Better Everyday

Confederation of Indian Industry

Presented by
Shri. Kumar Ivaturi
Shri. Hemant Chouhan
Shri. Varaprasad

JSW Energy Ltd., Vijayanagar

JSW ENERGY

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JSW Energy – Broad Structure

JSW Energy Limited
9,780 MW

- Ratnagiri – 1,200 MW
- Vijayanagar – 860 MW
- Nandyal – 18 MW
- Solar – 10MW
- JSWEBL – 1,080
- Ind-Barath- 700
- **Total – 3,868 MW**

JSW Neo Energy *
5,912 MW

Hydro Entities
Solar/Wind Entities
Products & Services

Energy Generation Portfolio

- JSW Hydro Energy Limited *(1,391 MW)* *(Karcham & Baspa)*
- JSW Energy (Kutehr) Limited *(240 MW)*
- JSW Renew Energy Limited (810 MW SECI-IX)
- JSW Renew Energy Two Limited (450 MW SECI-X)
- JSW Renewable Energy (Vijayanagar) Limited (863 MW Captive)
- JSW Renewable Energy (Dolvi) Limited (95 MW Captive)
- Renewable Portfolio of Mytrah Energy (1,753 MW - Acquired)
- JSW Renew Energy Three Limited SECI XII 300 MW

Products & Services

- **BESS** – SECI Pilot (500MW/1000MWh)
- **PSP**
  - LoI for 2.4 GWh
  - MOUs signed for 67 GWh
- Advanced high efficiency **solar module** (Awarded capacity under PLI)
- **Green Hydrogen** & its Derivatives

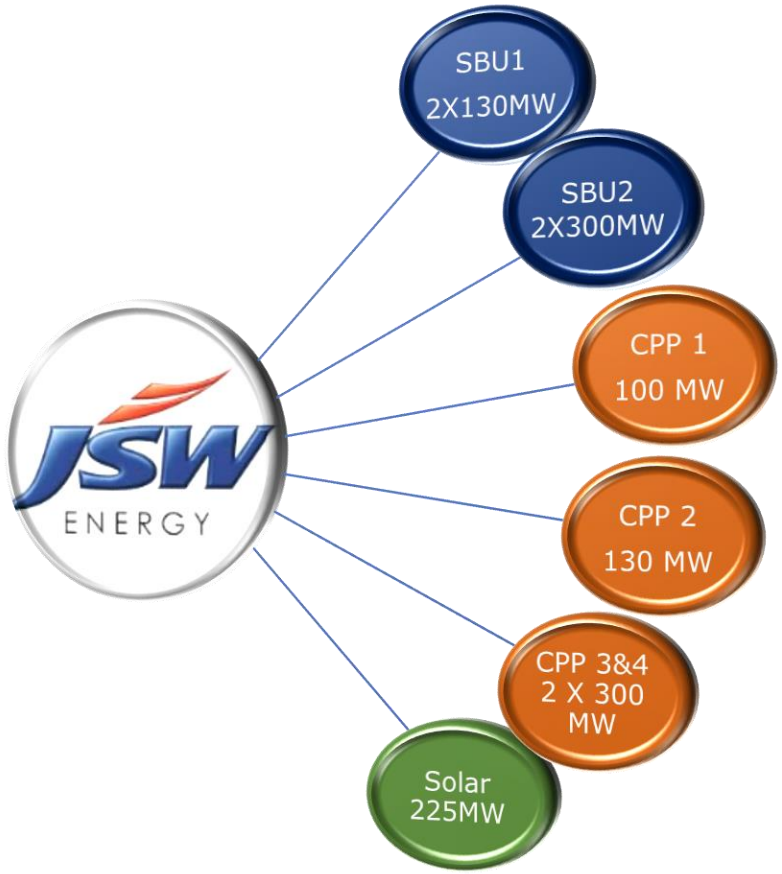
Vijayanagar Solar Power Plant

* Corporate structure post Acquisition and restructuring.
All subsidiaries shown are wholly owned subsidiaries

ENERGY PORTFOLIO

A BRIEF INTRODUCTION OF THE COMPANY

JSW Energy is one of the most efficient power generation companies in India. With a capacity of 6.56 GW spread across several locations, with generation facilities at Vijayanagar, Ratnagiri, Barmer and Sholtu.



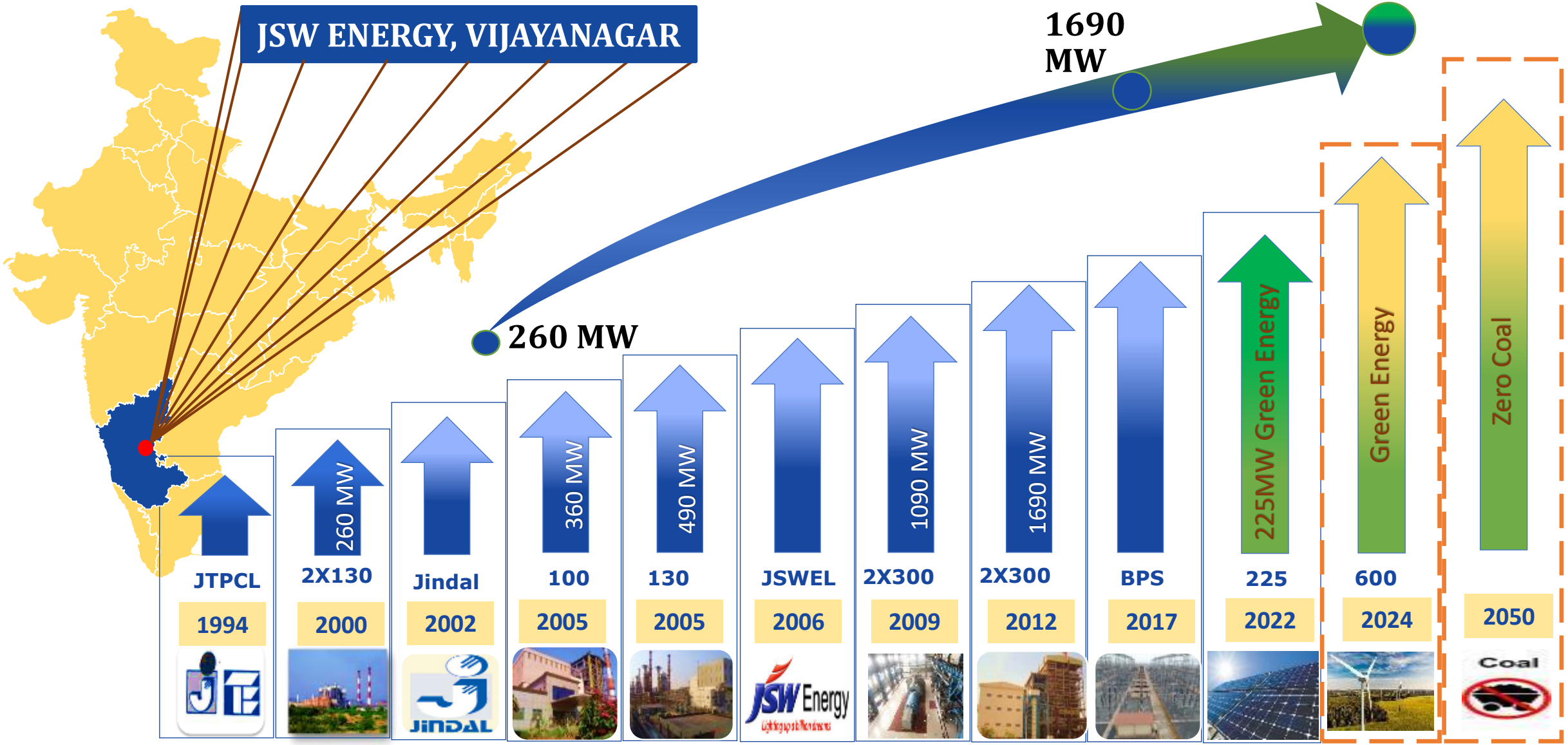
Unit	Fuel
SBU1	Imported coal & Steel Byproduct (BF Gas)
SBU2	Imported coal & Steel Byproduct (BF Gas)
CPP3&4	Imported coal & Steel Byproduct (BF Gas)
CPP1	Steel Byproduct (Corex & BF Gas)
CPP2	Steel Byproduct (BF Gas)
Solar	Natural Sunlight

SBU – Strategic Business Unit

CPP – Captive power plant

BF – Blast Furnace

GROWTH PATH...


JSW ENERGY, VIJAYANAGAR
260 MW
1690 MW
1915 MW
JTPCL
1994
260 MW
2X130
2000
Jindal
2002
360 MW
100
2005
490 MW
130
2005
JSWEL
2006
1090 MW
2X300
2009
1690 MW
2X300
2012
BPS
2017
225MW Green Energy
225
2022
Green Energy
600
2024
Zero Coal
2050
Coal

ENERGY CONSUMPTION OVERVIEW

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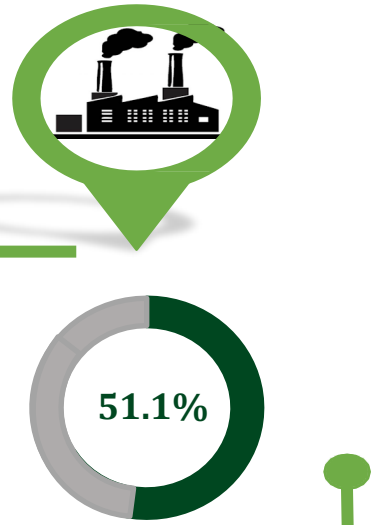
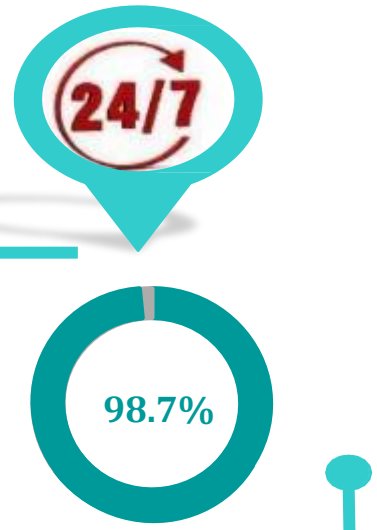
3854 MU

