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MANUFACTURED CAPITAL



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Energy is a fundamental catalyst in driving global development and as providers of a form of energy, we are conscious of the role we play in this cycle. This has led to Apraava Energy choosing an ambitious course for the future, one that is more sustainable and good for the environment but also on track to meeting the world’s intensifying power needs. While our aspirations have grown tremendously, the path we have chosen to realise these ambitions are what sets us apart.



MATERIAL TOPICS

- » Operational Excellence
- » Performance Monitoring and Management
- » Adoption of Advanced Technology

In 2009, Apraava Energy pivoted towards an approach that was more eco-friendly, with a foray into Renewable Energy (RE). Although we have been in this space for a brief period of time, we have fortified our position, maintained consistent cash flow, optimised resource use and upheld rigorous safety standards. In FY 2022-23, Apraava ventured into Advanced Metering Infrastructure (AMI) and achieved a significant milestone by securing two AMI projects in the states of Assam and Gujarat. The Government of India’s Revamped Distribution

Sector Scheme (RDSS) is a key reform, and Apraava Energy installed the country’s first smart meter as part of the RDSS scheme in Assam. In FY 2023-24, two new AMI contracts have been secured in the states of Himachal Pradesh, and West Bengal. Also, the four new wins in Transmission during FY 2023-24 has further strengthened our transmission portfolio. Expansion of RE, Transmission and AMI business is a testimony to our efforts to grow as a comprehensive clean energy player while contributing to India’s green energy mission and global sustainability goals.

Apraava Assets

Apraava Energy’s Power Generation Assets (as on 31 March 2024)

Technology Type	State	Capacity
Coal-fired Supercritical Power Station	Jhajjar, Haryana	1,320 MW
Solar Projects	Telangana, Maharashtra	250 MW
Wind Farms	Rajasthan, Gujarat, Maharashtra, Madhya Pradesh, Karnataka, Tamil Nadu	1,134 MW
400 kV Transmission Lines	Madhya Pradesh, Assam, Nagaland, Manipur	494 KM
AMI Business (consumers)	Assam and Gujarat	242,226

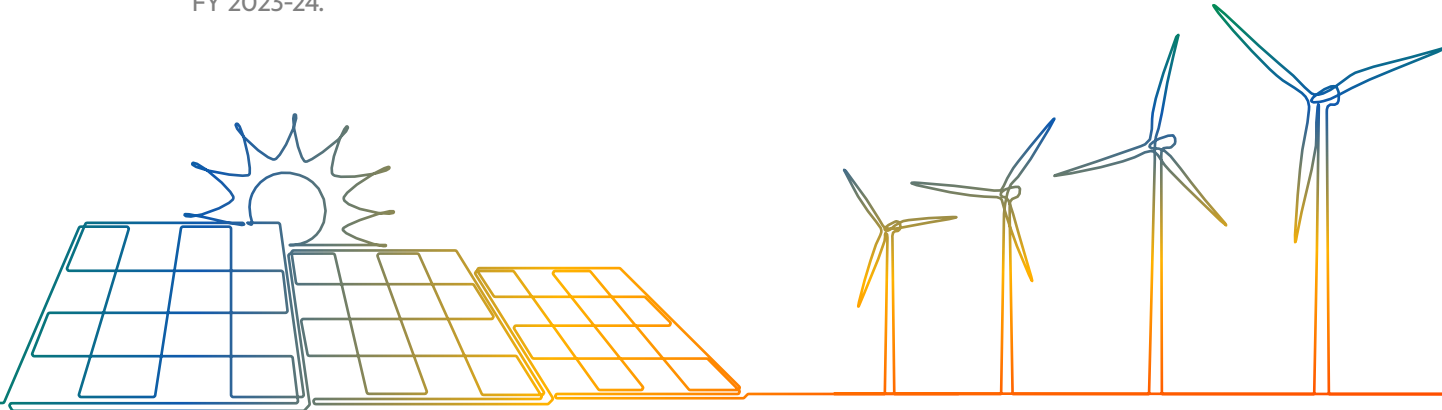
Source-wise Energy Sent Out (GWh)

