

Power Plant Analytics – Brochure

Improve Equipment Reliability and Plant performance using your data

- . Predictive Maintenance and Advanced Condition Monitoring
- . Performance Monitoring and Process Optimization
- . On-demand Operational Data repository

ARTIFICIAL INTELLIGENCE IN POWER PLANTS

INTRODUCTION

The thermal power industry is at the heart of any industrial growth story. But today, it operates in a complex environment with high variability in the operating conditions like fuel input, regulatory requirements, competitive market (alternative sources) and a changing workforce.

ExactSpace's advanced analytics solution helps power plants leverage one of their most precious (but rarely used) resources – their data – to help overcome these challenges and operate at **peak efficiency and reliability** at all times.

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PREDICTIVE MAINTENANCE

Avoid unplanned downtimes using our predictive asset health monitoring

HOW

Critical assets in a power plant typically display degradation patterns in related process and mechanical parameters way before they reach critical breakdown status. These patterns are not recognized easily by humans or by threshold-based DCS systems but if detected, can help the plant to plan ahead for such an event.

Detection: ExactSpace solution deploys Advanced Pattern Recognition algorithms to predict failures before they occur.

Resolution: It also uses EPRI recommended Fault trees and proprietary real-time causal analysis methods to provide possible diagnostics and root causes.



PERFORMANCE OPTIMIZATION

Track plant KPIs in real-time and reduce controllable losses to optimize performance

HOW

Plant KPIs like Heat Rate and Efficiency can be affected by a combination of processes across the plant. While operators can only keep a close tab of few critical parameters, optimization can be achieved only by having real-time knowledge of fuel consumption and minute changes in process and individual equipments' performance.

Detection: ExactSpace accurately predicts real-time coal consumption, controllable losses and associated asset degradation.

Resolution: Recommends operator set-points based on best past performance for similar conditions (fuel, load, etc) as well as highlights degrading assets that need to be corrected to optimize performance.



ON-DEMAND DATA ACCESS

Achieve greater workforce productivity by providing visibility of their plants anytime

HOW

Data in plants today predominantly exist in Excel spreadsheets and inaccessible historian systems. Management and operators are limited to seeing a few trend lines. The ability to view historic plant performance and explore/analyse data in seconds can help the workforce handle situations much more efficiently.

ExactSpace provides cutting edge data management and processing technology that integrates with existing plant automation systems and allows plant personnel to explore data and its patterns and collaboratively work amongst themselves to keep the plant running at peak levels.

SOLUTION FEATURES

The ExactSpace solution has been developed considering the demands and needs of the Thermal Power industry. It brings together decades of Power plant domain expertise and cutting edge data analytics technologies to provide most relevant insights and value to our customers.

1

AI SOLUTION + ON-DEMAND EXPERT

ExactSpace solution is built on the premise that *'Plant personnel are the experts'* - the solution merely uses the power of data technology to aid the plant operators in more accurate, timely and well-informed decision making.

Accordingly, our offering comprises two components:

- 1) **Advanced Analytics:** Methods like Machine learning, neural networks, etc are employed to autonomously learn relationships in data and capture abnormal behaviour leading in optimizing process and predicting equipment failure
- 2) **On-demand Expert:** ExactSpace's power experts will also remotely monitor technical issues and offer qualitative expertise/opinion on technical issues

2

REMOTE AND CENTRALIZED VIEW

Conveniently access critical live information about all the units of your plant/station from anywhere and anytime. The solution is based on highly secure connectivity between plant systems and remote server and uses industry standard architecture design to handle high volumes of live data.

