ISO 50001 Energy Management System – Case Study

2024 India

Apollo Tyres – Chennai Plant

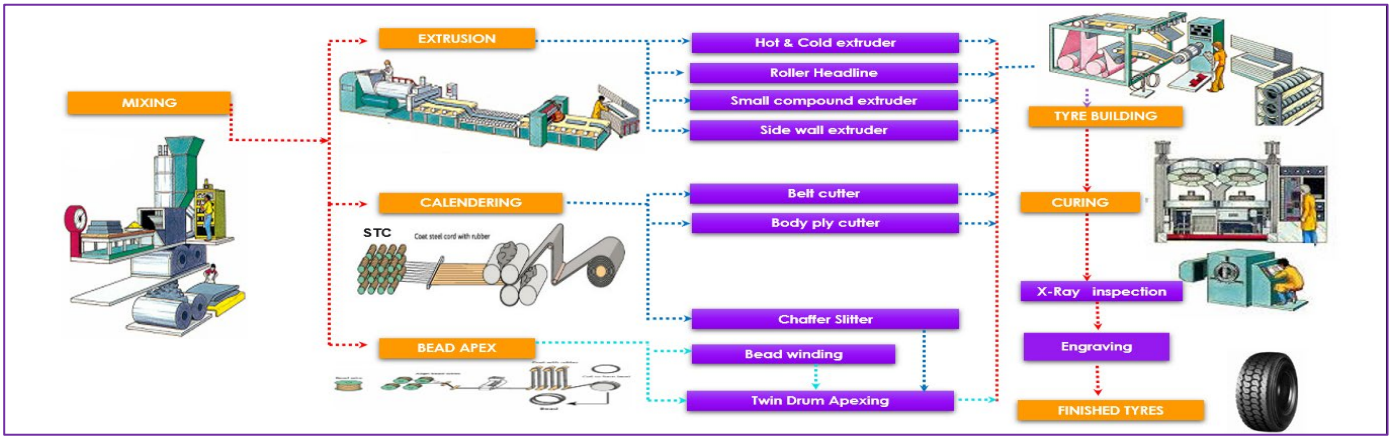
Deliver value to customer by building a "High Productive - High Performing Plant" utilizing TQM framework and digitalization while focusing on Safety, Sustainability & ROCE.

Case Study Snapshot	
Industry	Tyres
Product/Service	Passenger & Truck Bus Radial
Location	Apollo Tyres Limited, Oragadam – Sriperumbudur, Tamil Nadu – India.
Energy performance improvement percentage (over the improvement period)	4 % improvement (2023-24)
Total energy cost savings (over the improvement period)	USD 9,49,828
Cost to implement Energy Management System (EnMS)	USD 3,779
Total energy savings (over the improvement period)	10,765 MWh
Total CO_2-e emission reduction (over the improvement period)	5,969 Metric Tons

Organization Profile / Business Case

Apollo Tyres – Oragadam is the biggest plant of **Apollo Group** of companies spanning over **129 Acres**. Apollo Tyres – Oragadam has a turnover of 2 billion USD. Apollo Tyres has **26%** Share in Indian Market. Apollo Tyres is multinational units, registered under the National Stock Exchange and Bombay stock exchange. This unit employs **4391** Nos of Employees. Apollo Tyres – Oragadam production capacity is **885 MT/Day**. Capacity as per Tyres production as follows: Passenger Car Radial (**PCR**) – 16000 Tyres / Day, Truck Bus Radial (**TBR**) – 12000 Tyres / Day, Light Truck Radial (**LTR**) – 1700 Tyres / Day.

Tyres Manufacturing Process:



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The unit is certified for QMS (ISO 9001:2015), EMS (ISO 14001:2015), OHSAS (ISO 45001:2018), EnMS (ISO 50001:2018) and awarded with Deming Prize in TQM Practices. Apollo Tyres becomes the first in Commercial Vehicle segment to be approved for 5 Star Label for fuel efficiency as per Bureau of Energy Efficiency Tyres labelling programme. The Company has improved the rolling resistance of Commercial Vehicle Tyres by 6%.