Annual Generation



Plant Load Factor



Availability

2370 Kcal/kWh

Heat Rate

0.20 ml/kWh

Specific Oil Consumption

7.88%

Auxiliary Power Consumption

2225 M^3/MU

Specific Raw Water Consumption

SPECIFIC. ENERGY CONSUMPTION

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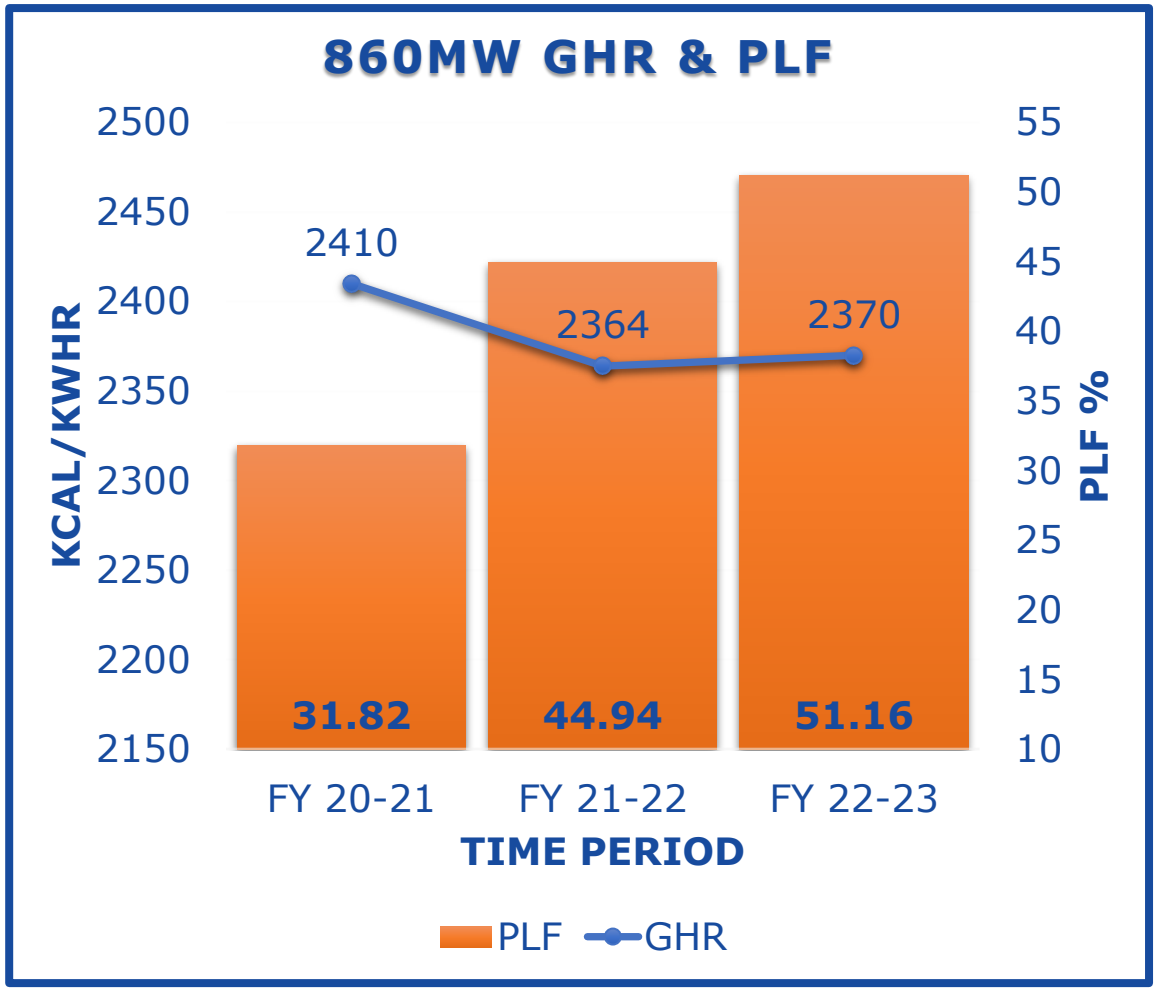
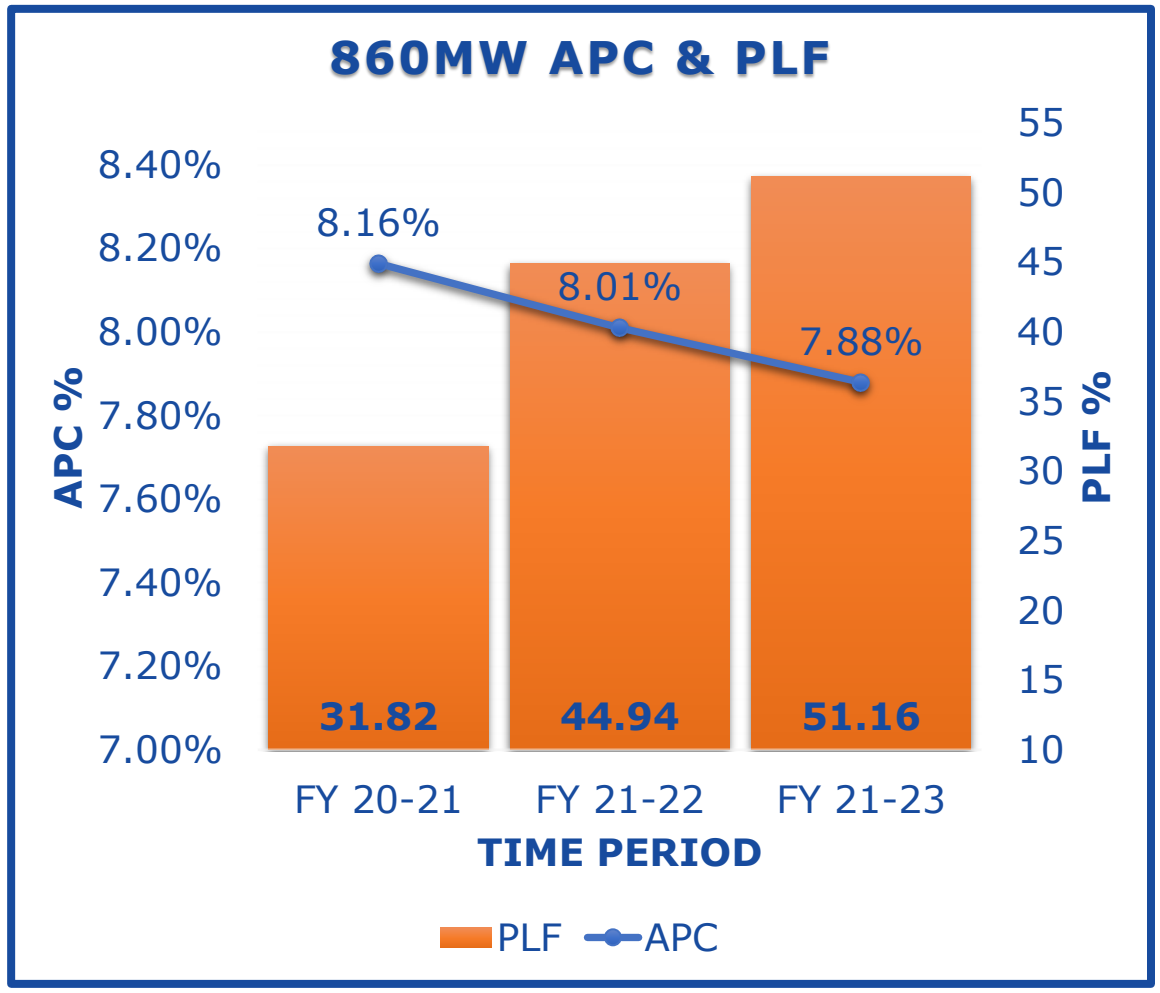
Last 3 Years (FY 2020-23)