Unit	Capacity (MW)	Heat rate (KCal/KWH)	Units prd today (KWH)	Load (MW)	Coal cons. (TPH)	Auxiliaries (%)	Cost/unit (Rs)
Unit 1	30	3003	733267	30.55	1.1		3.51
Unit 2	30		734750	30.63			
Unit 3	30	2981.67	502560	20.94	27.11	9.57	3.44

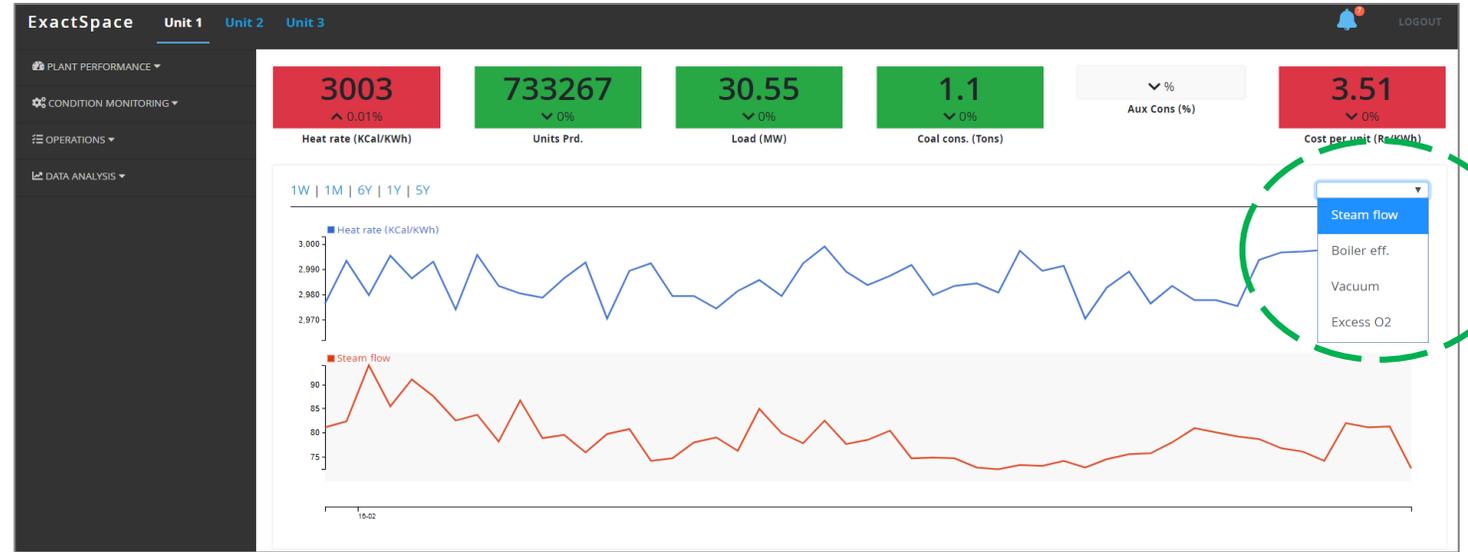
SOLUTION FEATURES

3

UNIT PERFORMANCE DASHBOARD

View live colour-coded KPI data of every single power producing unit along with trends for each for upto **5 years**.

Compare each KPI with any other key data point. For e.g. Heat Rate vs Steam produced or Coal Consumed vs GCV as might be the requirement.