Organizational Relationship: The Unit Head is overall in charge of Apollo Tyres, Chennai plant. He reports to the President (APMEA). Heads of Manufacturing Operations, Technology, Engineering, Finance, Human Resources, Quality, Safety, Sustainability and Environment functions within the plant report to the Unit Head.

Key Customers: Apollo Tyres caters to Tyre market at domestic and international level. Our OE customers are Toyota, Volkswagen, Hyundai, Skoda, Mahindra, Isuzu, Maruti Suzuki, TATA, KIA, Ashok Leyland, Eicher, Volvo, Daimler, IVECO, Man Trucks.

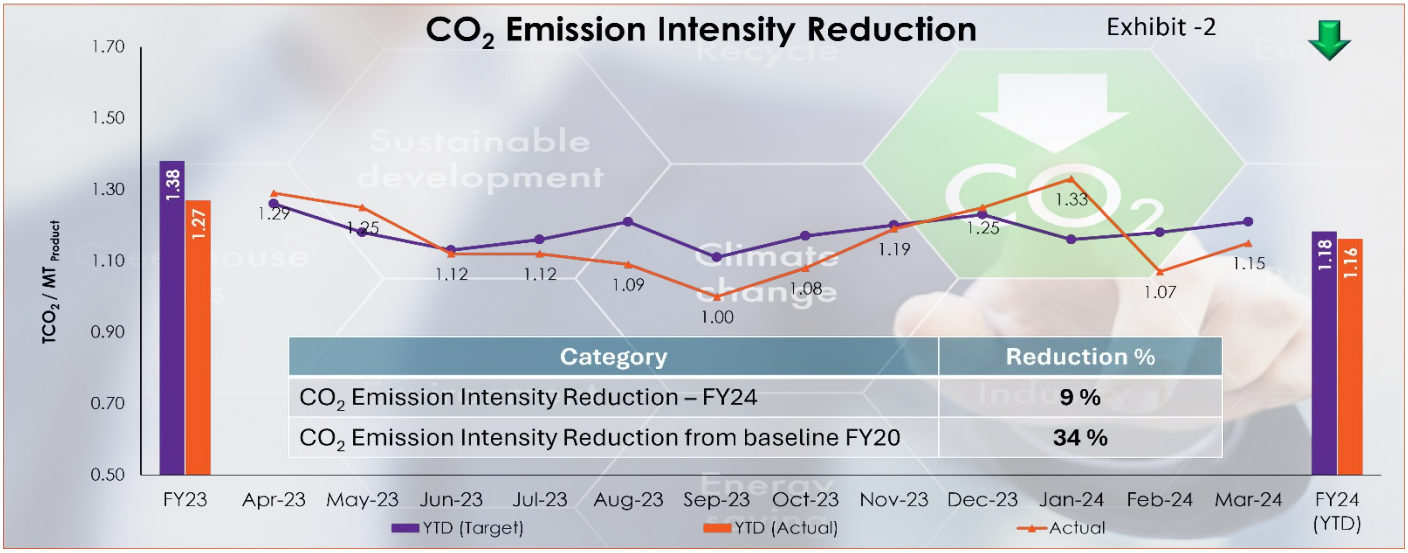
Timeline of the Unit: Apollo Tyres – Chennai Unit established in 2008.

De-Carbonization:

Sustainability is one of the Company's key growth pillars for achieving vision for FY26 and Apollo Tyres committed to become carbon neutral by 2050.

To ensure a gradual transformation to a low carbon trajectory, the Company has arrived a decarbonization strategy, through which the reduction of Scope 1 and Scope 2 emissions (Exhibit -1 & 2) are achieved.

