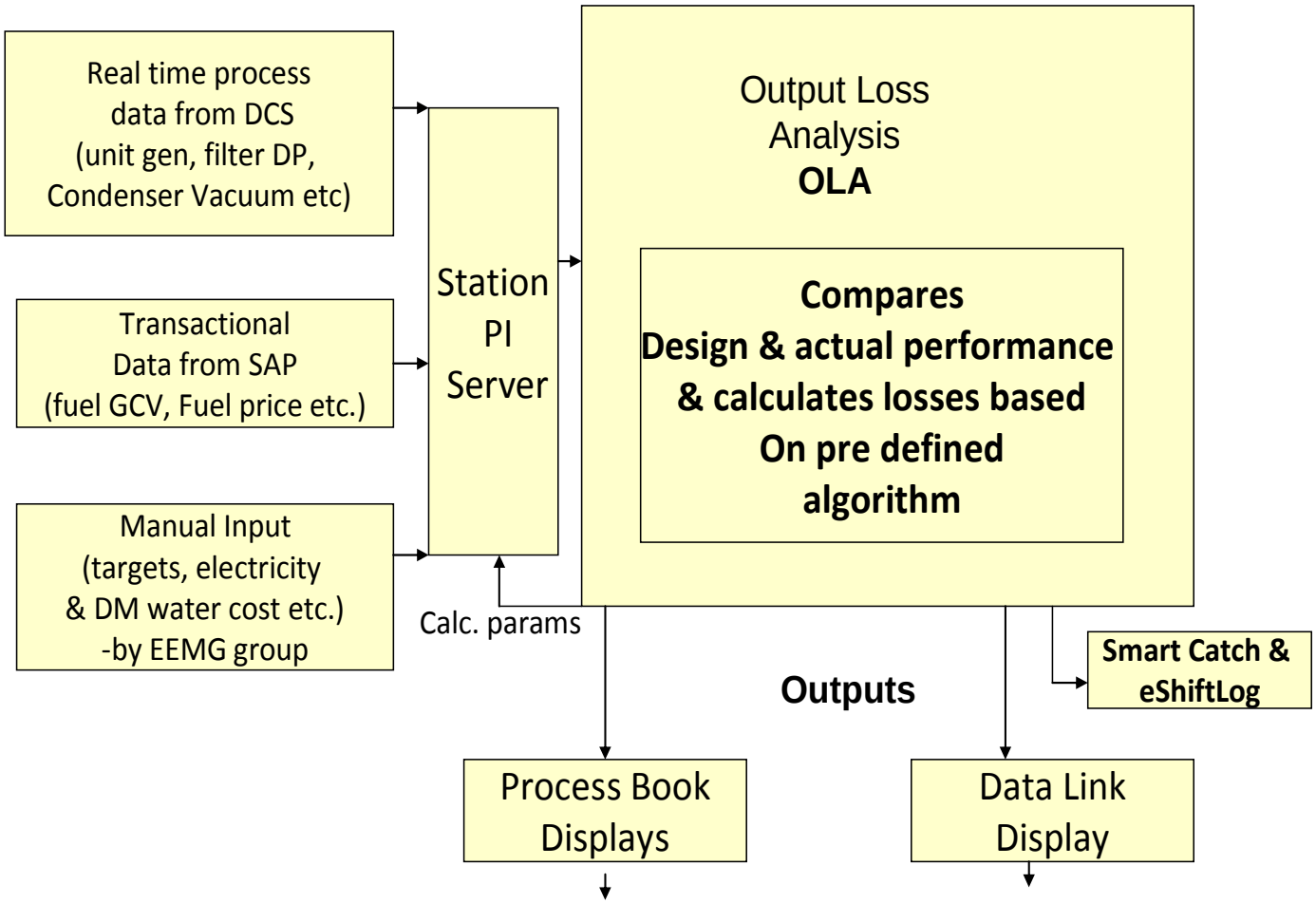
- Output Loss Analysis (OLA) is a tool to identify the CCGT station output (MW) losses plant area wise in real time enabling timely corrective actions to optimize them .

- The losses are displayed in monetary terms as well to have the desired impact on the operator.