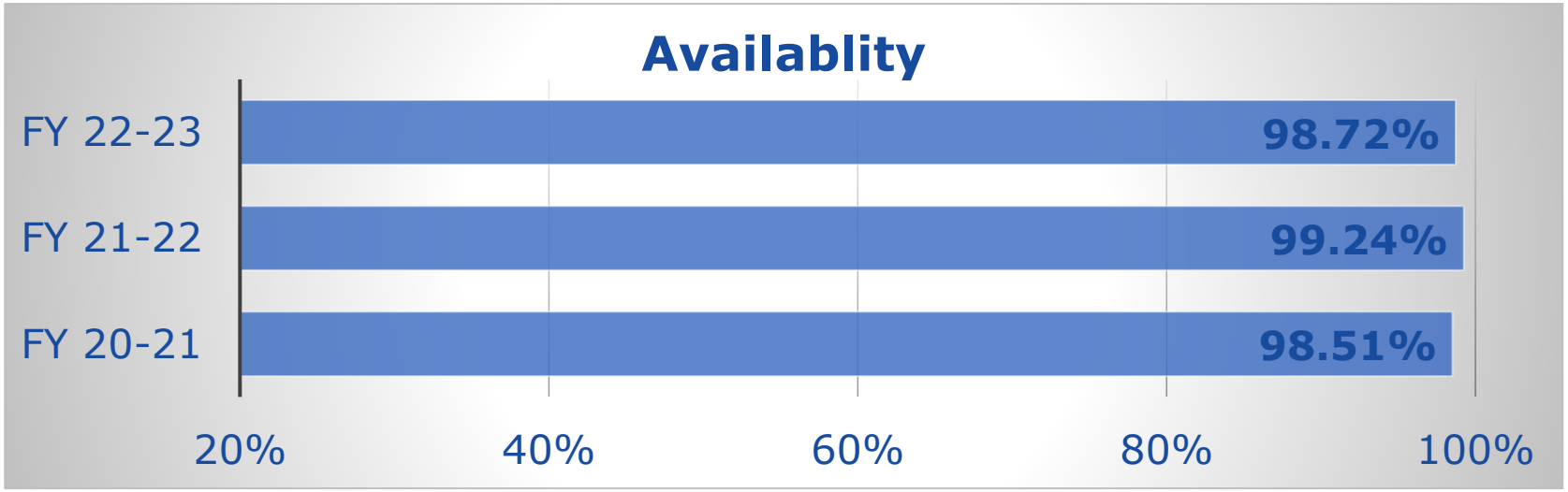


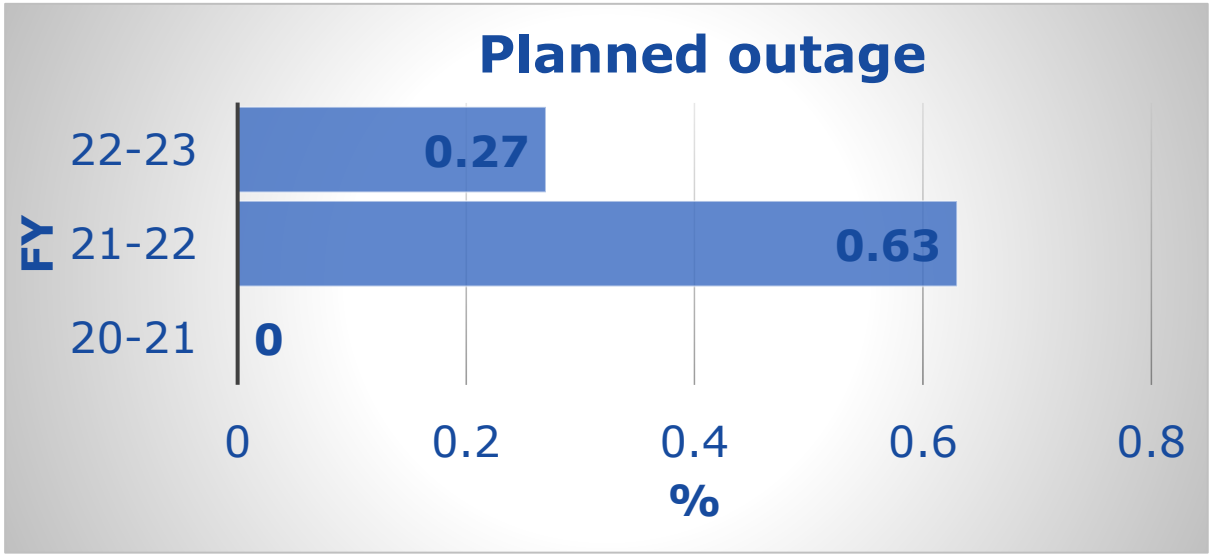


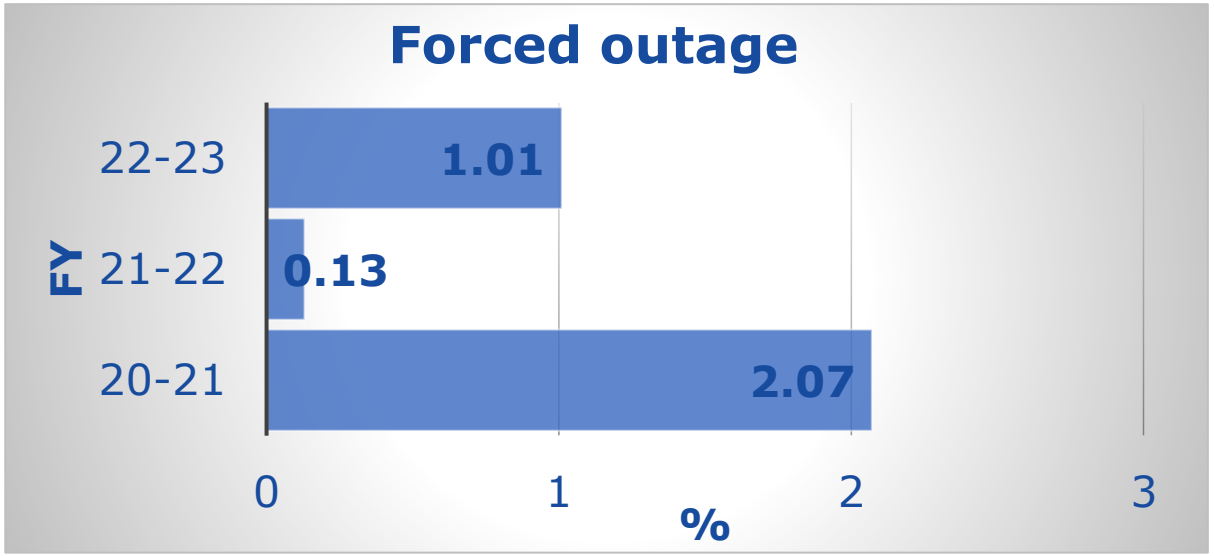
PLF has increased, GHR and APC have reduced

AVAILABILITY TREND

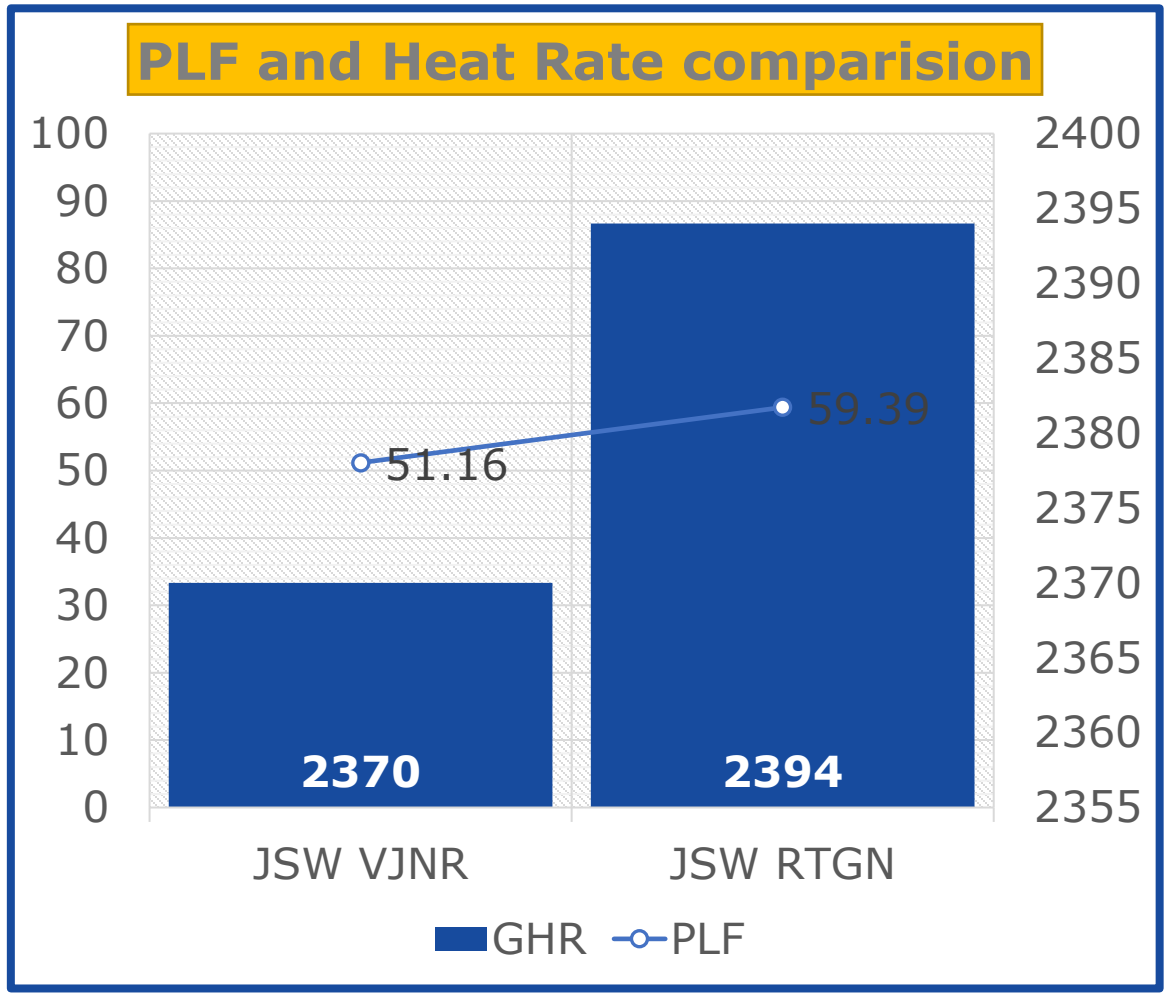
Last 3 years (FY 2020-23)

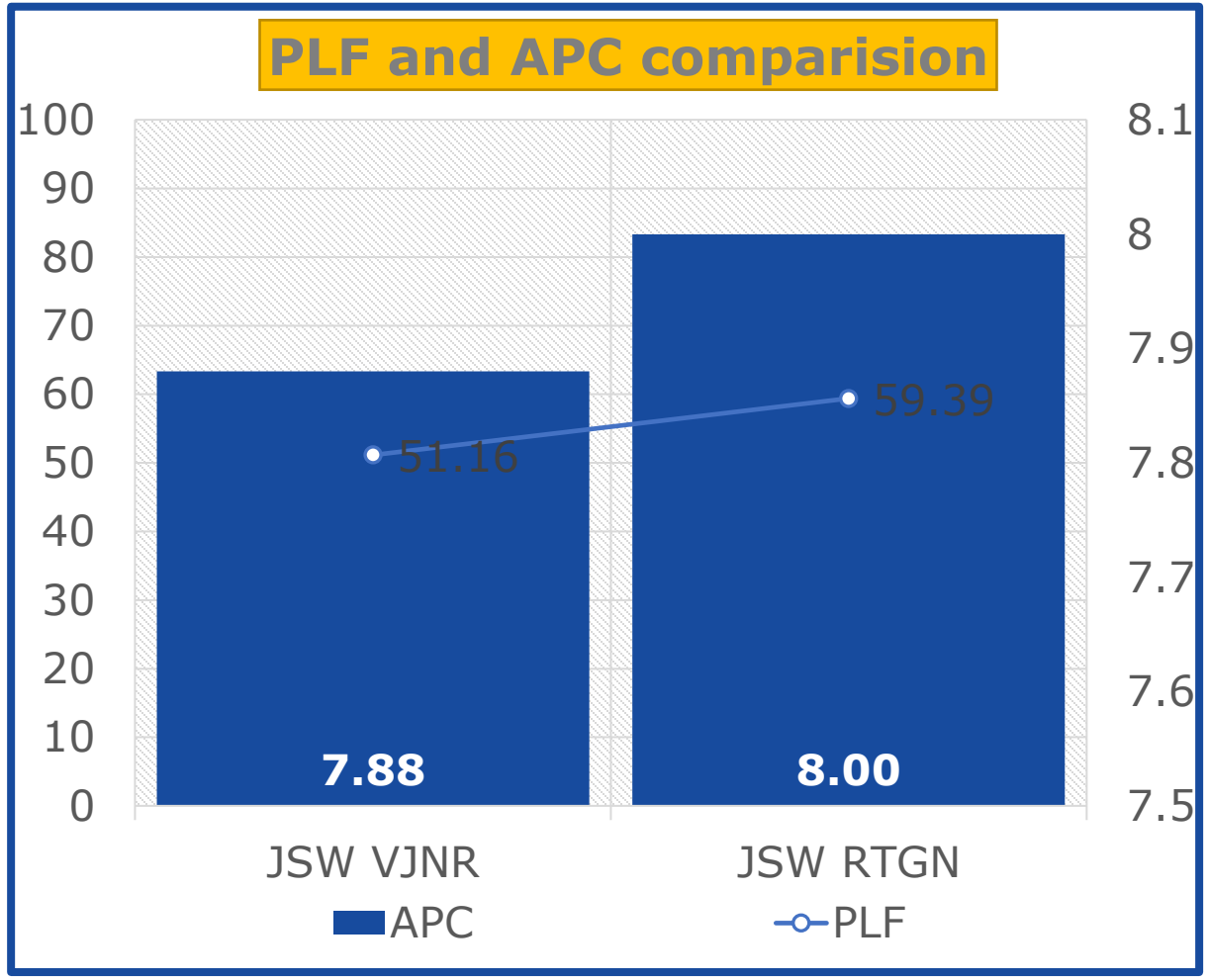






BENCH MARKING





Heat Rate is competitive with plants running at much higher PLF

APC is lower in spite of very low PLF

ENERGY CONSERVATION PROJECTS

Upcoming Projects in FY 23-24)