Exhibit-1



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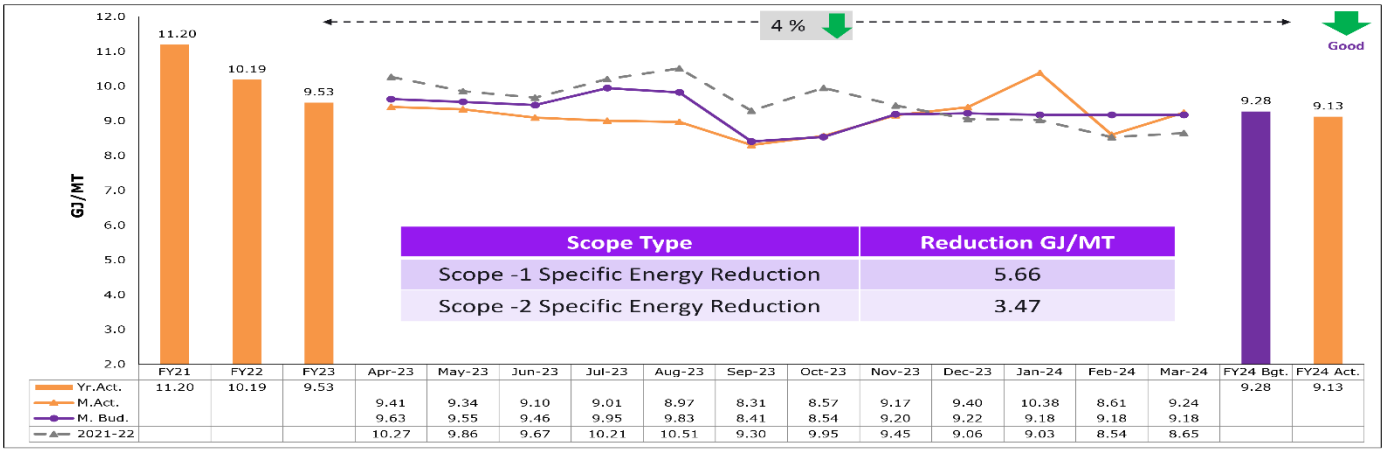
Year	Recognition & Awards	Remarks
2023	Won 1st Prize for Effective Implementation of Energy Management System (EnMS – 50001 :2018) organized by *CII (Confederation of Indian Industry)*	CII-Chandigarh Chapter
	Won Gold Award for Energy Management from *Society of Energy Managers & Auditors*	National level
2022	Winner Awards for Best Managed Electrical Systems from *CII (Confederation of Indian Industry)*	National level

Business Benefits

Adhering to ISO 50001:2018 framework has fetched results in many ways. Measurement, Monitoring & Reporting (MMR) systems integration has been instrumental in our journey towards enhanced efficiency. This shift has contributed to a significant achievement of 4% reduction in Energy Intensity compared previous year. We've set our sights on a targeted 27% reduction in energy intensity by FY26 from FY20 as baseline. Success factors are driven by the ground level operational team who has gained knowledge with respect to the energy policy, energy review, energy usage, energy performance indicators, Terminologies of EnMS. We are the industry benchmark within Apollo for key EnPIs (Specific steam consumption), this is because of Effective deployment of ISO 50001 and improvised operational controls. 3% YOY improvement in Plant direct cost is because of Energy efficiency improvement.

Specific Energy Consumption of Plant(GJ/MT) – FY24



	FY21	FY22	FY23	Apr-23	May-23	Jun-23	Jul-23	Aug-23	Sep-23	Oct-23	Nov-23	Dec-23	Jan-24	Feb-24	Mar-24	FY24 Bgt.	FY24 Act.
Yr.Act.	11.20	10.19	9.53													9.28	9.13
M.Act.				9.41	9.34	9.10	9.01	8.97	8.31	8.57	9.17	9.40	10.38	8.61	9.24		
M. Bud.				9.63	9.55	9.46	9.95	9.83	8.41	8.54	9.20	9.22	9.18	9.18	9.18		
2021-22				10.27	9.86	9.67	10.21	10.51	9.30	9.95	9.45	9.06	9.03	8.54	8.65		

Inference: Specific Energy Consumption of Plant is improved by 4 % in FY24 due to various Energy Consumption Reduction Initiatives