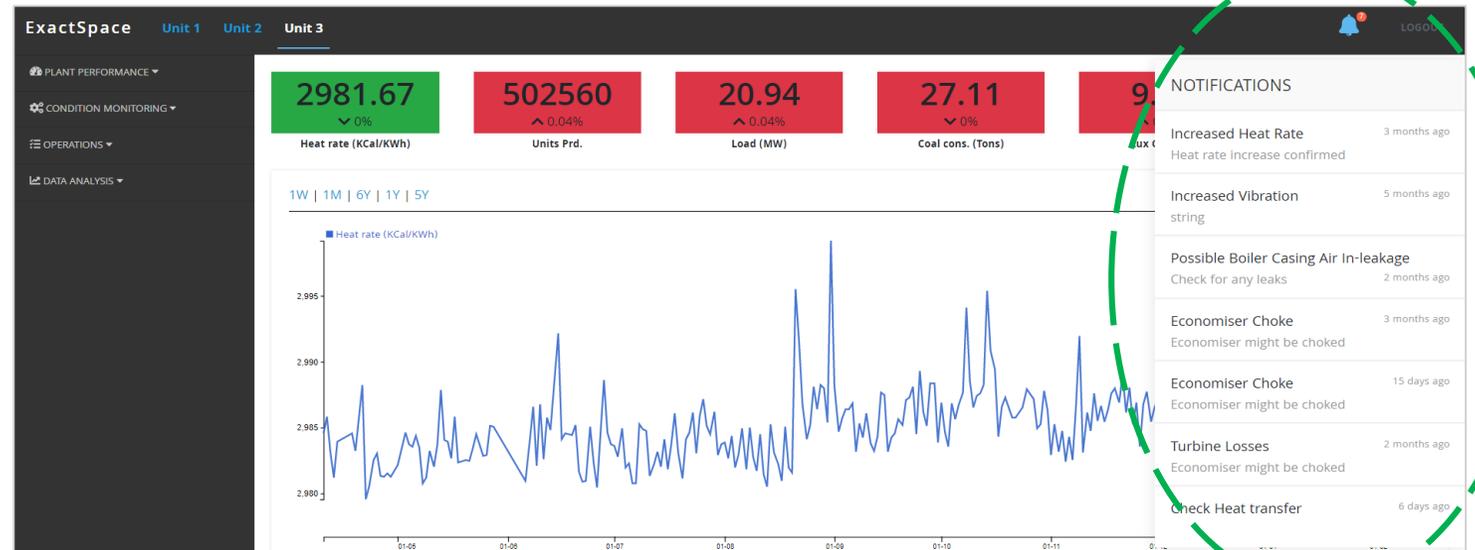


4

LIVE NOTIFICATIONS ON MAIL, SMS

Receive live notifications when system generates alerts/incidents or when users update messages, reports, data, etc with respect to each alert.

These notifications can be delivered on the web-app as well as on e-mails or SMS as configured by the users.



SOLUTION FEATURES

5

PERFORMANCE MONITOR

Monitor live heat rate and efficiency of the plant along with deviations caused by controllable losses (parameters), recommended set points and associated monetary loss.

Also get a view of changes in primary process parameters which may be causing the deviations.