Source	FY 2021-22	FY 2022-23	FY 2023-24
Coal	7,242	7,634	7,740
Solar	454	472	501
Wind	1,664	1,551	2,002

Apraava Energy’s Total Energy Consumption within the organisation

Source	Unit	FY 2021-22	FY 2022-23	FY 2023-24
Coal	TJ	72,118.21	75,441.73	74,410.14
Renewable Energy (Biomass)	TJ	0	0	1,149.40
HSD	TJ	64.57	54.27	32.99
Diesel	TJ	10.40	12.71	13.10
Petrol	TJ	0.02	0.13	0.14
Purchased Electricity (GRID)	TJ	34.18	49.76	59.03
LPG*	TJ	1.53	1.72	1.98
Total Energy Consumption	TJ	72,228.91	75,560.32	75,664.80
Energy Intensity	TJ/MWh	0.0077	0.0078	0.0074

*From the FY 2023-24, LPG consumption is not accounted in Scope 1 and has been shifted to Scope 3 accounting. Accordingly, LPG is not part of total energy consumption within the organisation for FY 2023-24.



Apraava’s Renewable Energy Assets

We witnessed significant growth in Renewable Energy (RE) capacity in FY 2023-24. While our operational wind capacity stands at 1,134 MW, solar capacity stands at 250 MW. We secured a 300 MW wind project in Karnataka and two solar projects of 250 MW and 300 MW respectively, in Rajasthan during the reporting period (refer to Business at a Glance on pg-14). The growth of our RE portfolio underscores Apraava Energy’s steadfast commitment to fostering a sustainable future through renewable energy.

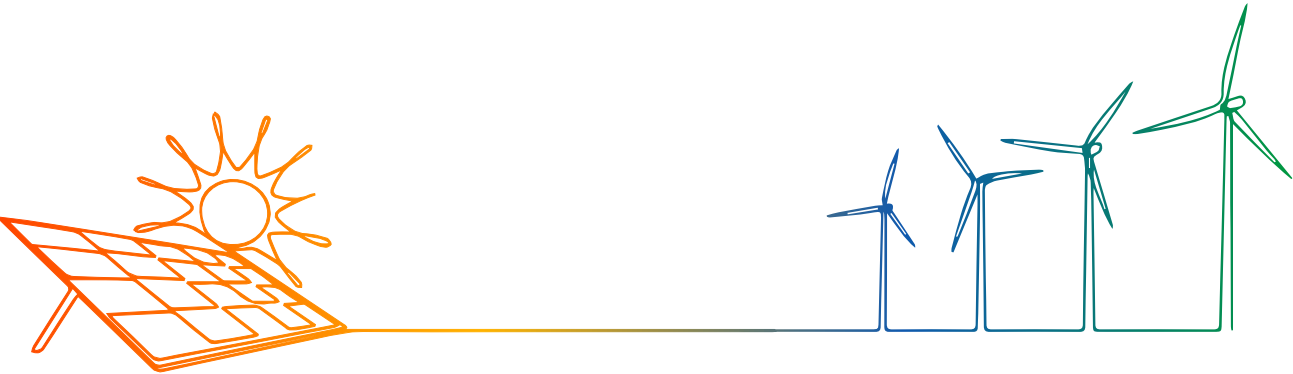
Operational Efficiency Across RE Assets

Source	KPI	Unit	FY 2021-22	FY 2022-23	FY 2023-24
Wind	Plant Load Factor	%	21.07	19.16	21.84
	Availability	%	96.46	92.66	94.11
Solar	Plant Load Factor	%	20.88	21.30	22.21
	Availability	%	89.77	93.60	99.57

We relentlessly seek to maximise operational efficiency by implementing real-time monitoring systems across all wind and solar assets. In alignment with our strategy for digital transformation, we have commenced the implementation of a Central Monitoring Facility (CMF) for all our RE sites. This strategic exercise is designed to work synergistically with Original Equipment Manufacturers (OEMs), facilitating the early detection of deviations from optimal performance or potential opportunities for operational improvements. This collaborative approach boosts our ability to address production

and transmission-related challenges promptly and effectively.