UNIT	PROJECT TITLE	Savings Electrical KWH (M)	Savings Thermal KCAL (M)	Investment Million (INR)
SBU2	APH baskets replacement in SBU2 U1 300 MW unit	8.87	-	32.8
SBU2	CW Pumps servicing to improve condenser vacuum	-	180600	10
SBU2	Turbine overhaul to improve efficiency	-	72240	30
SBU1	CW Pumps servicing to improve condenser vacuum	-	180600	10
SBU1	Turbine overhaul to improve efficiency	-	72240	30
SBU1	HVAC Chiller replacement to reduce specific power consumption	0.328	-	3.3
SBU1	Install VFD in SBU1 Both units CEP	1.764	-	21

ENERGY CONSERVATION PROJECTS

Implemented Projects in Last 3 years

FY	PROJECT TITLE	Investment Million (INR)	Savings Electrical KWH (M)	Savings Million (INR)
2022-23	BFP 1B de staging in SBU2 U1	25.34	7.46	56.01
2022-23	Cooling towers blade replacement with energy Efficient blades in SBU1(6Nos)	43.3	0.21	1.57
2022-23	Stopping of Ash handling Compressor up to max 12 hrs, based on the load condition in turn reduces Power Consumption	0	0.72	5.40
2022-23	Reducing secondary air Flow & reducing PA flow by two mill operation	0	3.26	24.48
2022-23	Rectification of blade pitch mechanism malfunction, Secondary Air Flow reduced to 480 to 440 tph	0	0.65	4.90
2022-23	PA fan reduced header pressure Up to 5.5 Kpa & 3 mill operation reduced header pressure up to 7 .0 Kpa	0	9.41	70.54
2022-23	Two mill Operation at low <120 MWh & coal flow < 58 TPH	0	2.37	17.78
2022-23	Low load operation CEP VFD locking speed reduced from 700 to 600 to avoid throttling losses	0	0.66	4.94
2022-23	To reduce slip losses in turn to reduce BFP Power Consumption by keeping both Working oil coolers in service	0	7.92	59.42

ENERGY CONSERVATION PROJECTS

Implemented Projects in Last 3 years

FY	PROJECT TITLE	Investment Million (INR)	Savings Electrical KWH (M)	Savings Million (INR)
2022-23	SBU1 One BFP stopping at low load	0	8.68	65.10
2022-23	SBU1 U2 PA fan auto pressure set point based on coal flow has given a saving 15 kwh	0	0.13	0.98
2022-23	SBU1 U2 BFP recirculation valve logic modification has given a saving of 311 kwh at 90 MW	0	5.12	38.40
2021-22	SBU2 BFP 1A RC Passing identification & rectification	0	1.54	14.34
2021-22	SBU2 U1 CEP Bypass MOV open to reduce throttling losses across deaerator level CV	0	0.21	1.85
2021-22	Turning gear & JOP Stopped in reserve unit	0	0.25	2.24
2021-22	SBU2 U1 8 CT cell fills replaced with trickle grid	28	1.40	8.36
2020-21	CEP VFD Deaerator level logic implementation to reduce throttling losses of Deaerator control valve	0	0.53	1.74
2020-21	SBU2 U1 4 CT cell fills replaced with trickle grid	14	0.70	4.18

ENERGY CONSERVATION PROJECTS

Better Everyday

Implemented Projects in Last 3 years

FY	PROJECT TITLE	Investment Million (INR)	Savings Electrical KWH (M)	Savings Million (INR)
2021-22	Instrument Air Compressor Power Consumption Optimization by attending system leaks	0	0.543	4.89
2021-22	PAF 1A IGV throttling losses rectification by replacing hydro coupling scoop	0.3	0.442	3.98
2021-22	SBU1 Compressor -A Power Consumption Optimization by changing from base mode to suction throttling mode	0	0.314	2.83
2020-21	SBU2 U1 Reduction in Net Unit Heatrate by improving the vacuum at 140MW by Keeping 2 CWP in service	0	1.3500	7.57
2020-21	SBU2 U1 Clear water pump sump Level Auto control by varying VFD speed	0	0.1253	0.41
2020-21	SBU2 U1 Condenser cleaning 8-March-2021	0.265	0.3433	1.99

INNOVATION- FLEXIBILIZATION

Flexibilization:

Enhancing the ability of thermal power plants to operate more flexibly and adapt to changes in demand and supply. To accommodate the integration of high renewable generation into the power system effectively.

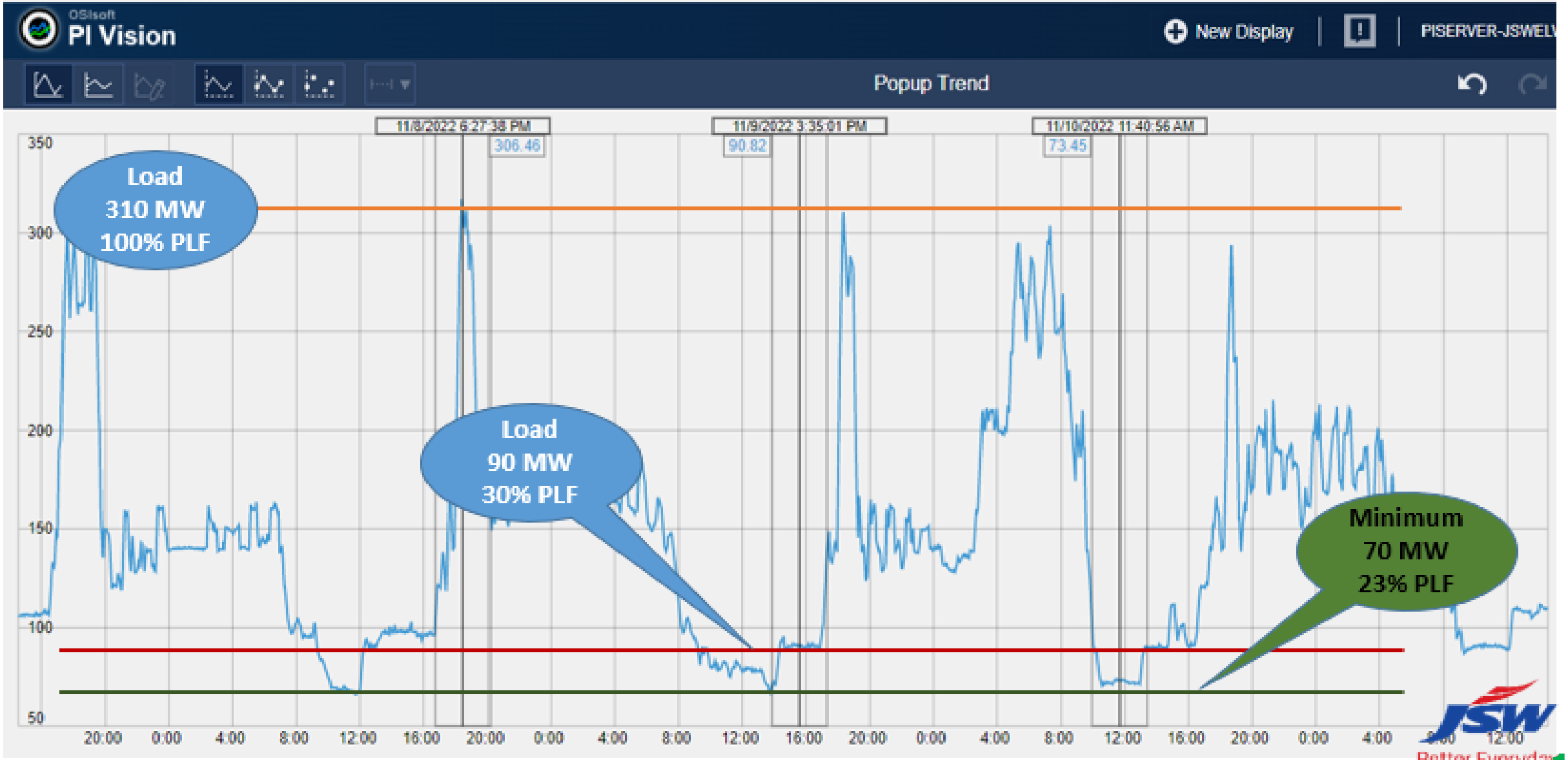
Shift from High PLF to Low PLF Capability:

- Era change: The energy industry has transitioned from prioritizing high Plant Load Factors (PLFs) to focusing on improving the capability of units to operate at low PLFs.
- Reason: This shift is driven by the increasing integration of renewable energy generation into the power system.