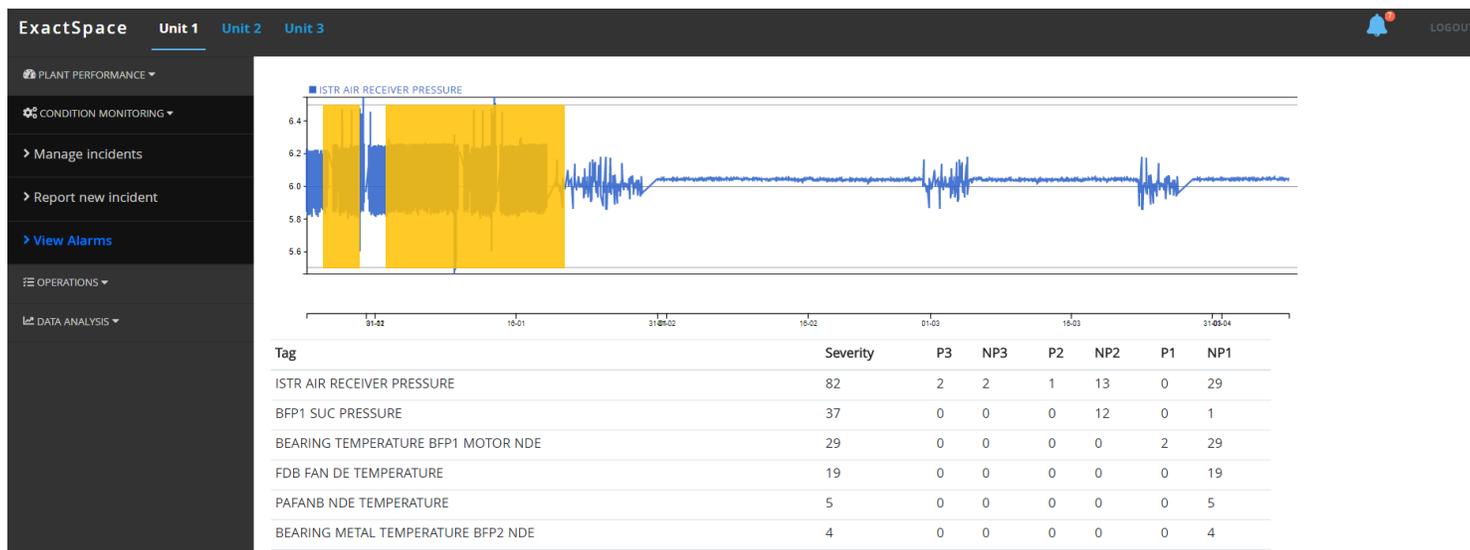


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ALARM SUMMARY

View a summarised and categorised list of alerts generated by the ExactSpace' pattern detection algorithms (note that these are not threshold based).

Unlike in DCS systems which generate thousands of alarms within days, these alarms are prioritised to get operator attention and is highlighted on trend lines to easily spot issues.



7

INCIDENT MANAGEMENT

Incidents are created to highlight process issues of higher priority which needs operator/management attention.

Incidents can be created by:

- System: These are generated when the system develops sufficient confidence that the observed issue is of high priority. For example, prolonged period of high heat rate.
- User: Solution users can manually create these to proactively resolve issue.

User created incidents:

These can be created by plant users and assigned to other plant users to take specific action or to ExactSpace remote analytics experts to perform deeper analysis on a specific issue.

Incidents belong to categories (e.g. Vibration, combustion, Heat rate, auxiliaries, etc). The user will have to specify the tag/s which are causing the issue and suspected causes (optional) as inputs for issue resolution for their team.

ExactSpace Unit 1 Unit 2 Unit 3

PLANT PERFORMANCE

CONDITION MONITORING

> Manage incidents

> Report new incident

> View Alarms

OPERATIONS

DATA ANALYSIS

Create incident report

Start time: dd-mm-yyyy End time: dd-mm-yyyy

Incident name: Name Incident type: Priority

Assign to:

Based on: Search for tag Probable root causes: Search for tag

Comments:

Create incident

7

INCIDENT MANAGEMENT

All incidents have 4 sections of information:

- 1. General:** All details of the issue, potential causes, location of the issue, recommendations, associated people
- 2. Messages:** All solution users (operators, management, ExactSpace experts, etc) can exchange messages and expert opinions with each other and to resolve incidents
- 3. Attachments:** System and users can attach reports, images, etc with respect to the incident
- 4. Data:** Relevant data for easy understanding of cause and effect.