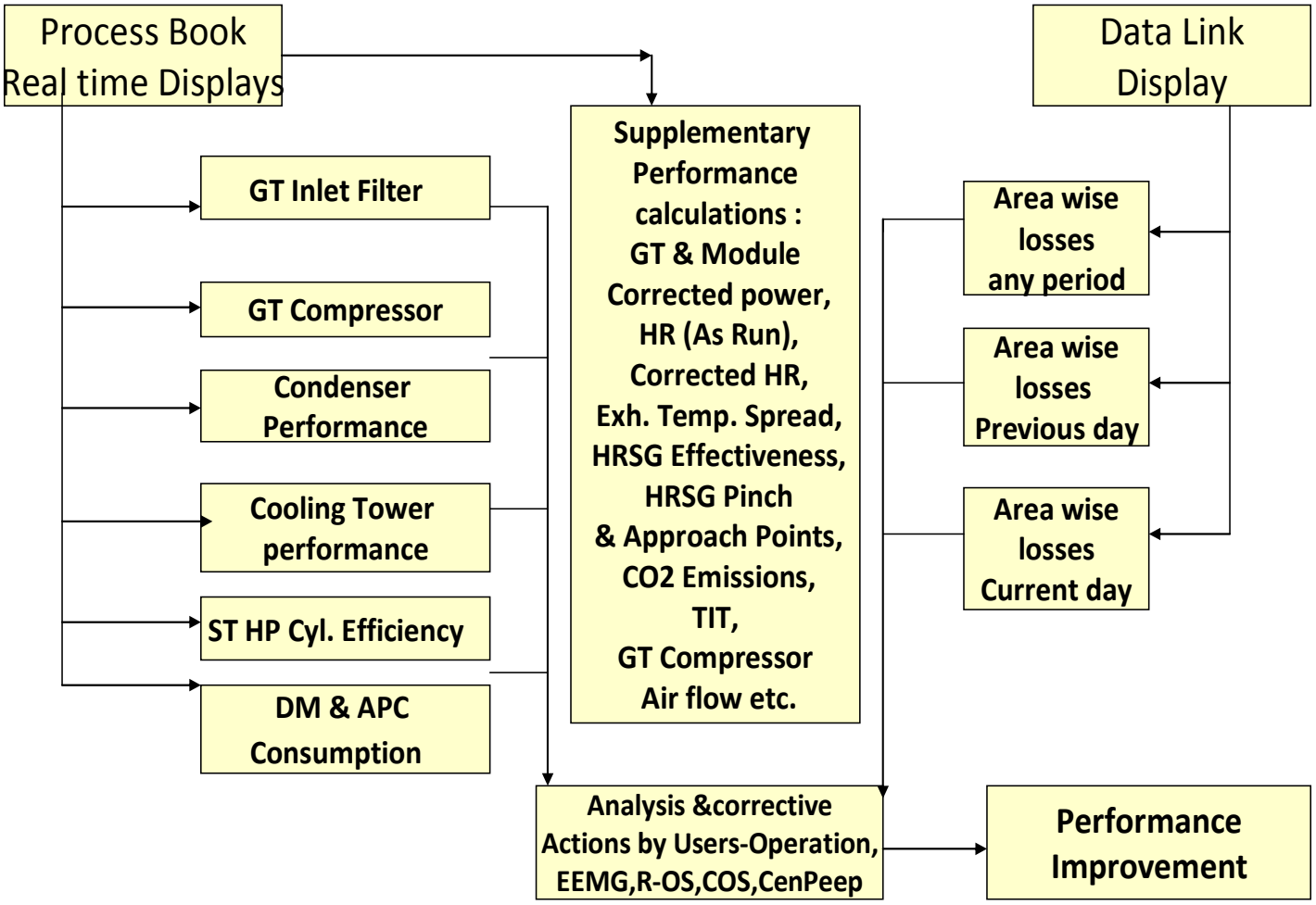
OLA – Configuration

- The OLA is developed using PI-ACE & PI MDB on .Net platform displaying its output in PI Process Book.
- The application works on the base data derived from
  - Station PI server
  - Registered data specific to the station (e.g. targets etc.)
  - Transaction data from SAP (e.g. fuel GCV….)

OLA-Process Flow



OLA-Process Flow



OLA – Displays

Uncontrollable losses

Ambient temperature, pressure, RH & frequency

Major Controllable losses

- Higher GT Inlet Air filter DP
- GT compressor efficiency deviation
- Condenser Back Pressure deviation
- Aux power consumption deviation

Supplementary Features

- GT & Module actual/corrected KPI's
- Loss Reports for a period
- OLA Help

OSISoft Products Used

- PI Server
- PI-ACE
- PI Module Database
- PI Process Book
- PI Data Link

OLA Results / Benefits

-Improved operator awareness of critical plant performance KPI's

- Allows operators to make critical cost effective decisions based on evaluated plant conditions

- Output loss quantification helps in prioritizing resource allocation to increase productivity

- Integration of process data with transaction data for MIS & other applications

-Maintenance effort is quantifiable based on pre & post work cost of losses

*Activities such as condenser water box cleaning, GT compressor washing, auxiliaries changeover at site are being done as per OLA recommendation.

OLA Future Roadmap

- Advice for GT Inlet air filter replacement based on filter replacement cost & output loss due to high filter DP.

- Indicators for GT Inlet temperature & mass flow in GT Performance

- Alerts for GT compressor wash based on GT compressor performance

- Completing OLA roll out at all NTPC CCGT stations

Conclusion

- Implementation of Performance enhancing applications has given a new dimension to the level & quality of information available within the plant as well as outside it.

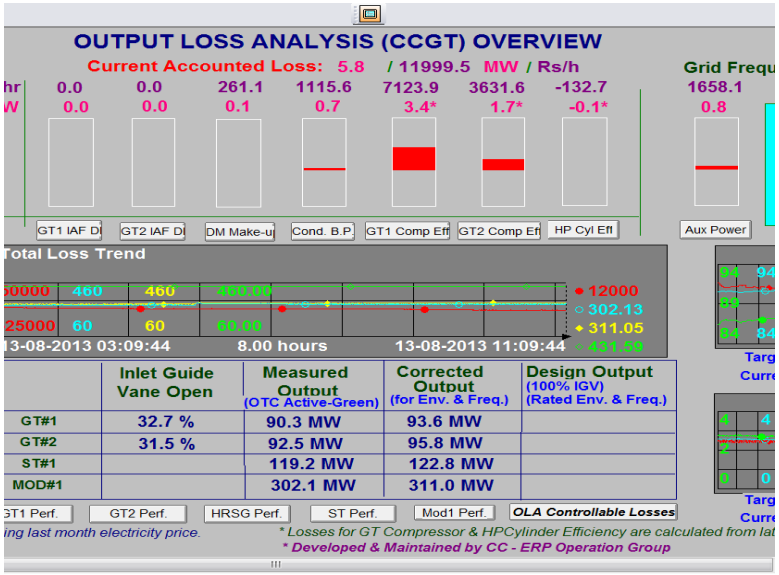
- Using these applications, the operator have an advisory tool with them to optimize station performance with quantified support to validate & justify his actions.

- The demand for more applications of such nature & addition of new features in existing applications is increasing by the day.