Apraava Energy’s largest wind farm project, located in Sidhpur, Gujarat, with a capacity of 250.8 MW, is inching close to completion. As of March 2024, of the 250.8 MW capacity, 210 MW has been commissioned. Having cleared all regulatory approvals, this momentous venture marks a substantial milestone in our ongoing quest for a sustainable, renewable energy-focused future.



Dry Cleaning of PV Modules at Solar Assets

Conventionally, water has been used in cleaning Photo Voltaic (PV) modules at solar plants through a process known as wet cleaning technology. Apraava Energy, too, has used water to clean PV modules in the past, executing a minimum of 18 wet cleaning cycles per year at each plant.

In a bid to conserve water, we switched to dry cleaning of PV modules using ‘pick and place’ robots. Opting for these robots under an Operational Expenditure (OPEX) model significantly resulting in water saving of approx 14,000 kl annually, and enhanced plant performance. This initiative demonstrates Apraava Energy’s commitment to balancing operational efficacy with environmental stewardship.

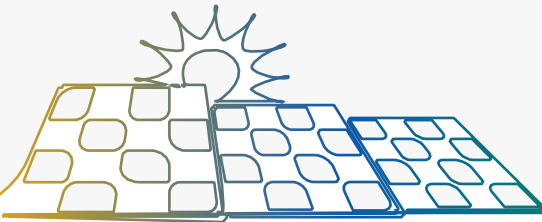
The implementation of dry cleaning systems for PV modules at our existing solar assets - Gale (50 MW), Tornado (20 MW), CREPL (30 MW), and Divine Solar Power Limited [DSPL] (50 MW), has been implemented from 1 May 2023.



Making the Shift to Solar Pumps

A transition from conventional electric pumps to solar-operated pumps was implemented at two of our solar sites, Veltoor (100 MW) , DSPL (50 MW) and is under the process of being implemented at CREPL (30 MW). Historically, our operational protocol entailed use of electrically-powered borewells to extract groundwater, a practice prevalent in the industry. However, in order to use renewable energy for our borewell pumps and demonstrate our commitment to sustainability, we decided to replace these traditional electric pumps with solar-powered alternatives.

Despite the initial cost, the shift to solar-powered borewells is expected to generate considerable auxiliary power savings. Moreover, the use of solar resources means that the operating costs associated with using conventional electric power are rendered negligible. This strategic move underlines our commitment to sustainable, cost-efficient practices and further propels us towards our sustainability goals.





Building 'Inclusive' Assets

In a marked effort to promote gender diversity, Apraava Renewable asset management team and one of our Operations & Maintenance (O&M) service partner, Param Renewable, successfully incorporated the inclusion of a female workforce in our operations. Confronted with major challenges such as gender integration and sustaining a female workforce, particularly in remote areas with prevalent safety and security concerns, a strategic approach was conceived and executed. O&M partner teams meticulously devised a recruitment strategy that saw the addition of four female engineers at Veltoor, supporting the asset management teams. The accompanying implementation of a 'buddy system' aimed to foster a supportive and comfortable work environment for our new female hires. In support of this initiative, the Apraava site management team provided comprehensive training sessions, imparting essential knowledge regarding asset management principles, Health, Safety, Security and Environment (HSSE) principles and Apraava Energy's praiseworthy practices. This project underscores our commitment not just in surmounting obstacles but also nurturing a culture of diversity, inclusion and excellence within our renewable asset operations.



Starting Young: Educating Students About Solar Power

With the intent of bridging the gap between theoretical knowledge and practical application, we took the initiative of engaging the student community to provide them with first-hand experience of solar site operations. We conducted two single-day events on 5 October 2023 and 20 December 2023 at our solar assets in Sakri and Veltoor for about 122 engineering students, including staff and professors. The participants, 58 boys and 64 girls, had robust theoretical knowledge in Electrical and Electronics Engineering. However, they lacked practical exposure to field operations in solar power generation.