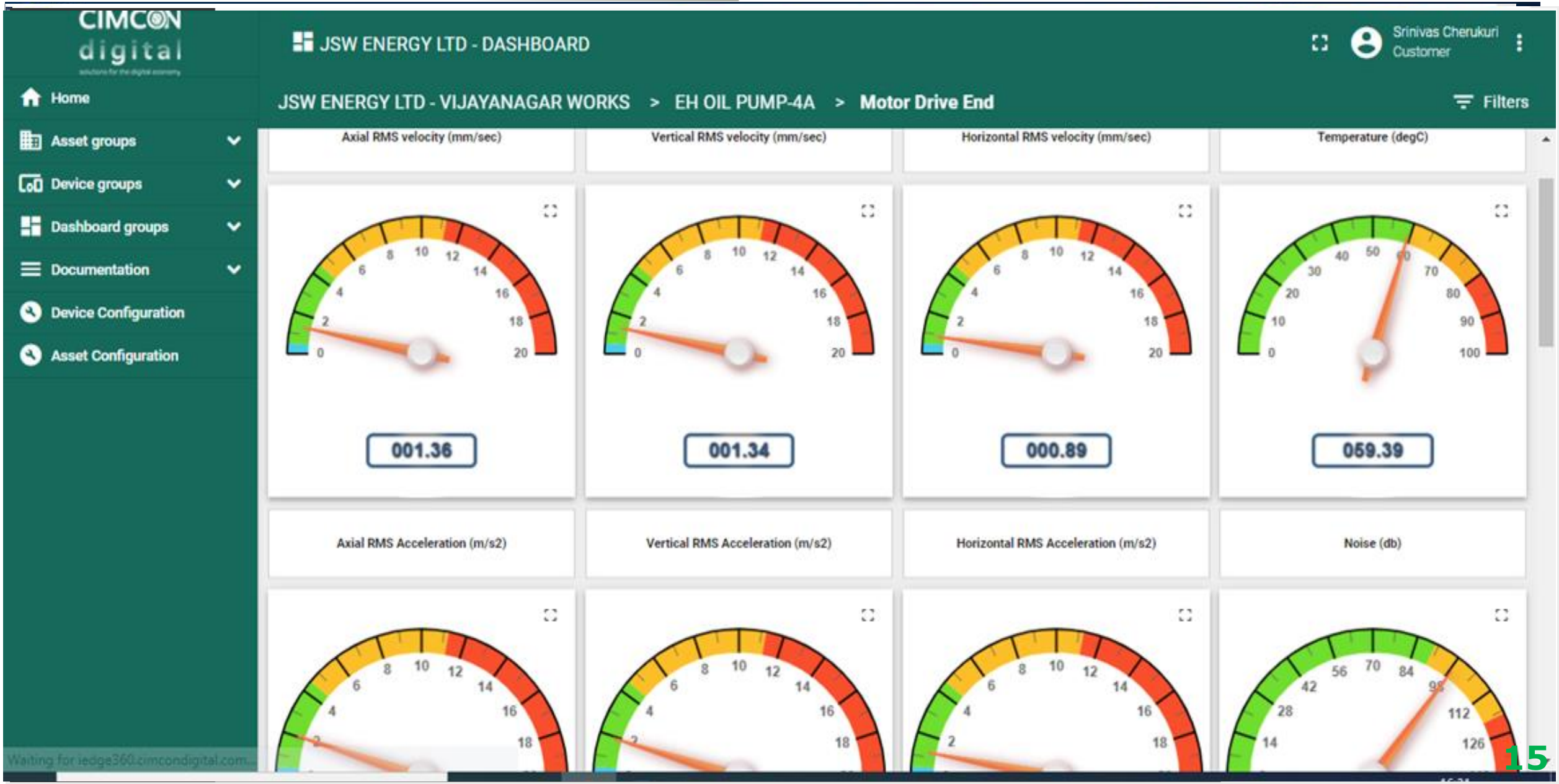
Solar Power Integration:

- Installation: JSW Energy Vijayanagar has installed a 225 MW solar power plant connected to the power system.
- Daytime operation: Successfully running 300 MW units at a 75 MW load (25% PLF) during daylight hours, taking advantage of peak solar generation.

INNOVATION- FLEXIBILIZATION

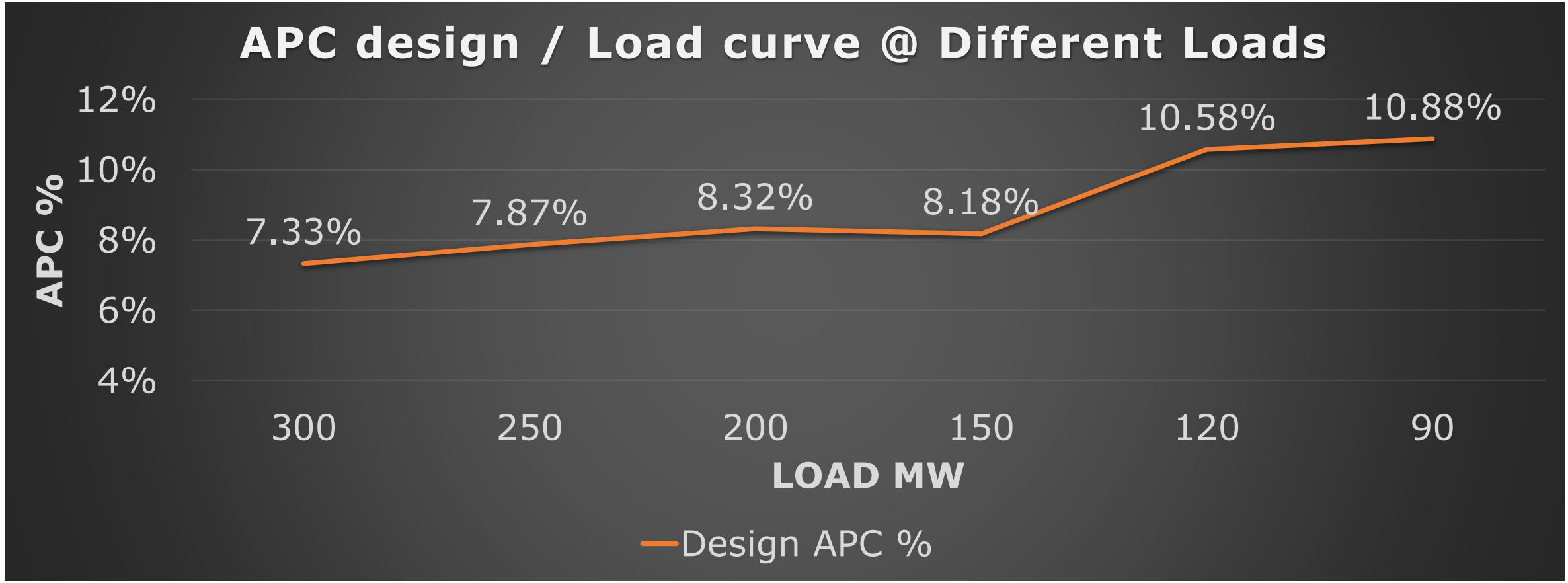


INNOVATION- FLEXIBILIZATION



PROJECT: REDUCTION OF APC AT PART LOAD

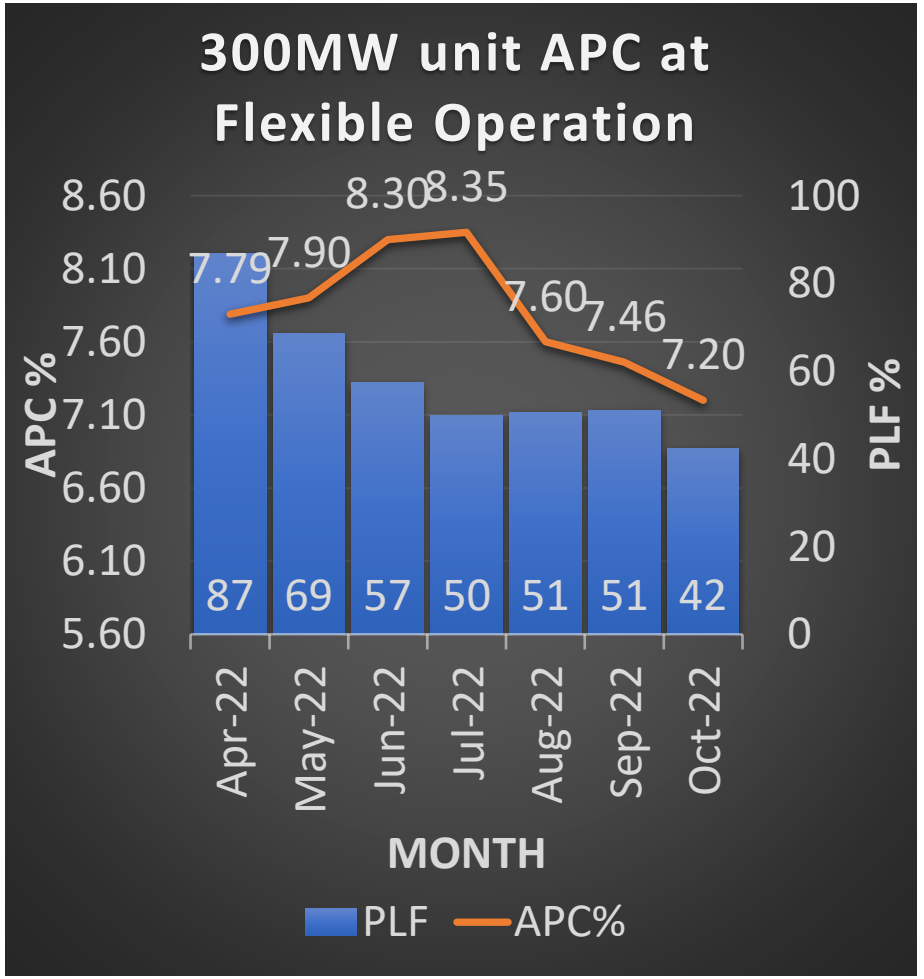
- We at JSW Energy, Vijayanagar have installed a 225 MW solar power plant.
- During Solar injection i.e., daytime, we run our 300 MW units to 75 MW.



PROJECT: REDUCTION OF APC AT PART LOAD

- APC at such a low load was a great challenge, but we have achieved a low APC of 7.2 %.
- Several innovative measures were adopted to bring down the APC.

- **Measures implemented-**
- Ash handling compressors stopped at part load – power savings 17 kWh
- Only 2 Mills out of six mills kept in service- power savings 450 kwh
- Only 1 set of ID an FD Fans kept running- power savings 48 kwh
- Only 1 BFP kept in service, and its one impeller stage out of six stages trimming done - power savings 284 kwh
- CEP speed reduction from 1270 rpm to 600 rpm by VFD, and the Deaerator level control valve and its bypass moved fully open to reduce losses- 30 kwh
- FD fan blade pitch setting done at part load – power savings 24 kwh
- ESP fields made OFF depending upon SPM – power savings 12 kwh
- Six CT fans out of twelve stopped - power savings 90 kwh
- BFP De-staging

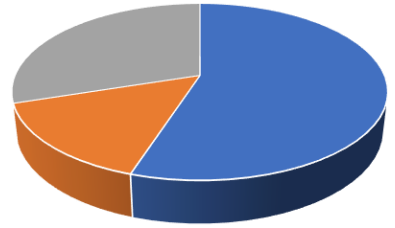


ENVIRONMENT MANAGEMENT- ASH UTILIZATION

Particulars	UOM	2020-21	2021-22	2022-23
Ash Stock in Plant (yard + pond)	Tons	113620.4	254517	212957
Ash Generated	Tons	113620.4	254517	212957
Ash Utilization	%	100	100	100
Ash Utilized in manufacturing of cement/concrete – other similar products	%	70	47	55
Ash Utilized in Fly Ash Bricks	%	12	15	15
Ash Utilized in Mine filling	%	18	38	30
Ash Utilized for Roads pavements	%	0	0	0
Ash Utilization in Other Areas – Please mention below	%	0	0	0