Summary

OLA – Output Loss Analysis

- Implementation of OLA has given a new dimension to the level & quality of information and an advisory tool for the operator to optimize station performance with quantified support to validate & justify his actions.



Business Challenge

- To identify area wise output loss for a CCGT Module & guide the operator to take necessary corrective action for loss optimization

Solution

Output Loss Analysis (OLA) is a tool to identify the CCGT station output losses plant area wise in MW as well as in monetary terms.

Results and Benefits

-Critical cost effective decisions based on evaluated plant conditions

- Prioritizing resource allocation to increase productivity

Contact Information

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   rajpalsingh@ntpc.co.in

   NTPC Ltd., Noida

THANK YOU

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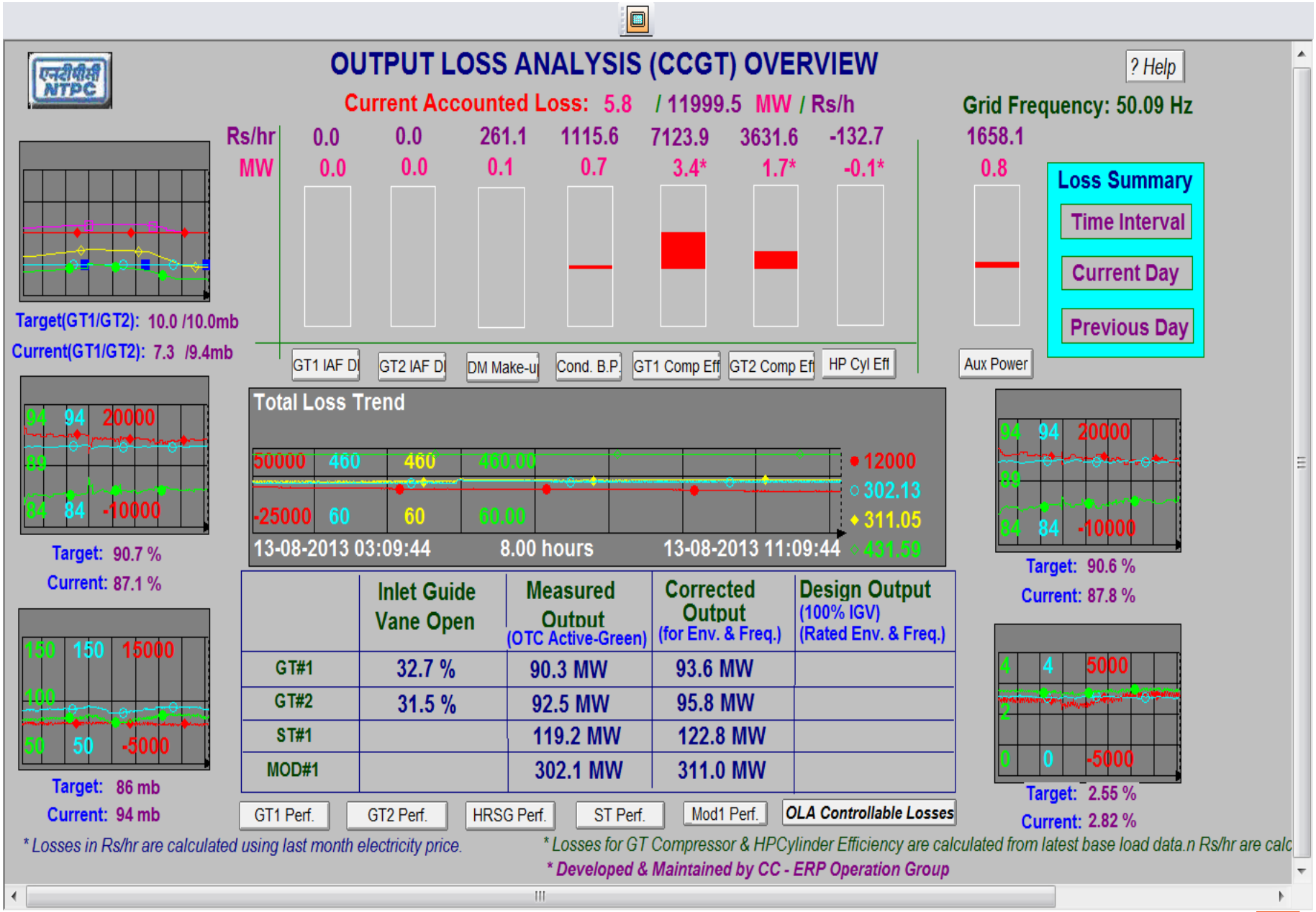