This exposure to practical operations supplemented their theoretical knowledge and career preparedness as far as the renewable energy sector is concerned. Knowledge sharing sessions at both sites included field tours and presentations. Practical lessons coupled with a mass tree plantation event aimed to deepen their understanding and foster environmental responsibility. Inspired by the success of these sessions, we plan to undertake more such initiatives in different operational locations to encourage student learning and understanding.



Jhajjar Power Limited

Effects of climate change have resulted in more than 700¹ heat waves in India in the last five decades, thereby increasing power demand as citizens purchase more air conditioners. This power demand is currently being met majorly through coal, a resource abundantly available in India. India's reliance on coal shall continue in the near future given the surging power demand and the cost effectiveness of coal-based electricity.

In the face of these issues, it is necessary for coal based power plants to operate efficiently as well as ensure compliance with the environmental norms. We are proud to say that our sole thermal power plant, JPL, is one of the most efficiently

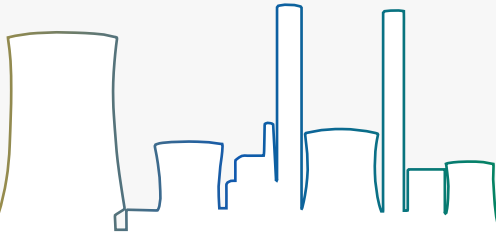
operated thermal power assets in north India. JPL, a supercritical plant with a generation capacity of 1,320MW, is the first and only thermal plant in north India to be equipped with a Flue Gas Desulphurisation (FGD) unit, a hybrid Electrostatic Precipitator and Fabric Filter. These facilities are accompanied by low Nitrogen Oxide (NOx) burners, a zero water discharge system and 100% ash and gypsum utilisation along with waste management processes that are tangible steps towards a circular economy.

In addition, concrete steps are also being taken to make JPL's thermal power as 'green' as possible with various environment and sustainability initiatives.



Efforts Towards Biomass Co-firing

Over the last fiscal year, JPL has made significant strides in its energy transition endeavours, particularly through the increased utilisation of biomass co-firing. This consistent uptick in biomass co-firing over the last year has been made possible by effectively addressing numerous process and supply chain challenges. JPL stands at the forefront of efforts to maximise biomass consumption in India and is amongst the TPPs consuming highest biomass in FY 2023-24 i.e. ~79,511 metric tonnes. Our trajectory of improvement positions us well to meet statutory requirements for biomass usage and also a frontrunner in abetting carbon emission through biomass co-firing. The various innovative measures undertaken at JPL have resulted in improved energy efficiency, increased safety, reduced operational risks and reliable operations.



1. <https://edition.cnn.com/2024/01/06/india/extreme-heat-india-climate-ac-intl-hnk/index.html>

Details Of Technology Absorption at JPL

Technology Absorption

Tunable Diode LASER Analyser for Oxygen measurement at STACK

FGD vacuum belt feeder slurry thickness measurement transmitter has been changed to LASER based level transmitter for better accuracy

Procurement of Composite PV block

Installation of high output coal feeder motor gearbox set in coal mills

Benefits to the Company

- Reliable oxygen measurement which is used for showing corrected SOx and NOx measurement.
- LASER transmitter helps us to keep vacuum belt in auto mode/close loop control.
- With the utilisation of this Composite PV block, we can securely manage any derailment involving wagons or locomotives.
 - Efficient, secure, and trouble-free movement of rakes within the plant premises.
- Reduce demurrage expenses resulting from wagon or locomotive derailments.
- Availability of 01 nos. each coal mill in both units for maintenance and standby operation.
 - Estimated yearly energy saving of 3.18 million kWh/unit and INR 6.36 million kWh for both units.
 - Yearly savings in energy of value around INR 26 million.