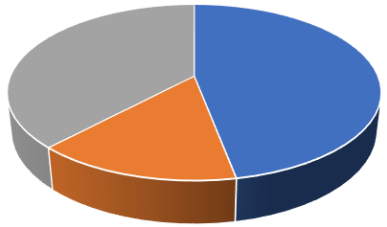
Ash Handling done through various methods		
Ash Handled (Wet Method)	%	0
Ash Handled (Dry Method)	%	55
Ash Handled (semi wet)	%	45

FY 22-23



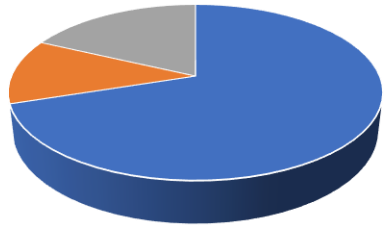
Cement Bricks Mine

FY 21-22



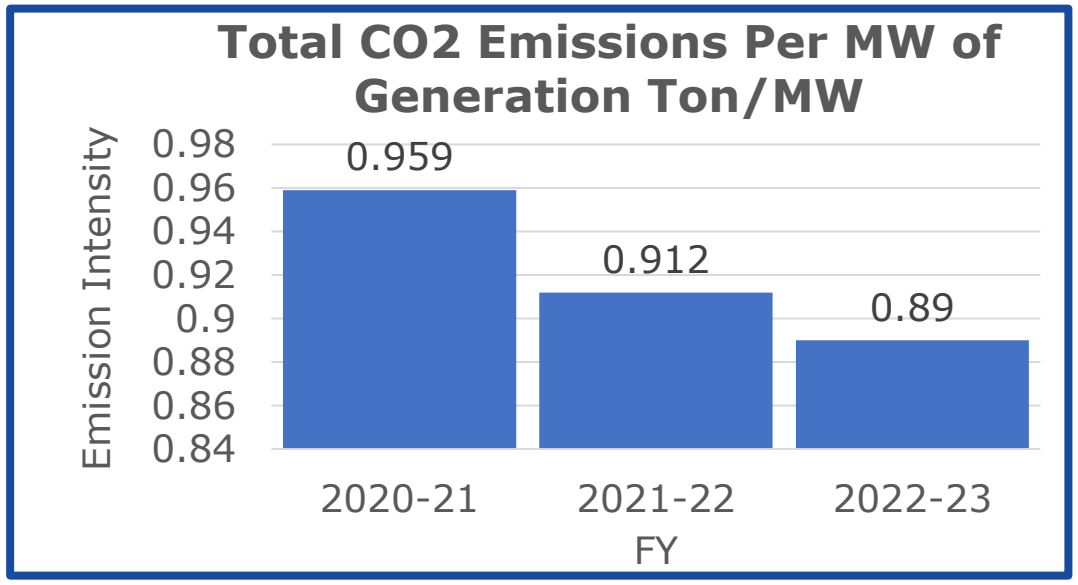
Cement Bricks Mine

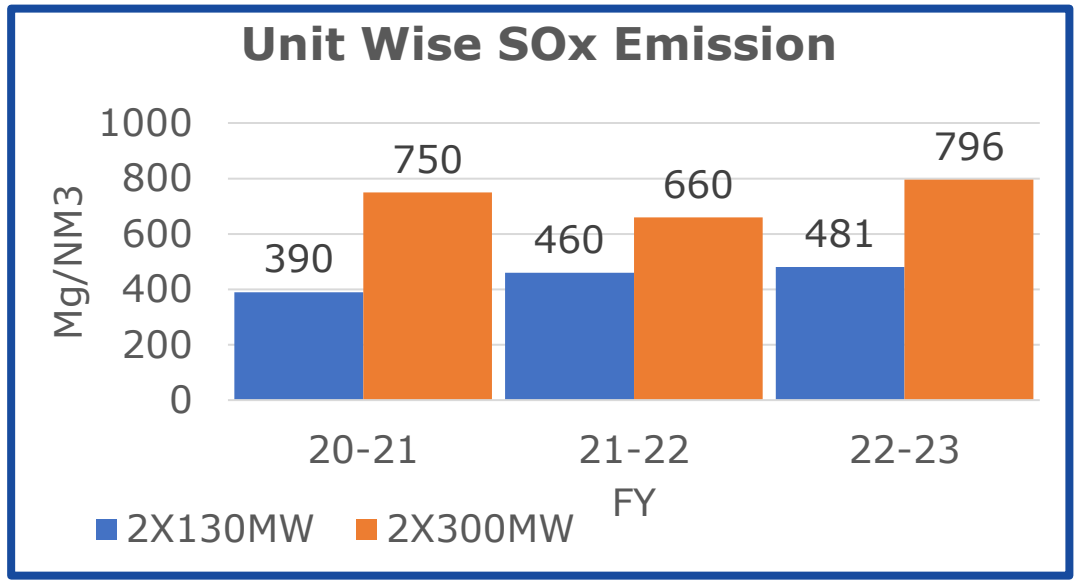
FY 20-21

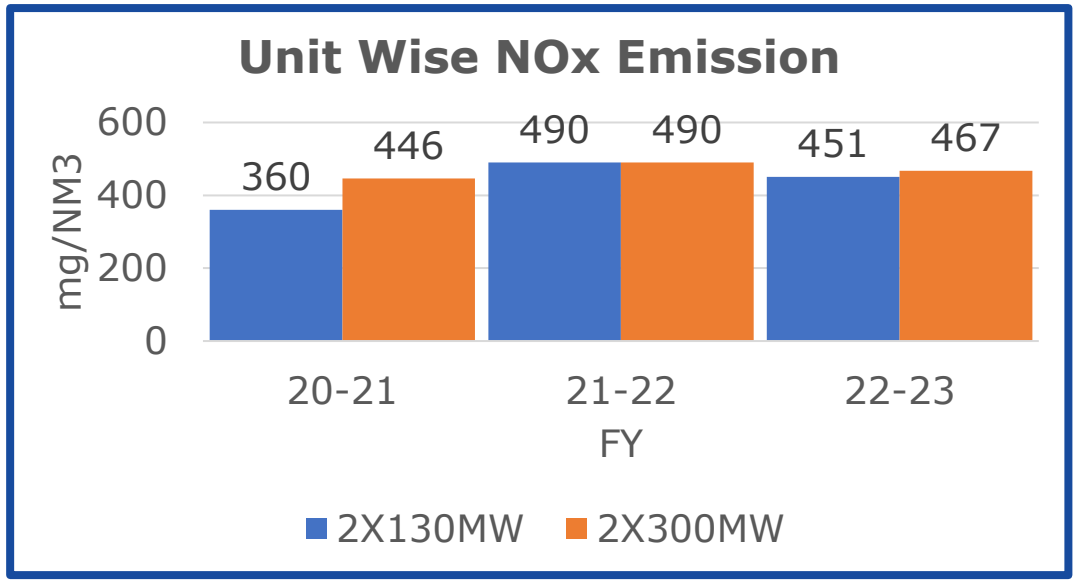


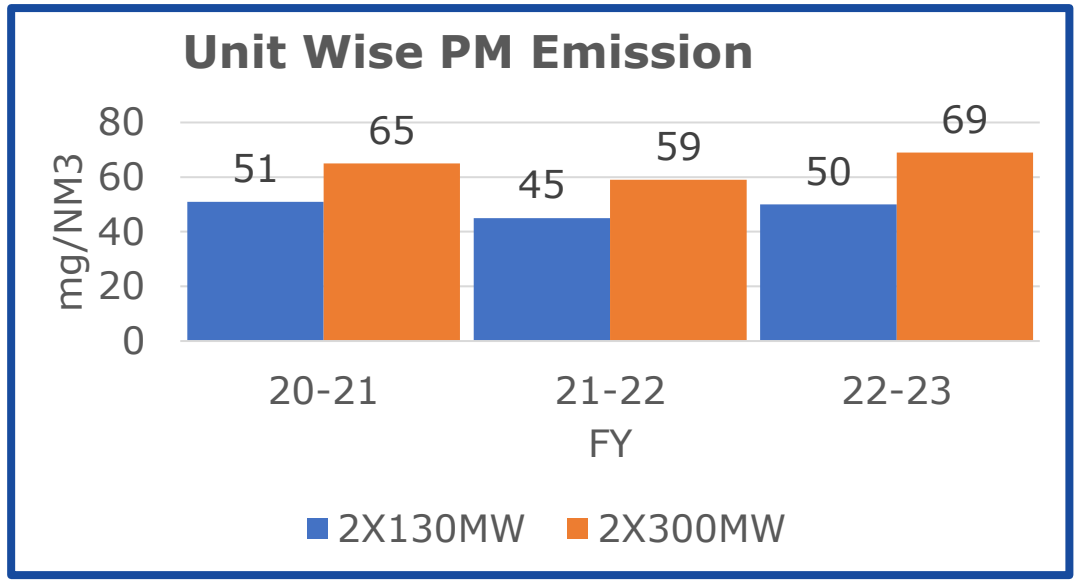
Cement Bricks Mine

ENVIRONMENT MANAGEMENT- EMISSIONS









ENVIRONMENT MANAGEMENT

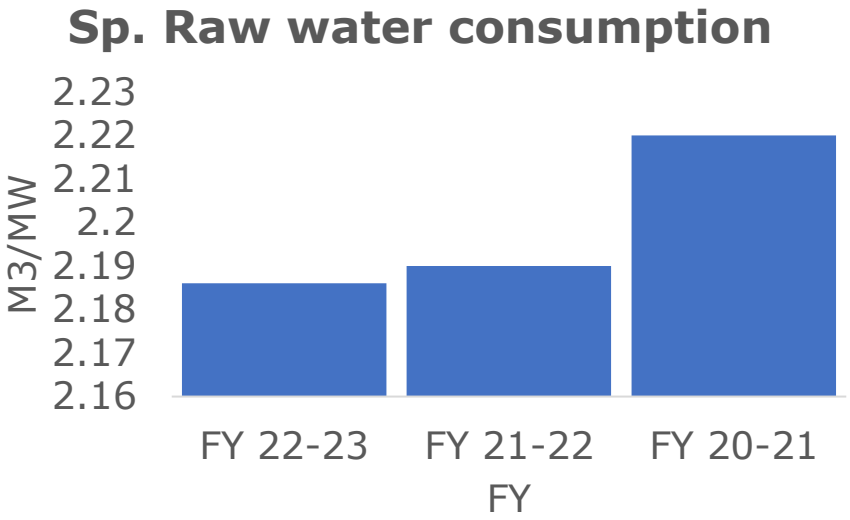
Whether Plant is Zero Liquid Discharge - YES

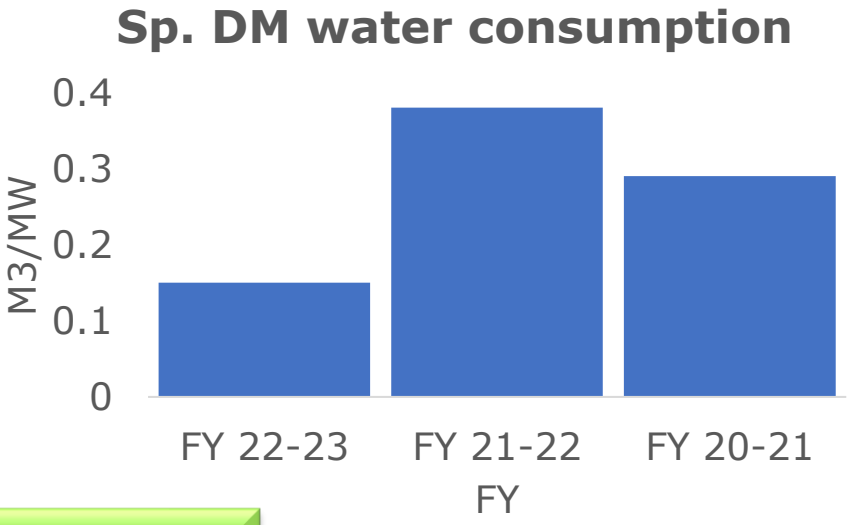
Operational Measures

- Low Specific Water consumption (2.2 cum/MWh) , below the CEA guidelines (4.0 Cum/MWh).
- Use of imported low Ash, low Sulphur coal.
- Use of steel plant waste gas.
- 100 % Fly ash utilization.