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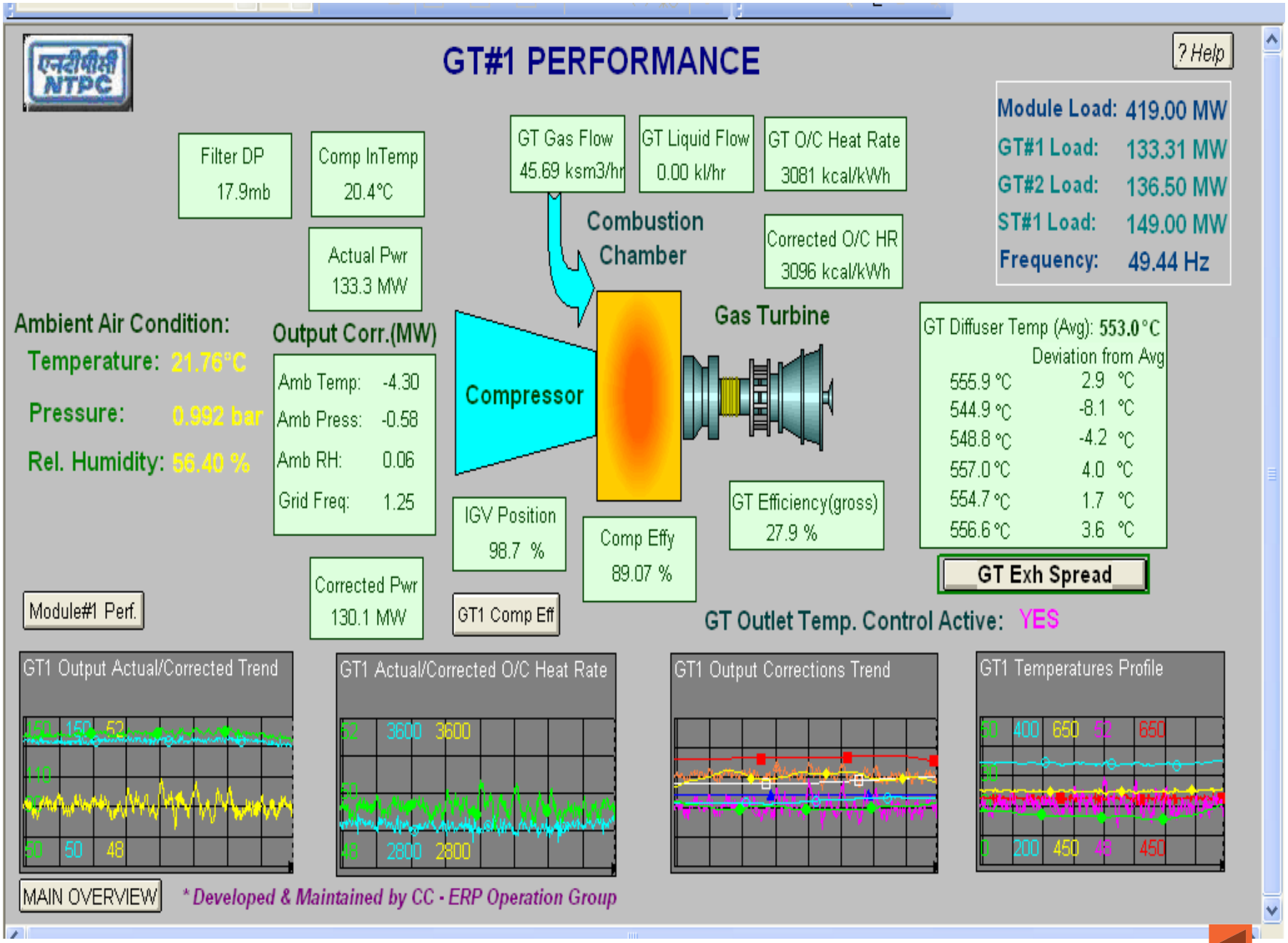

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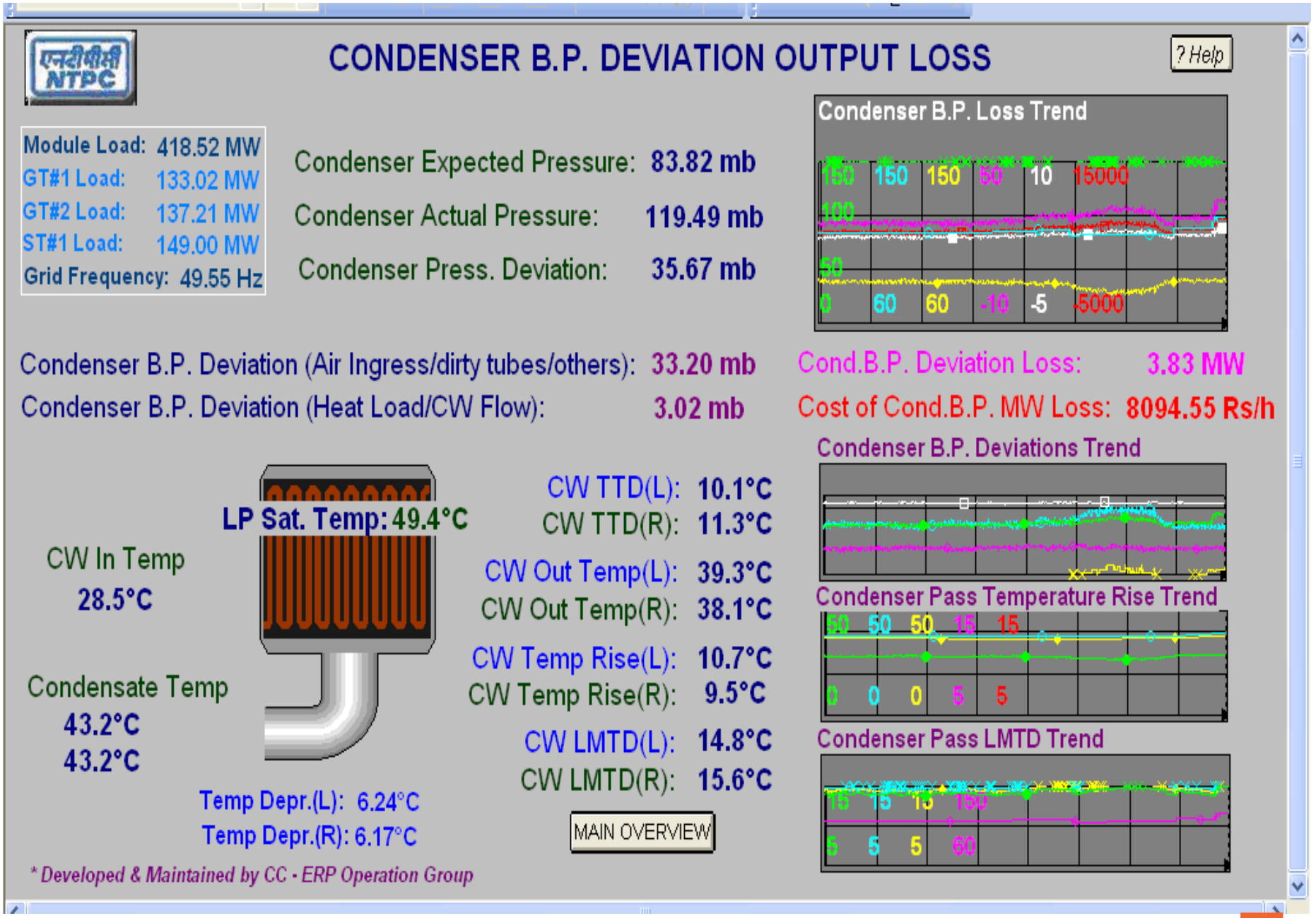