Scope Type	Category	Project Details -FY 24	Energy Savings (KWH)	Co2 Reduction (MT)	Investment (USD)	ROI (Months)
Scope 1	Consumption	Installation of Spray chamber at PCR for recovery of flash steam	3320930	1660	52941	11
		Installation of Spray chamber at TBR trench 7 for recovery of flash steam	1328372	664	54118	25
		Fuel saving by thermal insulation of feedwater delivery pipeline	859535	430	3529	1
	Generation	Trimming of oxygen(O2) in Boiler	3154884	1578	NA	NA
	Design	Single High-Capacity Pump for Plant Hot Water Demand for vulcanization	887500	692	4706	2
Scope 2	Consumption	Reduce air leaks by reducing the regeneration time of desiccant dryer	255600	200	2353	2
		Optimization of Water-Cooled Chillers' Refrigeration Load Distribution	235684	184	10588	7
	Generation	Upgradation of Compressors' Impeller/Screw Elements	53250	42	70588	15
		Replacement of Overcapacity Pumps & Motors with Efficient Pumps & Motors	8520	7	5882	12
		Additional Cooling Tower Installation for Water Cooled Chillers	561000	438	176471	4

Scope -1	8663721 Kwh	Scope -2	2001554 Kwh	Total	10665275 Kwh

These initiatives reflect our commitment to sustainable practices and underscore our dedication to achieving energy efficiency targets.

ISO 50001 in Supply Chain: Key energy performance indicators for the service availed for energy intensive equipment like Chillers, Compressor, Boilers, were captured in Service level agreement and expected deliverables is mutually agreed before the start of the service. When it comes to Supply, we have a well-defined procedure (CHE/EnMS/Proc/01) for procurement and vendors were being evaluated based on energy performance.

Plan

We strategize through mid -term plans (MTP) every 5 years and frame roadmaps. With the roadmap, the annual planning process kicks off at the start of each year. The Energy saving projects are part of capex plan on a rolling model which are executed annually. Energy performance Indicators are being identified as an objective and being tracked through Policy Management and Daily Work Management. These efforts are crucial in Apollo Tyres' journey towards achieving its ambitious goal of a 27% reduction in energy intensity by FY26 from the financial year FY20 as baseline.

We are securing the commitment of top decision-makers through the following policy objectives,

1. To improve energy efficiencies in our operations by reducing wastage, use of energy efficient technologies and having an energy efficiency improvement target on regular basis.
2. To Ensure the availability of all necessary information and resources for achieving the objectives and targets on energy performance. The energy performance indicators will be used to monitor and review the energy performance for continual improvement.
3. To Integrate the energy policy into our business planning, decision making and performance review at appropriate levels in line with our Carbon neutrality commitment.
4. To Procure energy efficient products & services and focus on the design stage for the energy performance improvement.
5. To reduce dependence on fossil fuel by enhancing the use of renewable energy sources.
6. To Involve employees at all levels to promote energy conservation and resource efficiency.

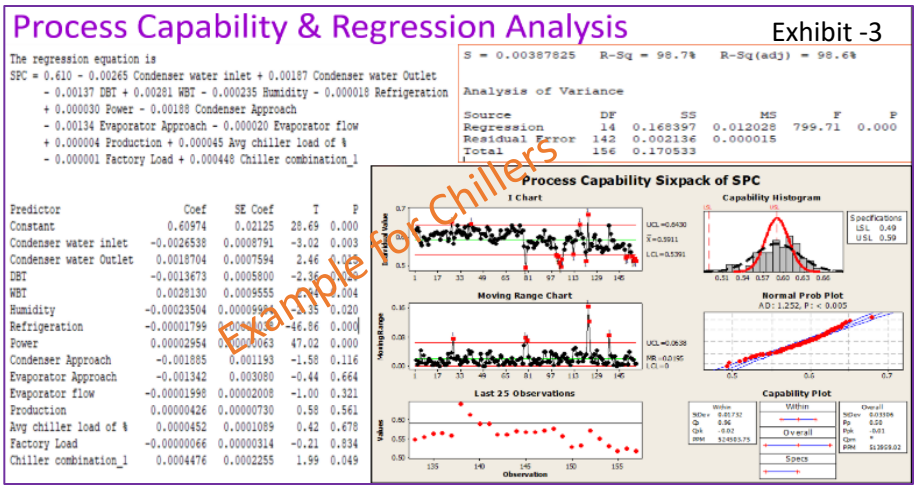
Top Management Roles and Responsibilities are being arrived through RACI Matrix (CHE/EnMS/EMT/01). Top management has appointed a designated energy management team (CHE/EnMS/OC/10) to oversee the implementation process, responsible for setting the overall direction and objectives for the EnMS implementation. It also provides oversight and support throughout the implementation process, ensuring that the EnMS is effectively integrated into the organization's overall operations and strategic priorities. During monthly review, management monitors the performance of the EnMS, including tracking key performance indicators (KPIs), energy consumption trends, and progress towards energy efficiency goals, assess compliance and identify areas for improvement.