JPL's Operational Efficiency

KPI	Unit	FY 2021-22	FY 2022-23	FY 2023-24
Net Thermal Efficiency	%	36.11	36.40	36.84
Plant Load Factor	%	67.08	70.45	71.16
Availability	%	85.83	86.23	86.11
Auxiliary Power Consumption	%	6.64	6.28	6.19



Fuel Consumption at JPL

Sources	Unit	FY 2021-22	FY 2022-23	FY 2023-24
Coal	TJ	72,118	75,442	74,410
	MT	4,738,330	5,040,563	5,080,173
Biomass	TJ	-	-	1,149.40
	MT	-	-	79,511
High Speed Diesel	TJ	65	54	33
	Kl	1,764	1,483	902
Specific Coal Consumption	MT/MWh	0.61	0.62	0.63
Specific Oil Consumption	ml/kWh	0.23	0.18	0.11

Installation of Liquid Collection System (LCS) and Borosilicate Lining in Chimney Flue Can



Corrosion presents a significant challenge to our Flue Gas Desulphurisation (FGD) unit operations, affecting the FGD bypass duct and entire chimney from the bottom to an elevation of 275 meters. This issue necessitates extensive maintenance work during overhauls alongside ongoing repairs during normal operations.

In previous overhauling periods, we employed titanium patching on corroded surfaces and applied protective coatings over welding joints.

However, subsequent inspections during brief shutdowns revealed that these measures proved insufficient as the anti-acidic coating had failed and titanium patching, was detached by continued corrosion. Thus, it did not prove to be a prudent solution for the long term and condensate carry over caused significant damage to flue can. In order to overcome this issue, we have installed LCS to mitigate corrosion issues along with borosilicate block lining from the chimney's base.

Upon installation, we anticipate the following benefits:

- Condensate collection capacity will be ameliorated, leading to enhanced plant reliability and availability
- Occurrence of corrosion will be mitigated for the rest of the life of the equipment
- Overall running maintenance is going to be minimised

Optimisation of Diesel Consumption at JPL

JPL used dozers to stack coal in yards in the past before it was reclaimed for the bunkers, consuming 138,600 litres of High Speed Diesel (HSD) in 2021. To reduce environmental impact and enhance efficiency, JPL adjusted processes to maximise direct coal feeding to bunkers, reducing rehandling in yards.

This change, implemented with no extra budget, led to significant reduction in HSD consumption which dropped by 33.64% in 2022 and 35.14% in 2023, with cost savings of INR 4.6 million and INR 4.8 million, respectively. Environmental benefits included a CO₂ emission reduction of 124 metric tonnes in 2022 and 129.5 metric tonnes in 2023. With enhanced operational efficiency, monetary benefits and environmental sustainability, this initiative is a testament to the advantages of strategic changes in coal handling.