1

2

3

4

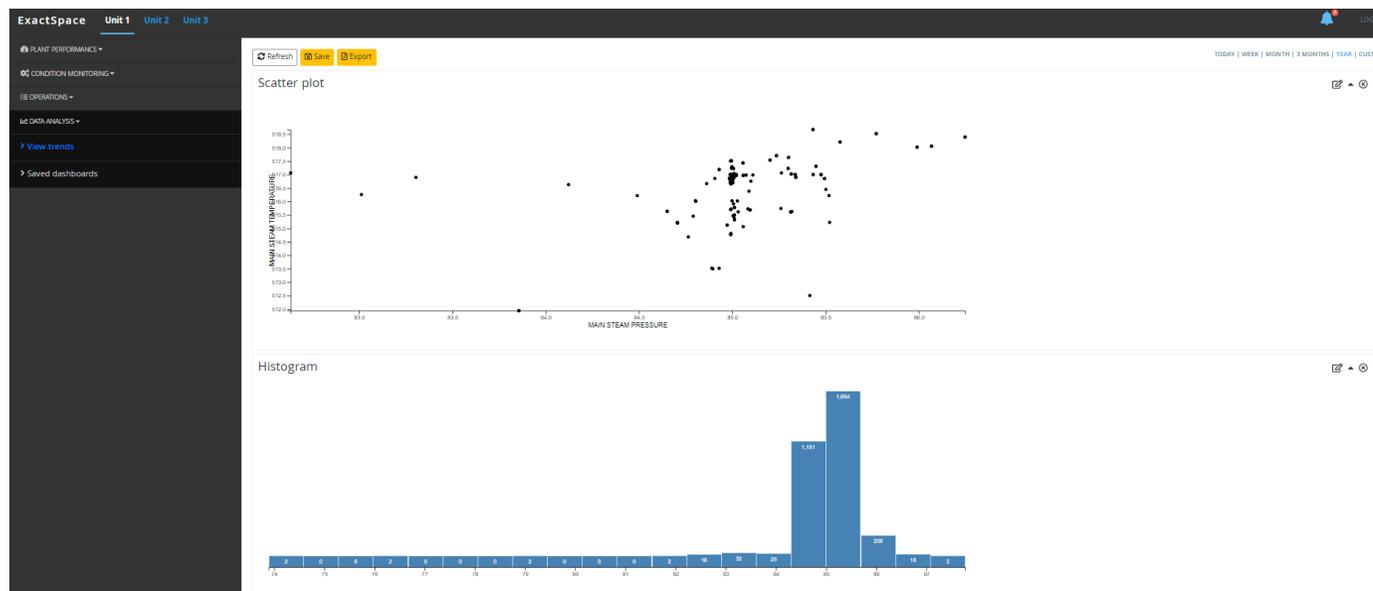
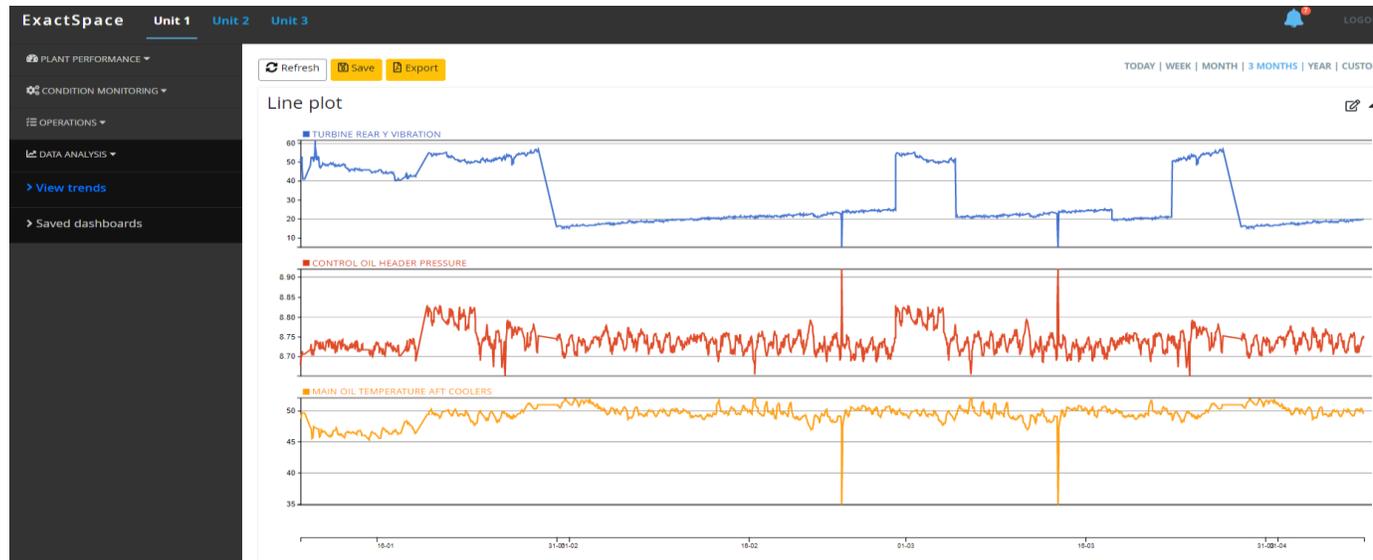
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DATA ANALYSIS AND VISUALIZATION

With traditional DCS systems and historians, accessing and ability to analyse data is very limited. ExactSpace solution aims to overcome this by providing plant users access to upto 5 years of process data within seconds.