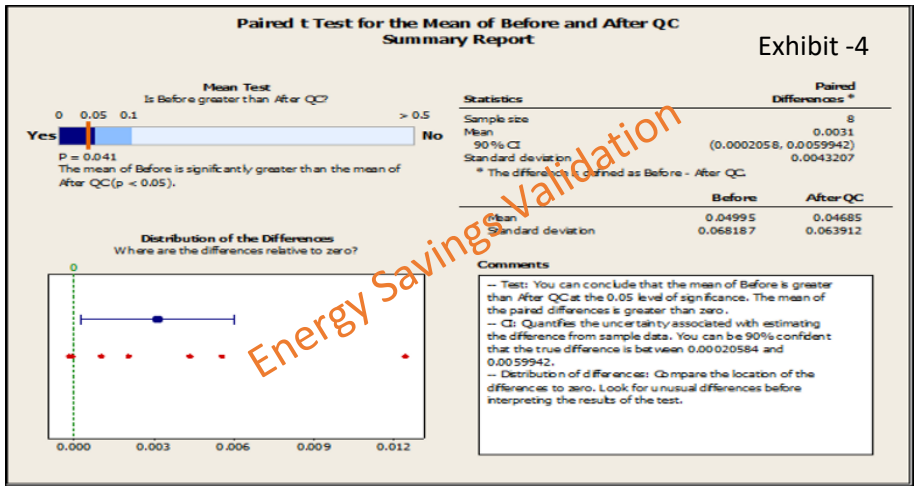
To develop an appropriate approach for managing energy consumption, data analysis plays a crucial role. With clean and validated data, the next step is to analyze it to identify patterns, trends, and anomalies in energy consumption. This involves using statistical methods/tools, data visualization techniques, and energy management software to explore and interpret the data effectively for predicted energy which is shown below in Exhibit-3 and energy savings validation done with paired t test method which shown below in Exhibit-4.

Reviewing and analyzing energy use involves a systematic process as follows:

a. Clearly define the objectives of the energy review and analysis process.
b. Collect comprehensive data on energy consumption.
c. Normalize energy consumption data to account for factors such as weather variations, production levels, occupancy rates, and operating hours.

d. Analyze the normalized energy consumption data to identify patterns, trends, and anomalies.
e. Develop key performance indicators (KPIs) or energy performance indicators (EnPIs) to track and measure energy performance over time.
f. Use the analysis results to identify specific opportunities for energy savings and efficiency improvements.
g. Prioritize identified opportunities based on their potential impact, feasibility, cost-effectiveness, and alignment with organizational goals.
h. Implement the identified energy-saving measures and initiatives according to the action plan.
i. Implement monitoring systems, conduct regular energy audits, and review performance data to identify deviations from expected performance and opportunities for further improvement.
j. Evaluate the effectiveness of implemented measures periodically. Assess whether they have achieved the desired results and adjust the approach as needed.
k. Future Energy Performance is calculated based on Regression equation and base line is arrived accordingly.





We have established a centralized team consisting of Energy Managers and Auditors responsible for overseeing the development and implementation of the EnMS across the plant. This Team develops standardized processes, procedures, and guidelines for energy management that can be applied consistently. This team conducts energy assessments and audits at each site to establish baseline energy consumption, identify opportunities for improvement, and prioritize areas for action. This team defines specific energy management targets and goals for each site. This team implements a consistent system for monitoring and reporting energy performance across all sites.

The establishment and communication of energy policy, objectives, and targets serve as fundamental pillars in our commitment to energy management excellence.

This proactive approach not only fosters accountability but also empowers us to identify opportunities for optimization and innovation. Through energy management best practices like kaizen competitions, Yokoten forums and adherence to our established policies, we remain dedicated to enhancing both our environmental stewardship and operational efficiency.