Performance Achievement and Trade Scheme (PAT) for JPL

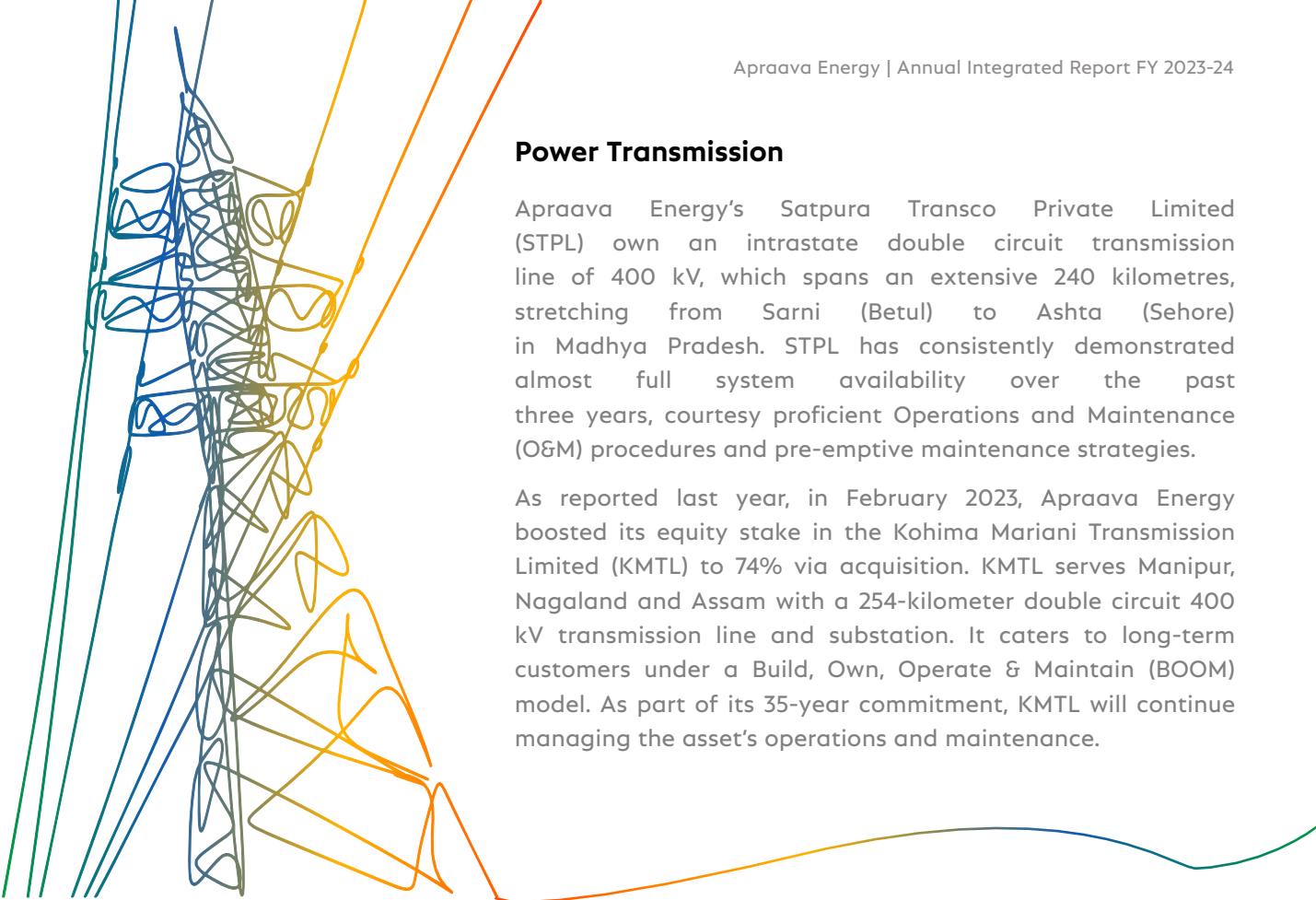
The Performance Achievement and Trade (PAT) scheme, a Government of India (GoI) initiative, aims to boost energy efficiency in industries. Under this scheme, industries are given energy saving targets over a 3-year period. They earn Energy Saving Certificates (ESCs) for meeting these targets, providing a financial incentive for efficiency improvements. JPL has been identified as a Designated Consumer (DC) under PAT Cycle III by the Bureau of Energy Efficiency (BEE) and needs to comply with this scheme.

JPL underwent a baseline audit for FY 2015-16, receiving a target heat rate of 2,365 Kcal/KWh for FY 2018-19. The performance for FY 2019-20 was audited by a third-party auditor, resulting in a derived net station heat rate of 2,323 Kcal/KWh after applying normalisation factors as per PAT Cycle III, which was confirmed by the auditor. Consequently, positive ESCs equivalent to JPL's performance were proposed for issuance. The Ministry of Power (MoP) issued 13,521 positive ESCs for PAT Cycle (FY 2018-19) to JPL after reviewing the Monitoring and Verification audit (M&V) audit report and supporting documents.

The ESCs can be traded at the power exchange, with the minimum price set at 10% of the prevailing cost of one metric tonne of

oil equivalent. The quantity of ESCs bought or sold in the trading window depends on the demand-supply scenario. JPL registered with POSOCO (Grid India) as an Eligible Entity (EE) for ESC trading and is currently in the process of registering with the Indian Energy Exchange (IEX) for the same.