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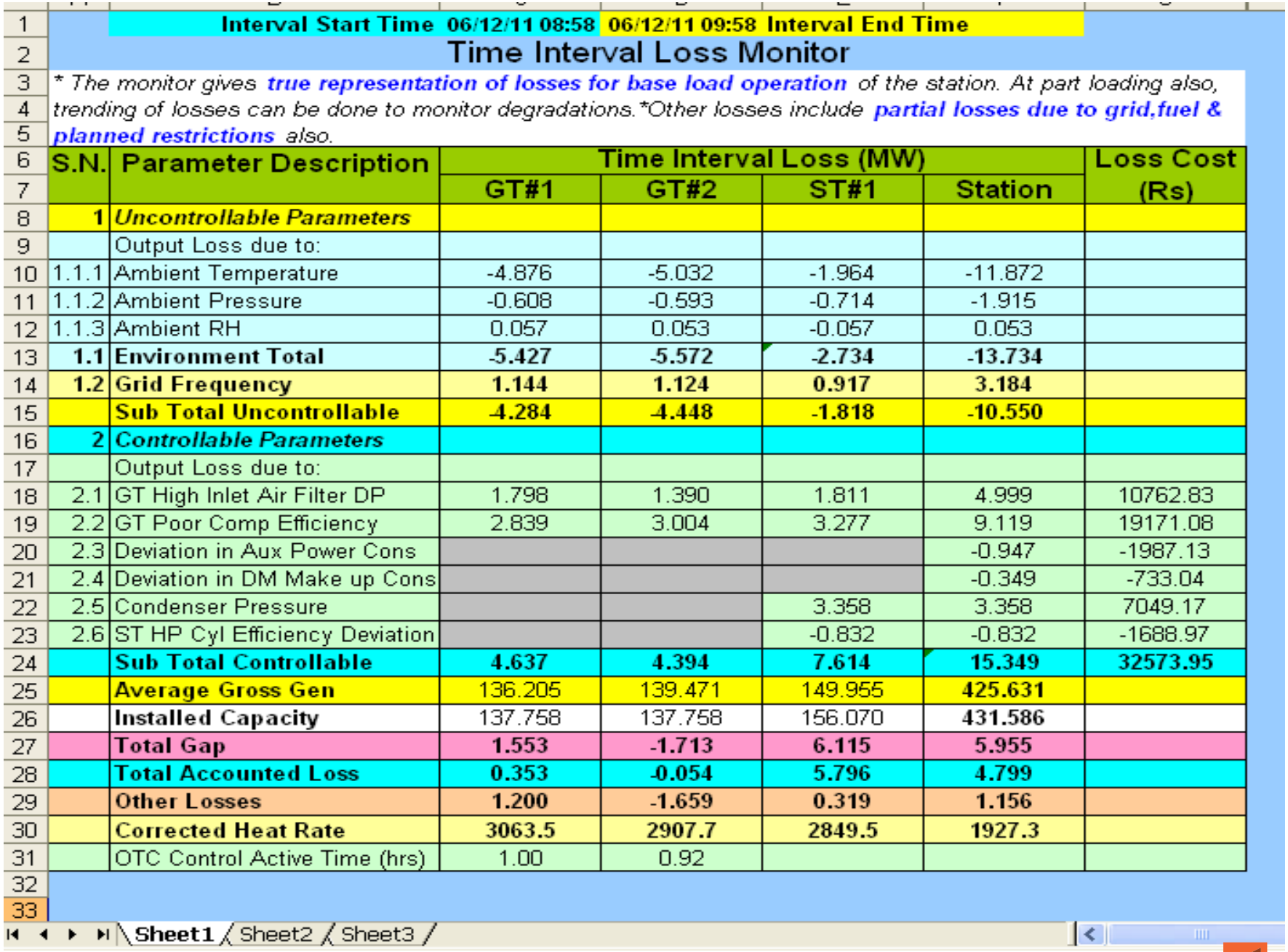