Environment Management Initiatives

- Reed bed based STP over conventional or domestic effluent treatment and use for plantation
- RO based effluent recycling plant to maximize recycling and balance effluent for ore beneficiation at steel plant.
- Rain water harvesting for water utilization
- Use of low NOx burners to minimize formation of NOx at source.





JSWEL, Vijayanagar an ISO 14001:2004 Certified Organisation

BEST PRACTICES ADOPTED FOR SUSTAINABILITY

Use of low ash (<15%) and low sulphur (< 0.6%) imported coal to mitigate pollution

Usage of Electro chlorination in place of gas chlorination for micro biological control in Cooling towers

Closed conveyors / enclosed galleries in coal handling plant with bag filters / dust extraction and dust suppression systems at strategic points

Low-NOx burners with OFD to minimize NOx formation

The Existing IFM gas Igniter (LPG has primary fuel) has been replaced with HEA IGNITOR which helped to eliminate safety hazard and consumption of natural resource.

NET ZERO COMMITMENT

JSW group is Committed towards Net Zero Coal by 2050.

Action Plan- By 2030, we are planning 20 GW with 81% renewable energy. We are majorly focusing on renewable energy like Hydro, Solar, Wind, PSP.

UTILIZATION OF RENEWABLE ENERGY SOURCES

JSW Energy

JSW Neo Energy Ltd

The Green Energy Platform of JSW Energy

5.9 GW of installed capacity by CY 24

Current Generation Capacity (3,509 MW)

1,461 MW	657 MW	1,391 MW

Under Construction Generation Capacity (2,403 MW)

2,163 MW	240 MW

Energy Products and Services

3,800 TPD	2,400 MWh	1,000 MWh

UTILIZATION OF RENEWABLE ENERGY SOURCES

Source	Year	Installed capacity (in MW)	Generation (in Million kWh)	Consumption (in Million kWh)	Share %
SOLAR	**2022-23**	225	392.4	392.4	100

225 MW Solar plant commissioned on 6th April 2022

610 MW Wind projects under installation

EMS SYSTEM AND OTHER REQUIREMENTS

Existing energy monitoring system / IOT system

- OSI PI based Monitoring system with Realtime and historic dashboards for Heat rate, APC, Excursions, Turbovisory,

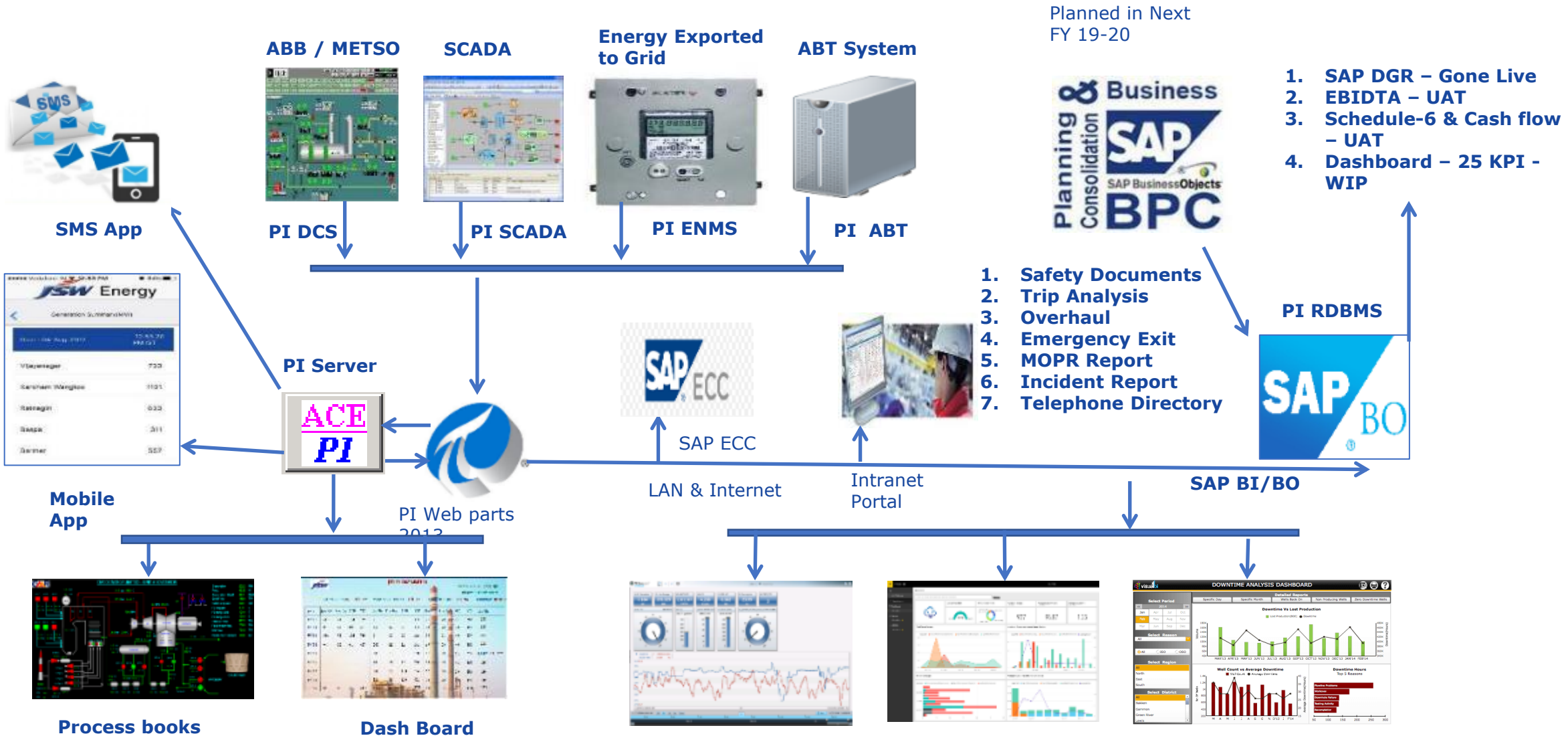
ISO 50001 certification

- We are an ISO 500001 Certified company

Learnings from CII energy award or any other award program

- CII and other Energy Awards give us awareness of what best and innovative practices are going around the world. It gives us the opportunity to showcase and share our best practices with the industry.