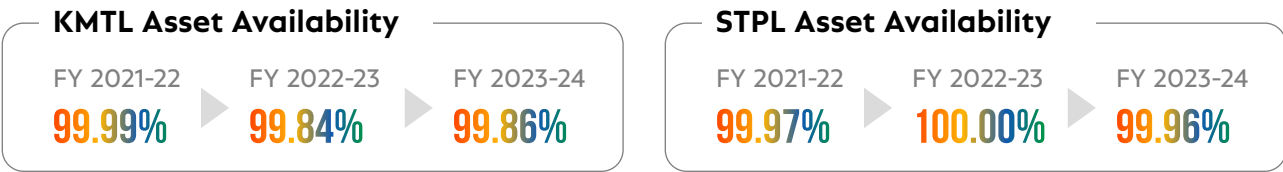
Meanwhile, for subsequent years, JPL has entered PAT VII scheme after a successful M&V audit of PAT III, with the assessment year for PAT VII set as FY 2023-24 and a target Net Station Heat Rate (NSHR) of 2,411.44 Kcal/KWh. The same procedures that were applicable to PAT III will apply to PAT VII, with the M&V audit tentatively scheduled for mid-2025. With JPL consistently improving its heat rate performance over the last four years, the Company is poised to reap the benefits in the upcoming PAT VII cycle, slated for completion next year. This remarkable operational performance has enabled JPL to cut down on a significant amount of coal consumption, thereby directly mitigating environmental impacts with lower emissions. It has also resulted in Apraava Energy accruing direct benefits through coal savings and gains from the PAT scheme. Such all-round performance has become a hallmark of JPL's operational excellence.



Power Transmission

Apraava Energy's Satpura Transco Private Limited (STPL) own an intrastate double circuit transmission line of 400 kV, which spans an extensive 240 kilometres, stretching from Sarni (Betul) to Ashta (Sehore) in Madhya Pradesh. STPL has consistently demonstrated almost full system availability over the past three years, courtesy proficient Operations and Maintenance (O&M) procedures and pre-emptive maintenance strategies.

As reported last year, in February 2023, Apraava Energy boosted its equity stake in the Kohima Mariani Transmission Limited (KMTL) to 74% via acquisition. KMTL serves Manipur, Nagaland and Assam with a 254-kilometer double circuit 400 kV transmission line and substation. It caters to long-term customers under a Build, Own, Operate & Maintain (BOOM) model. As part of its 35-year commitment, KMTL will continue managing the asset's operations and maintenance.



We continuously review O&M processes at our transmission assets, strengthening them through third-party audits and inspections. These rigorous quality assurance practices promote operational efficiency, ensure the safety and sustainability of transmission assets and foster a secure, productive environment.

Currently, Apraava Energy is actively engaged in the construction of four transmission projects which were secured in FY 2023-24, These include:

- ❖ Fatehgarh-IV Transmission Ltd. (Transmission System for evacuation of power from REZ in Rajasthan (20GW) under phase III- Part A1)
- ❖ Fatehgarh-III Transmission Ltd. (Transmission System for evacuation of power from REZ in Rajasthan (20GW) under phase III- Part A3)
- ❖ Karera Power Transmission Ltd. (Western Region Expansion Scheme XXXIII (WRES - XXXIII): Part B in Madhya Pradesh)
- ❖ Rajasthan Phase-IV A Power Transmission Ltd. (Transmission System for evacuation of power from Rajasthan REZ Ph-IV (Part-2:5.5GW) (Jaisalmer/Barmer Complex): Part A)



Advanced Metering Infrastructure (AMI)

Since venturing into the Advanced Metering Infrastructure (AMI) sector in FY 2022-23, we have made rapid progress and substantial accomplishments in this line of business. Focusing on the deployment of cutting edge AMI systems, commonly known as smart electricity meters, the Company significantly enhances energy management and efficiency for customers and distribution companies. Apraava Energy has swiftly established itself as an influential player in the energy infrastructure sector, steering advancement in the industry within a short span of time.

In the current reporting period, Apraava Energy secured two new projects for AMI deployment, creating new revenue streams and extending customer reach. The Company has embarked on new collaborations with several DISCOM partners, which includes Assam Power Distribution Company Limited (APDCL), Paschim Gujarat Vij Company Limited (PGVCL), West Bengal State Electricity Distribution Company Ltd. (WBSEDCL) and Himachal Pradesh South Zone. We have successfully launched AMI meters operations in Assam and installed 242,226 meters as of 31 March 2024. Our target is to reach 4.7 million Indian household in next 2 years. These initiatives demonstrate Apraava Energy’s commitment to delivering superior and more transparent customer experiences. We are keen on leveraging this approach to effectively address and resolve issues faced by customers more promptly, thus cultivating effective relationships with consumers.