Interval Start Time 06/12/11 08:58 06/12/11 09:58 Interval End Time

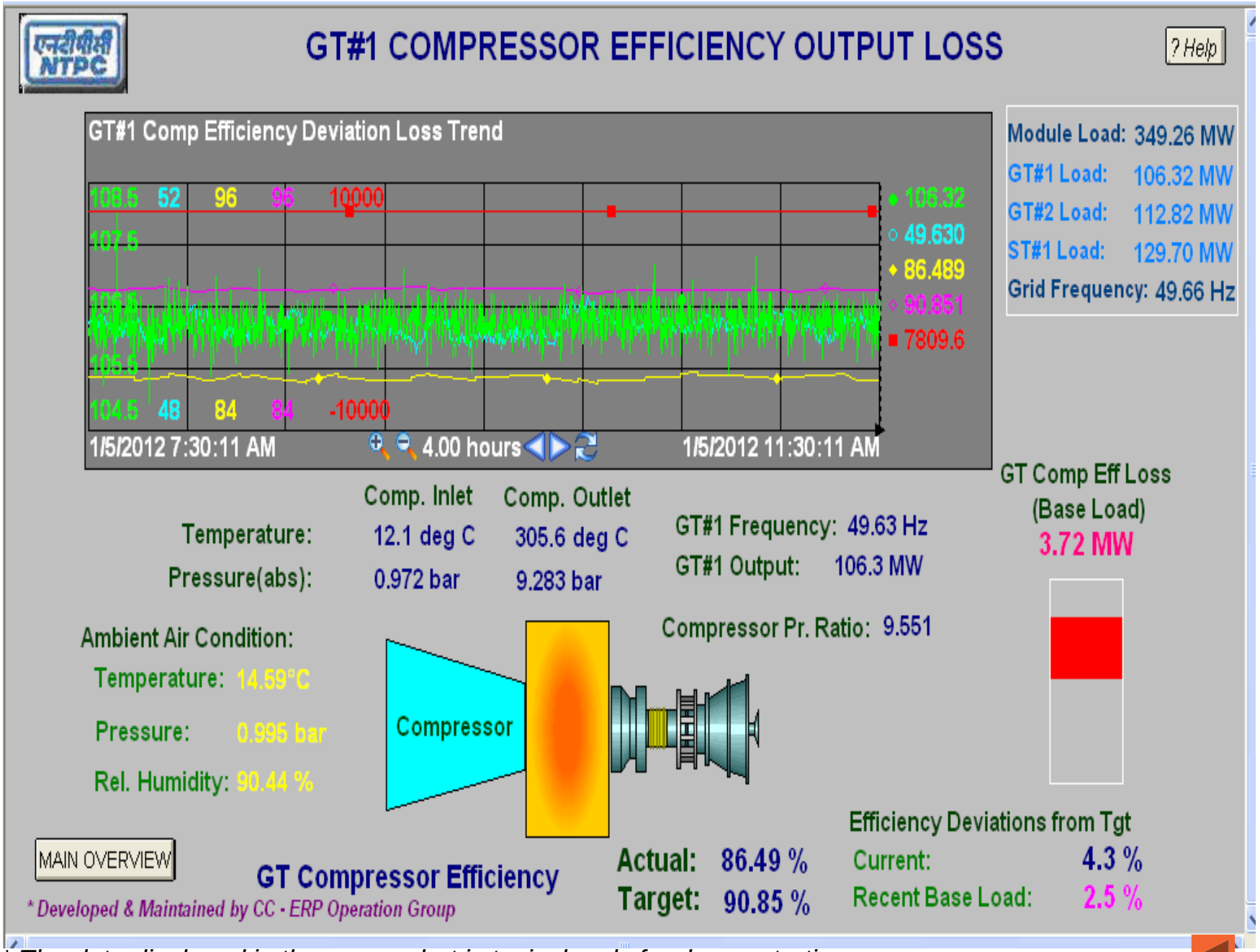
Time Interval Loss Monitor

** The monitor gives **true representation of losses for base load operation** of the station. At part loading also, trending of losses can be done to monitor degradations.*Other losses include **partial losses due to grid,fuel & planned restrictions** also.*

S.N.	Parameter Description	Time Interval Loss (MW)				Loss Cost (Rs)
		GT#1	GT#2	ST#1	Station	
1	***Uncontrollable Parameters***					
	Output Loss due to:					
1.1.1	Ambient Temperature	-4.876	-5.032	-1.964	-11.872	
1.1.2	Ambient Pressure	-0.608	-0.593	-0.714	-1.915	
1.1.3	Ambient RH	0.057	0.053	-0.057	0.053	
1.1	**Environment Total**	**-5.427**	**-5.572**	**-2.734**	**-13.734**	
1.2	**Grid Frequency**	**1.144**	**1.124**	**0.917**	**3.184**	
	Sub Total Uncontrollable	**-4.284**	**-4.448**	**-1.818**	**-10.550**	
2	***Controllable Parameters***					
	Output Loss due to:					
2.1	GT High Inlet Air Filter DP	1.798	1.390	1.811	4.999	10762.83
2.2	GT Poor Comp Efficiency	2.839	3.004	3.277	9.119	19171.08
2.3	Deviation in Aux Power Cons				-0.947	-1987.13
2.4	Deviation in DM Make up Cons				-0.349	-733.04
2.5	Condenser Pressure			3.358	3.358	7049.17
2.6	ST HP Cyl Efficiency Deviation			-0.832	-0.832	-1688.97
	Sub Total Controllable	**4.637**	**4.394**	**7.614**	**15.349**	**32573.95**
	Average Gross Gen	136.205	139.471	149.955	**425.631**	
	Installed Capacity	137.758	137.758	156.070	**431.586**	
	Total Gap	**1.553**	**-1.713**	**6.115**	**5.955**	
	Total Accounted Loss	**0.353**	**-0.054**	**5.796**	**4.799**	
	Other Losses	**1.200**	**-1.659**	**0.319**	**1.156**	
	Corrected Heat Rate	**3063.5**	**2907.7**	**2849.5**	**1927.3**	
	OTC Control Active Time (hrs)	1.00	0.92			