IT INITIATIVES



DIGITAL TRANSFORMATION INITIATIVES

Procurement

1.Coal ViU

2. Coal Inventory

3. Coal Logistics Tracking

Reliability

1. IOT based vibration sensors

2. Excursion management system

3. SAP customized RCM tools.

Efficiency

1. AI/ML models for Heat Rate optimization

2. APC Benchmarking & Real time Monitoring

3. Mobile Application

Human Resource

1. CWMS

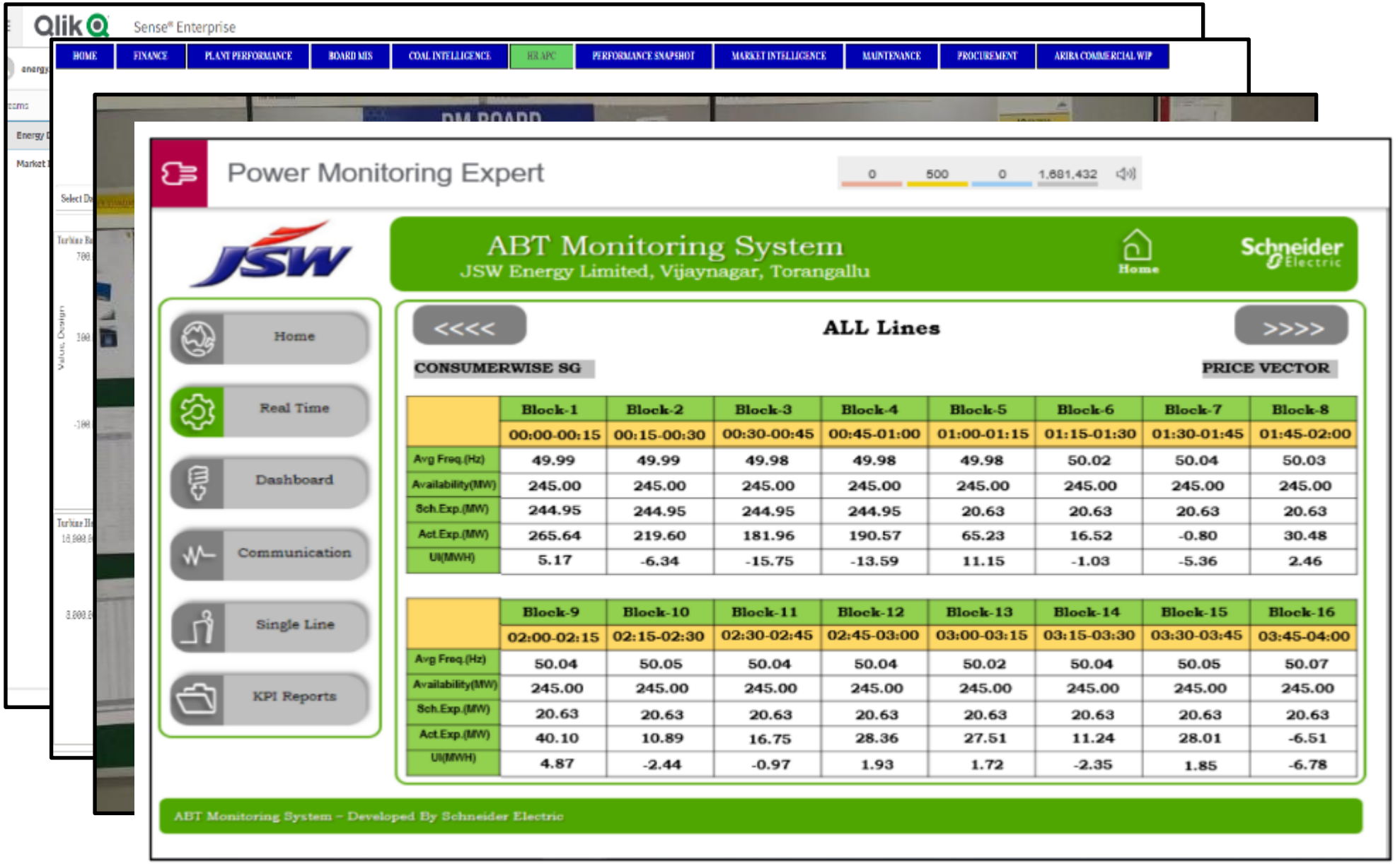
2. GPS Tracking

3. Drone Inspection

4. Darwin box

TEAMWORK, EMPLOYEE INVOLVEMENT & MONITORING

TEAMWORK, EMPLOYEE INVOLVEMENT & MONITORING



	Block-1	Block-2	Block-3	Block-4	Block-5	Block-6	Block-7	Block-8
	00:00-00:15	00:15-00:30	00:30-00:45	00:45-01:00	01:00-01:15	01:15-01:30	01:30-01:45	01:45-02:00
Avg Freq.(Hz)	49.99	49.99	49.98	49.98	49.98	50.02	50.04	50.03
Availability(MW)	245.00	245.00	245.00	245.00	245.00	245.00	245.00	245.00
Sch.Exp.(MW)	244.95	244.95	244.95	244.95	20.63	20.63	20.63	20.63
Act.Exp.(MW)	265.64	219.60	181.96	190.57	65.23	16.52	-0.80	30.48
UI(MWH)	5.17	-6.34	-15.75	-13.59	11.15	-1.03	-5.36	2.46

	Block-9	Block-10	Block-11	Block-12	Block-13	Block-14	Block-15	Block-16
	02:00-02:15	02:15-02:30	02:30-02:45	02:45-03:00	03:00-03:15	03:15-03:30	03:30-03:45	03:45-04:00
Avg Freq.(Hz)	50.04	50.05	50.04	50.04	50.02	50.04	50.05	50.07
Availability(MW)	245.00	245.00	245.00	245.00	245.00	245.00	245.00	245.00
Sch.Exp.(MW)	20.63	20.63	20.63	20.63	20.63	20.63	20.63	20.63
Act.Exp.(MW)	40.10	10.89	16.75	28.36	27.51	11.24	28.01	-6.51
UI(MWH)	4.87	-2.44	-0.97	1.93	1.72	-2.35	1.85	-6.78

ISO CERTIFICATION

Bureau Veritas Certification

JSW ENERGY LIMITED

JSW Energy

POST BOX NO. 09, TORANAGALLU, BALLARI DISTRICT – 583 123, KARNATAKA, INDIA

Bureau Veritas (India) Pvt. Ltd. (Certification Business) certify that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the Management System Standards detailed below

Standards

ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 & ISO 50001:2018

Scope of certification

GENERATION OF 2X130MW & 2X300MW ELECTRICITY FROM THERMAL POWER PLANT

Original cycle start date ISO 9001 & ISO 14001:	**08 December 2007**
Original cycle start date ISO 45001:	**28 January 2021**
Original cycle start date ISO 50001:	**09 May 2014**
Expiry date of previous cycle for ISO 50001:	**20 November 2022**
Recertification Audit date for ISO 50001:	**01 October 2022**
Recertification cycle start date:	**07 December 2022**

Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: **07 December 2026**

Certificate No. **IND.22.8804/IM/N** Version: **1** Issue date: **07 December 2022**

Certification Authority
Jagdheesh N. MANIAN
Director – CERTIFICATION, South Asia
Commodities, Industry & Facilities Division

NABCB QM 003 NABCB EM 004 NABCB OHSMS 001 NABCB EnMS03

Local office: Bureau Veritas (India) Private Limited (Certification Business) 72 Business Park, Marol Industrial Area, MIDC Cross Road "C", Andheri (East), Mumbai – 400 093, India.

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organization. To check this certificate validity please call + 91 22 6274 2000.

CERTIFIED ISO 9001:2015 COMPANY

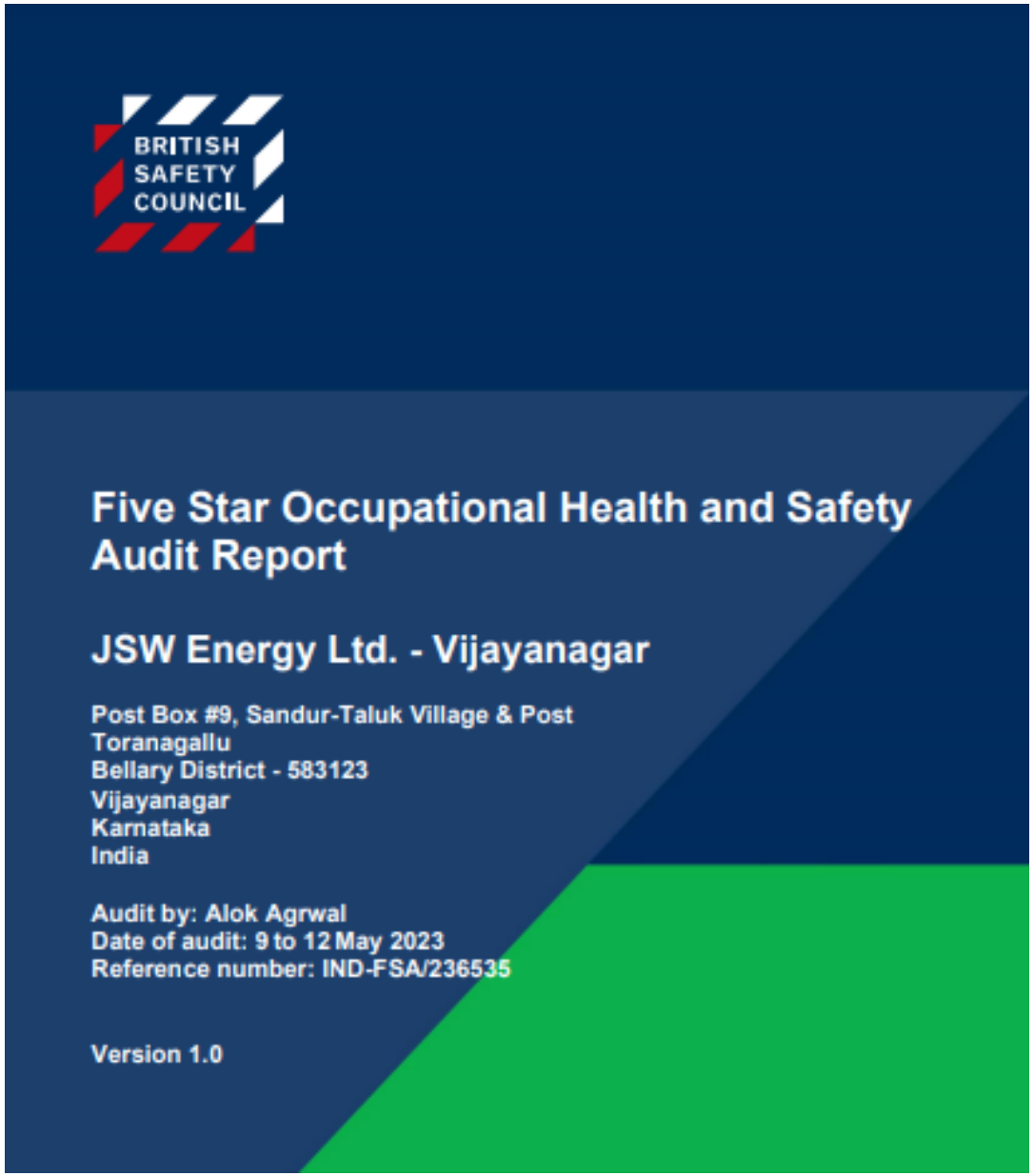
ENVIRONMENTAL MANAGEMENT SYSTEM ISO 14001

CERTIFIED ISO 22301:2019 (BCMS) COMPANY

OCCUPATIONAL HEALTH & SAFETY OHSAS 18001

CERTIFIED ISO 50001 CERTIFIED

BSC FIVE STAR CERTIFIED



BRITISH SAFETY COUNCIL

Five Star Occupational Health and Safety Audit Report

JSW Energy Ltd. - Vijayanagar

Post Box #9, Sandur-Taluk Village & Post
Toranagallu
Bellary District - 583123
Vijayanagar
Karnataka
India

Audit by: Alok Agrwal
Date of audit: 9 to 12 May 2023
Reference number: IND-FSA/236535

Version 1.0

Five Star Occupational Health and Safety Audit – Five Stars –

Valid until 11th May 2024

★ ★ ★ ★ ★

This is to certify that

JSW Energy Limited, Vijayanagar

after an extensive evaluation by a British Safety Council auditor, has been awarded a rating of Five Stars.

Chair of the Board of Trustees

Mike Robinson
Chief Executive

Certificate number
IND-FSA/236535

Issue Date
12/05/2023

British Safety Council (Company Limited by Guarantee) Registered in England and Wales No. 4656703. Registered Charity No. 1095271 and OSCR No. SC037696

BRITISH SAFETY COUNCIL
Because Experience Counts

AWARDS & ACCOLADES

Best Energy Efficient Unit in IPP below 250 MW SBU1 U1
Organized by the Council of Enviro Excellence

Green Crest Energy Conservation Award 2022
by Green Maple Foundation

"National Efficiency Award – 2023" for Best Thermal Power Performer-
by Mission Energy Foundation.

National Power Plant Award 2023 in the category of CPP above 135 MW
by Council of Enviro excellence

Best Energy Efficient Plant – Coal
Organized by Mission Energy

Jury awards for Innovation and Renewable initiatives Organized by the Indian Chamber of Commerce

National Award for Excellence in Energy Management 2022"
Organized by Confederation of Indian Industries

"National Energy Management Award 2021 organised **by Society for Energy Engineers and Managers**

“See every day as an opportunity to Better Everyday”

Thank You

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varaprasad.sriramoju@jsw.in, 9449879435

BETTER EVERYDAY

JSW Energy