Salient features include:

- Access data upto 5 years
- Option to view trends, scatter plots and histograms
- Zoom in and out to specific time periods
- Save a combination of charts as dashboard for easy access
- Download as image/file



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REPORTS AND DATA DOWNLOAD

Create customized reports and schedule it to be emailed to specified recipients on a regular basis.

Additionally, download any data required for management reporting activities on a need basis.

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USER MANAGEMENT AND SECURITY

User roles can be created as per a plant's security policy and access to data can be assigned based on user roles. Plant admin will have the ability to create any number of users and manage them while using the solution

ExactSpace Unit 1 Unit 2 Unit 3

PLANT PERFORMANCE ▾

CONDITION MONITORING ▾

OPERATIONS ▾

> Data entry

> Download report

DATA ANALYSIS ▾

Download reports

Daily Reports 04-04-2018

Report name	
Turbine status	Download
Boiler status	Download
Flue gas analysis	Download
Generation	Download
Heat rate deviations	Download

Monthly Reports January 2016

Report name	
Monthly heat rate	Download

SOLUTION BENEFITS

ExactSpace's offering has been designed keeping in mind the current operating situation at Indian Power Plants to address both daily operational issues as well as management priorities.

FINANCIAL IMPACT

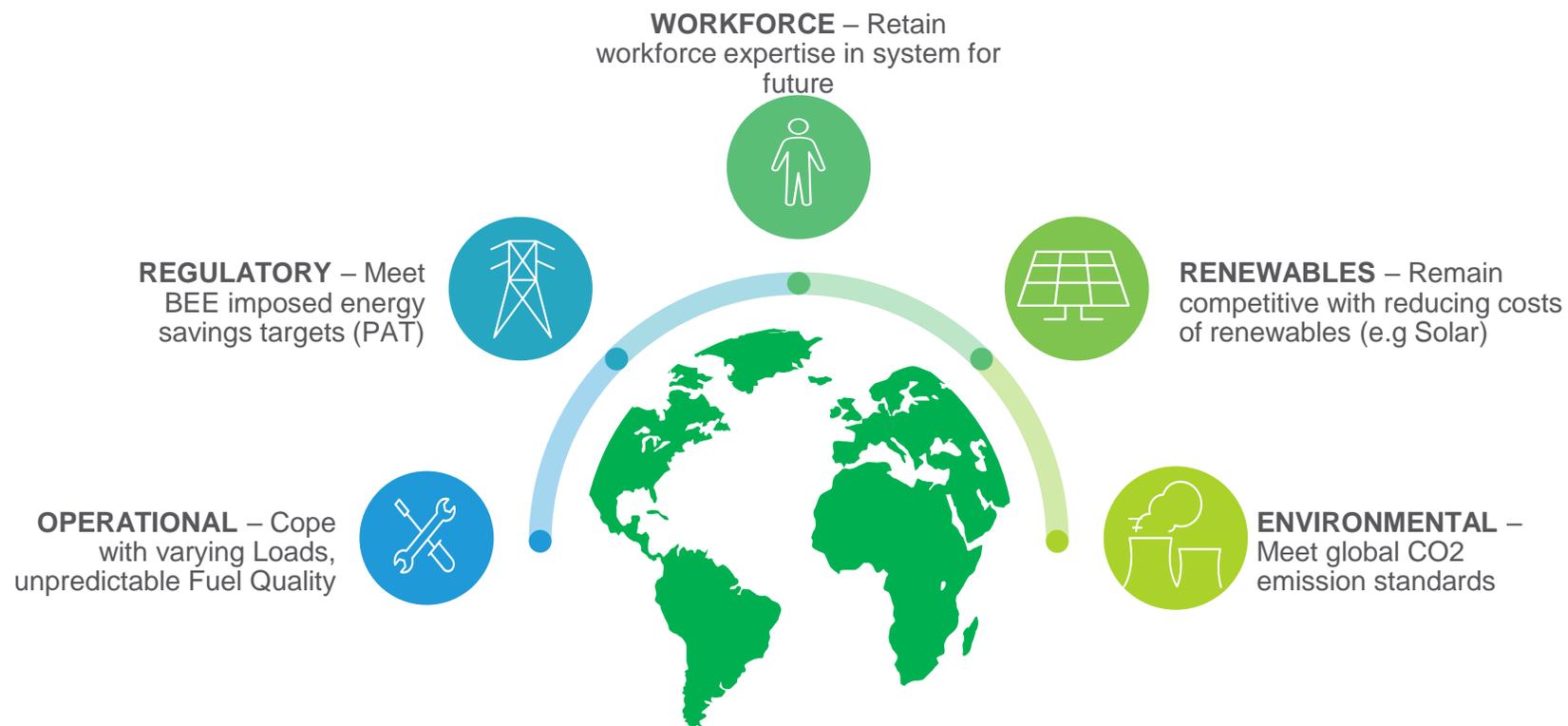
- 1) Avoid unplanned downtime and reduce maintenance costs
- 2) Optimize capacity utilization
- 3) Reduce input costs by process optimization