Sheet1 / Sheet2 / Sheet3

** The data displayed in the screenshot is typical, only for demonstration purpose.*



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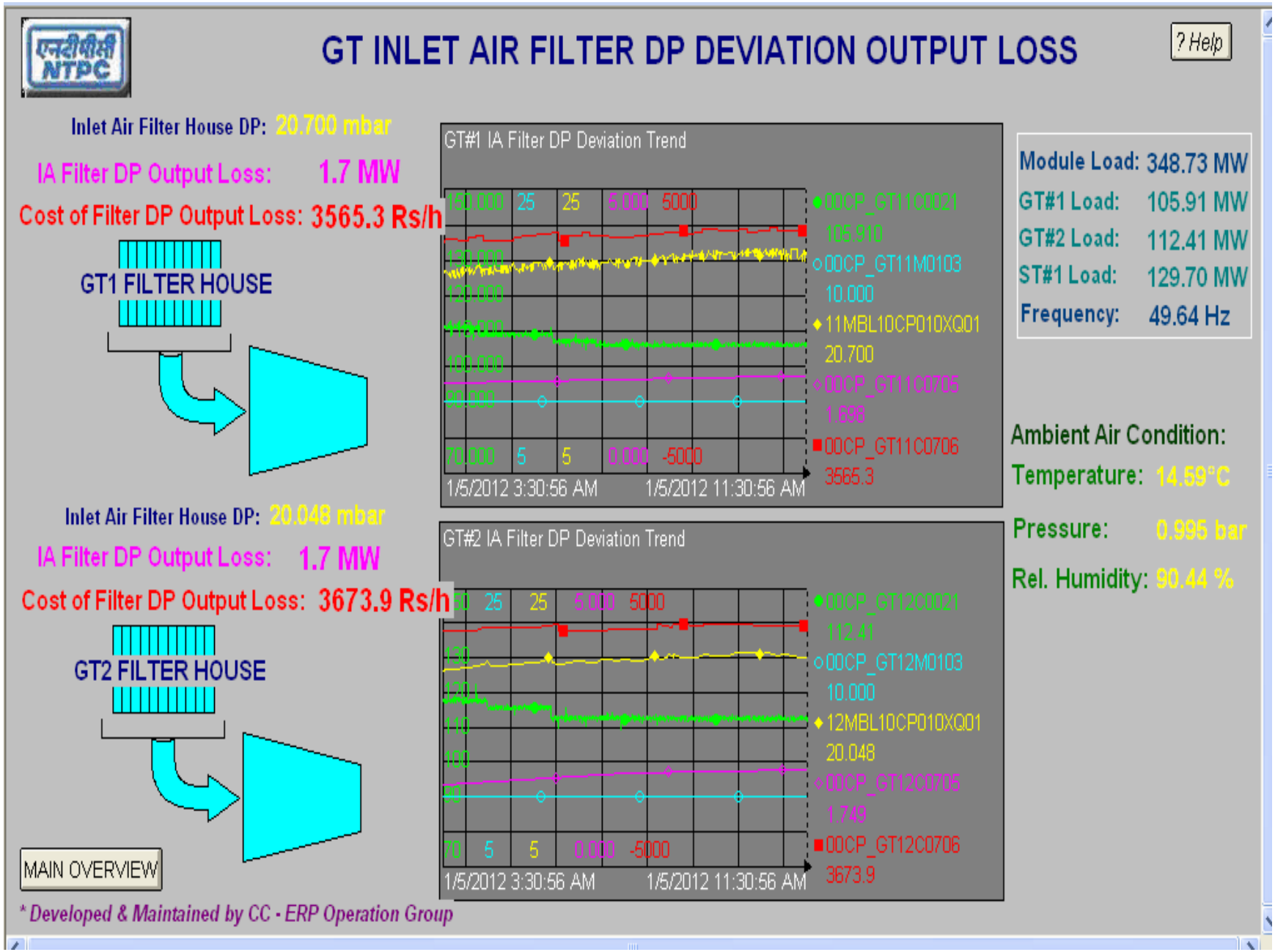

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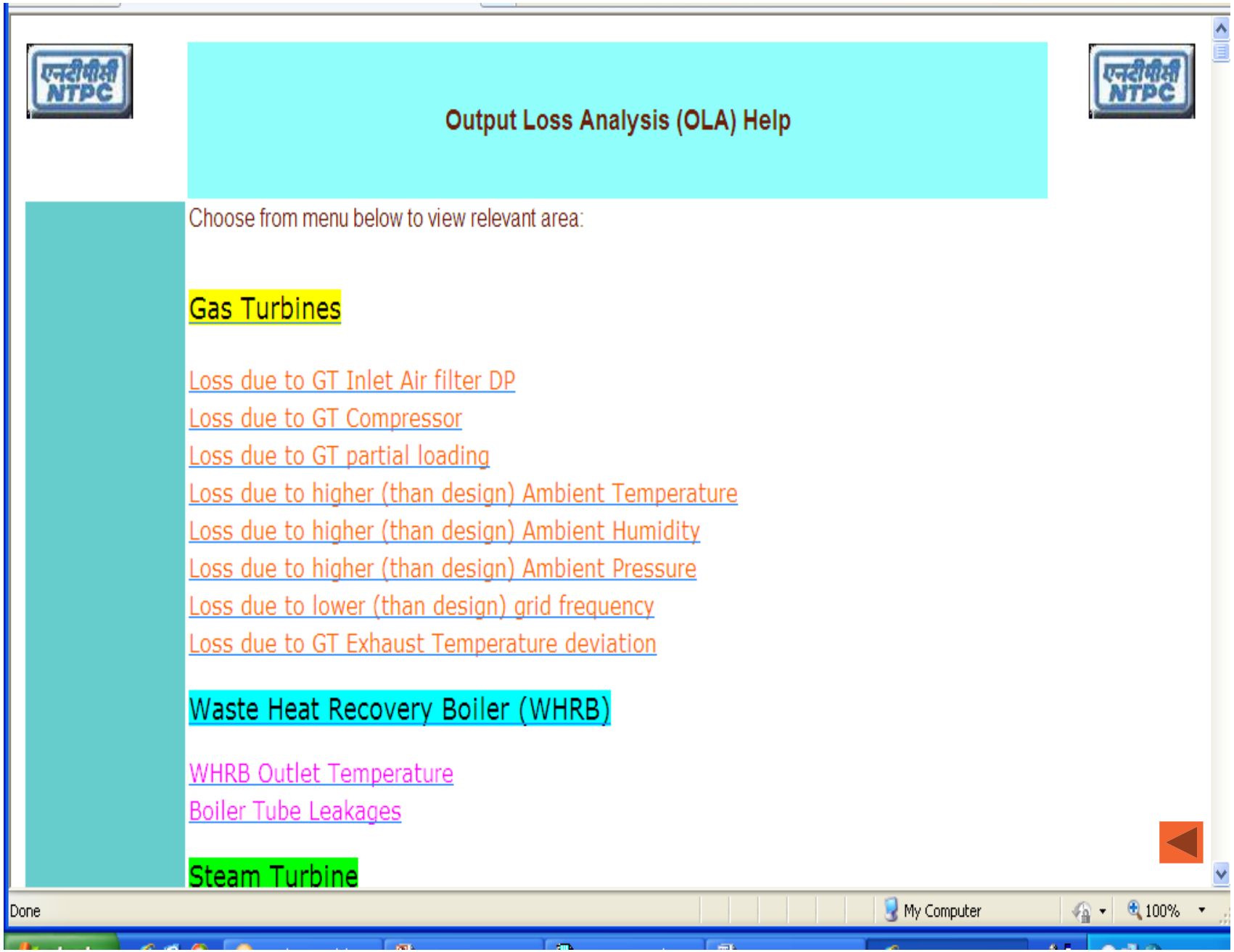