Progressing towards Energy Transition through Renewable Energy Storage

In India, RE projects, predominantly wind and solar, have significantly reduced emissions. However, due to RE’s intermittent nature, storage is necessary for its increased integration to the grid without sacrificing stability. There are sectors like chemicals/fertilisers, steel and shipping where RE alone cannot reduce emissions. Apraava Energy is focusing on this transition to augment RE capacity with storage, among other greener alternatives, in challenging sectors.

Currently, we are assessing storage options that are financially feasible in today’s time, namely Battery Energy Storage Systems (BESS), and Pumped Hydro. We are planning to participate in upcoming BESS projects while also identifying potential sites for Pumped Hydro as part of a comprehensive analysis.

Project Management Governance System (PMGS)

The Project Management Governance System (PMGS) serves as an advanced framework designed to support the execution and delivery of top-tier projects. This comprehensive system harnesses consistent, process-driven methodologies for project management, supplemented by a readily available assortment of standardised guidelines and toolkits.

The PMGS integrates project governance at every stage, utilising meticulously designated gates and checkpoints which are subject to review and approval by relevant authorities or project steering committees. These gates and checkpoints establish a set of standard requirements that the project teams are obliged to fulfil.

Through this, the PMGS successfully streamlines the entire project management process, bolstering efficacy and ensuring that each undertaken project aligns with globally recognised best practices. In essence, PMGS embodies a complete project lifecycle management solution, delivering value and reinforcing operational efficiency.

At the organisational level, the PMGS offers substantial benefits:

- It centralises and capitalises on best practices acquired from various entities across the Group companies, paving the way for optimal knowledge transfer across the organisation
- It augments the predictability of outcomes through the implementation of standardised procedures, thereby enhancing operational efficiency and reliability
- It facilitates valuable guidance and direct oversight from senior management and investors, ensuring alignment with broader strategic goals and fostering a transparent and accountable system of governance

As a strategic framework, PMGS plays a pivotal role in the successful delivery of projects by:

- Establishing lucid guidelines for accountability and responsibility at all hierarchical levels within the organisation, thereby promoting clarity of roles in project management
- Aligning all practices with applicable codes, standards, laws and regulations to ensure legal and ethical compliance throughout the course of the project
- Advocating for a proactive approach to risk management throughout all stages of the project lifecycle. This forward-thinking stance allows for early identification and effective mitigation of potential risks, contributing to overall project success

By employing the PMGS framework, projects can be enhanced considerably through these initiatives by the continuous advancement of knowledge, awareness and behaviour in project management. This is achieved through the dissemination of lessons learned from past experiences and projects. The resulting improvement in competencies across the board leads to seamless execution and management of future projects.

Project Phases as per PMGS



Project Execution Capabilities

As Apraava Energy grows in size and complexity, timely execution of projects while maintaining high quality standards as per the PMGS, will have to be the norm, more so because of the sector we operate in. Towards this goal, we set up a Project Management Office in FY 2023-24, through which we aim to achieve the following:

- ✦ **Comprehensive MIS:** A unified data source on project progress to enable data-driven decisions and real-time update availability for relevant teams. Project cost data will be tracked using ERP.
- ✦ **Review Process:** A multi-level coordination and review mechanism to foster collaboration and hasten decision making. This will involve regular meetings at various levels including the Project Working Group (PWG), Project Steering

Committee (PSC) and monthly reviews by the Managing Director.

- ✦ **Knowledge Management:** Capturing learnings from projects to apply for future projects, which could involve altering contract documents or project management processes.

These strategies aim to boost project execution capabilities, driving sustained growth and excellence for Apraava Energy in the future.

Apraava Energy’s ability to deliver consistent and stable services even as we expand our horizons is possible through strong emphasis on quality of operations and robust delivery mechanisms. We will continue to experiment, innovate and adopt best practises across all our assets to optimise efficacies and manifest energy in action through superior performance.