OPERATIONS IMPACT

- 1) Improved visibility into operations and plant KPIs
- 2) Maintain equipment health and safe operations
- 3) Reduce time to resolve issues

WORKFORCE EMPOWERMENT

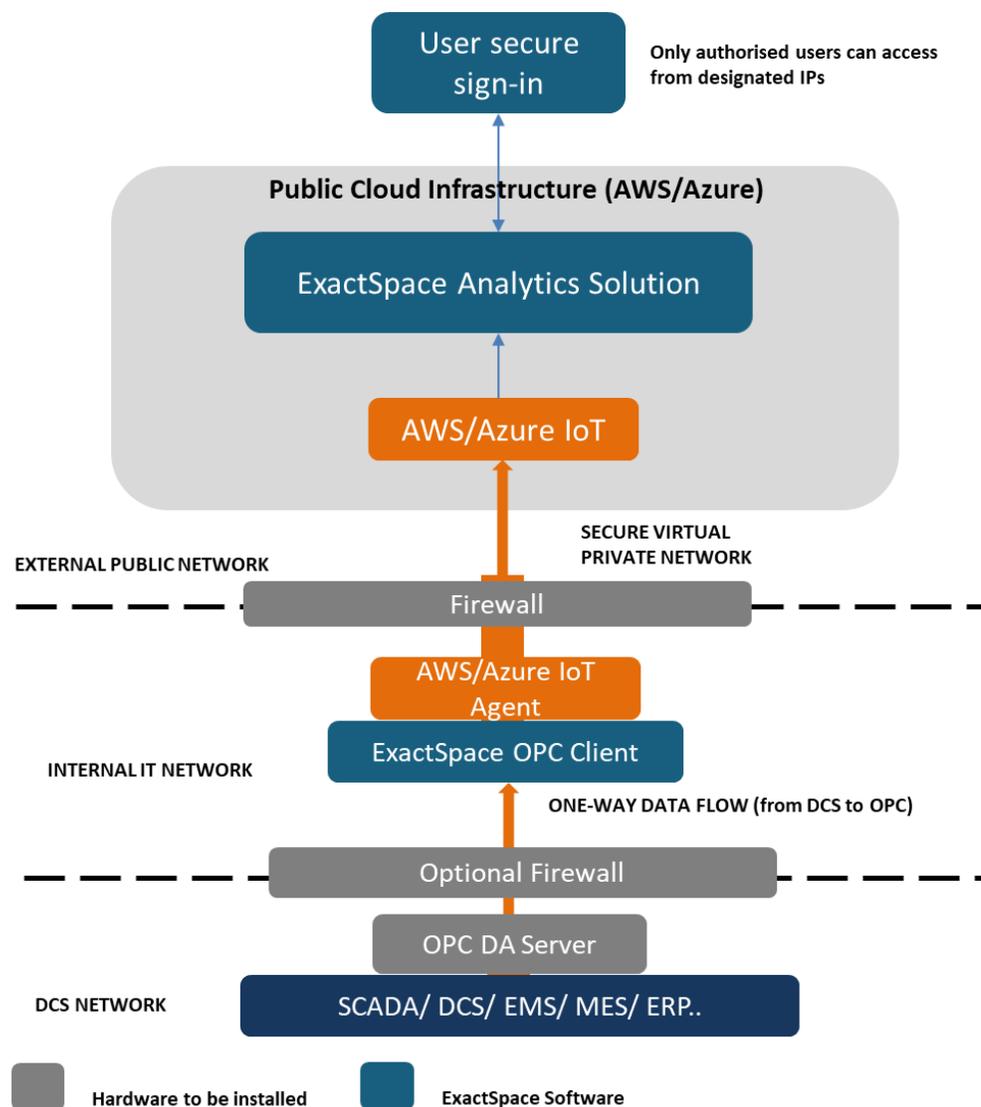
- 1) Retain workforce expertise in the system
- 2) Enable workforce with more powerful tools
- 3) Utilize workforce for more value adding activities