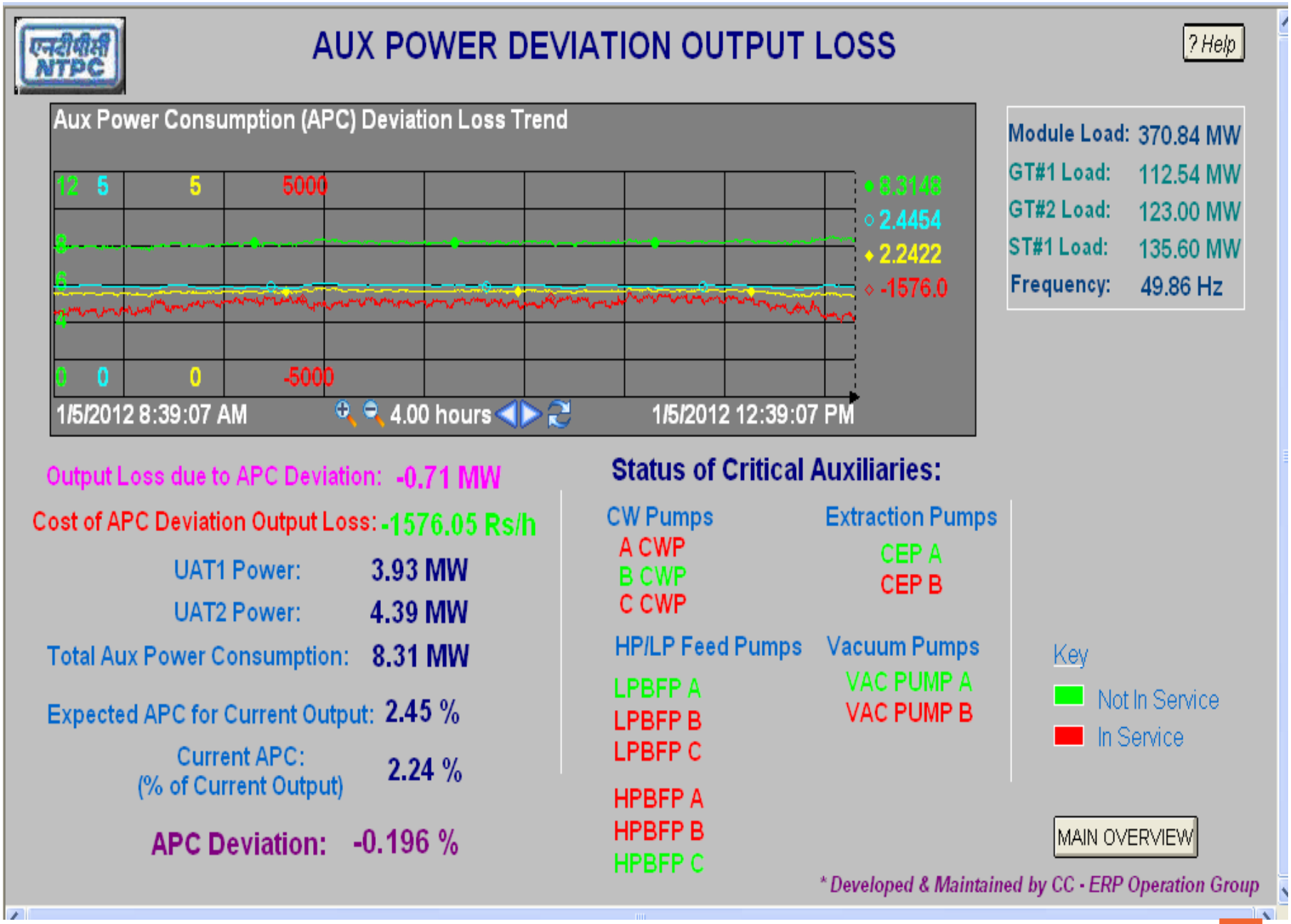

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