SOLUTION ARCHITECTURE

Secure connectivity to the cloud/remote server is the most critical component when it comes to enterprise systems. Using secure components from Amazon Web Services (AWS)/Azure, we ensure your security is not compromised. The solution provides **three layers** of security to ensure your data and plant is isolated from any external influences:

1. Firewall provides first layer of security ensuring only outbound data will flow and bar any inward connections
2. AWS/Azure IoT agent along with Virtual Private network provides another layer of security to ensure that the connection between the plant and cloud is isolated from the external world
3. The application further requires secure sign-on for users to access the data



INFRASTRUCTURE REQUIREMENTS

Component	Function	Expectation from Customer
Automation system integration	<ul style="list-style-type: none"> Protocol translation(OPC-UA, OPC DA, ModBus) Cloud upload of machine data 	<ul style="list-style-type: none"> 1 PC in plant premises OPC Server
Firewall	<ul style="list-style-type: none"> Allow READ Only access from Historian to ExactSpace System Allow only authorized traffic from plant to cloud Isolate OT network from IT network 	<ul style="list-style-type: none"> 1-2 firewalls in plant premises based on policy High Speed Internet
Cloud platform	<ul style="list-style-type: none"> Equipment inventory Time series sensor data store Statistical processing Email notifications 	<ul style="list-style-type: none"> None (ExactSpace provisioned)
User Interface	<ul style="list-style-type: none"> Browser based web application Secure sign-in Data explorer Issue monitor Dashboards 	<ul style="list-style-type: none"> Any desktop, laptop or mobile device with internet access

ABOUT EXACTSPACE

ExactSpace is an Analytics technology company which helps leading global industrial companies utilize data from various sources to make more informed and accurate operational and management decisions.

We build cutting edge Artificial Intelligence technology for Power Plants to enable the following outcomes:

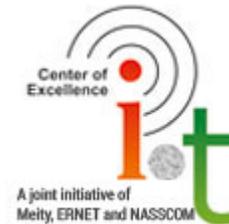
- Improve Reliability and Safe operations
- Improve Efficiency and Heat Rate of plant
- Produce greener power

ExactSpace brings together experts with combined expertise of over five decades in Power Generation, O&M, Efficiency improvement and Artificial Intelligence technologies. Our solutions have been built with a laser focus on Indian Power Plants to address top priorities and primary challenges faced by them.

Recognized by:

#startupindia

Incubated at Nasscom COE-IoT



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