Since it is re-certification, Maturity level of EnMS has improved and this was acknowledged during the surveillance audit under Maturity Level Evaluation. The extract from the surveillance audit report is given below.
"The improvement continuum graph is the status of your organization viz a viz where you want to be. This has improved from primitive stage through grassroot, embraced and now at embedded stage".
The Management of Energy-related Greenhouse Gases (GHGs) involves several key activities focused on:

Setting Objectives and Targets -> Baseline Assessment -> Identifying Significant Sources -> Risk Assessment of GHG emissions -> Integration with Environmental Objectives -> Developing action plans and implementation strategies to reduce GHG emissions -> Monitoring and measurement systems to track progress towards GHG emissions reduction targets and objectives.

Do, Check, and Act

Implementing an energy management action plan involves transforming goals and strategies into concrete actions and initiatives that drive energy efficiency, reduce greenhouse gas emissions, and optimize energy usage across an organization's multiple operations. The transformation of goals and strategies will be done by the Top Management and the Core Energy Management Team.

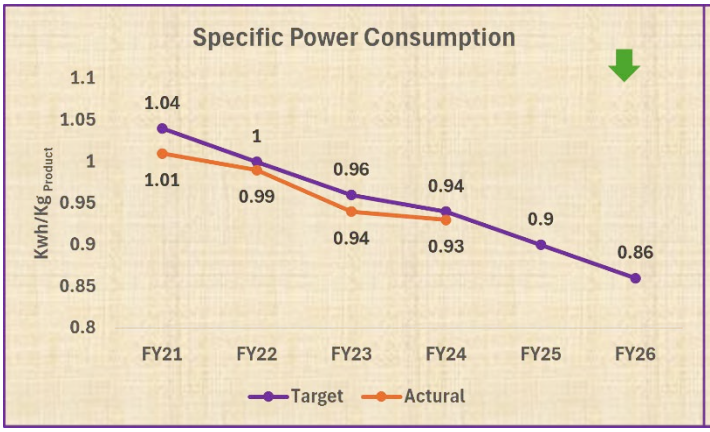
The Top Management of an organization plays a crucial role in providing motivation and support for the implementation of EnMS by doing the following:

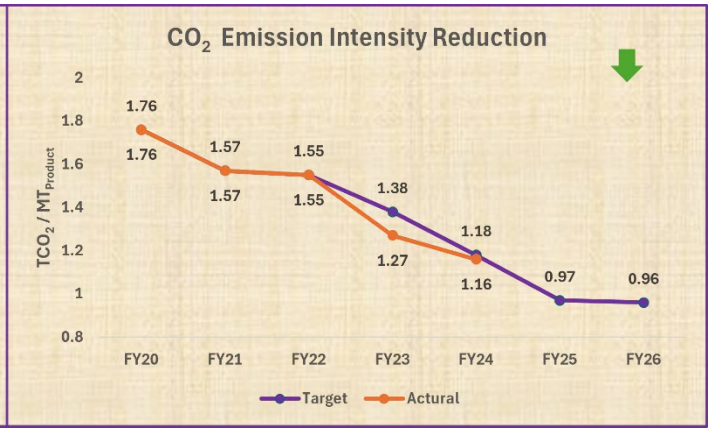
- Top management communicates clear goals and objectives for energy management, including targets for energy efficiency improvement, greenhouse gas emissions reduction, and cost savings.
- Top management allocates adequate resources, including budget, personnel, and time, to support EnMS implementation efforts.
- Energy Performance is Evaluated Daily against the budget and MIS is being circulated. Energy performance is communicated to the top management during the Monthly review meeting.
- For Operational Control, we have a well-established procedure (Doc-ref: CHE/EnMS/OC/01) and all parameters affecting energy performance indicator are captured and hourly monitoring of operational parameters is being done by the operation team.

The key activities are as follows:

- ✓ Energy Efficient upgrades like High-Efficient Pumps & Motors and High-efficient LED Fixtures installation.
- ✓ Renewable Energy Integration – Solar & Wind Power Purchase Agreement.
- ✓ Optimized production processes and workflows to reduce energy consumption and improve efficiency.
- ✓ Engaged employees at all levels through awareness campaigns, training programs, and incentive schemes to promote energy conservation behaviors and foster a culture of sustainability.

Effects of EnMS implementation:





Targets Achieved: (Exhibit -6)

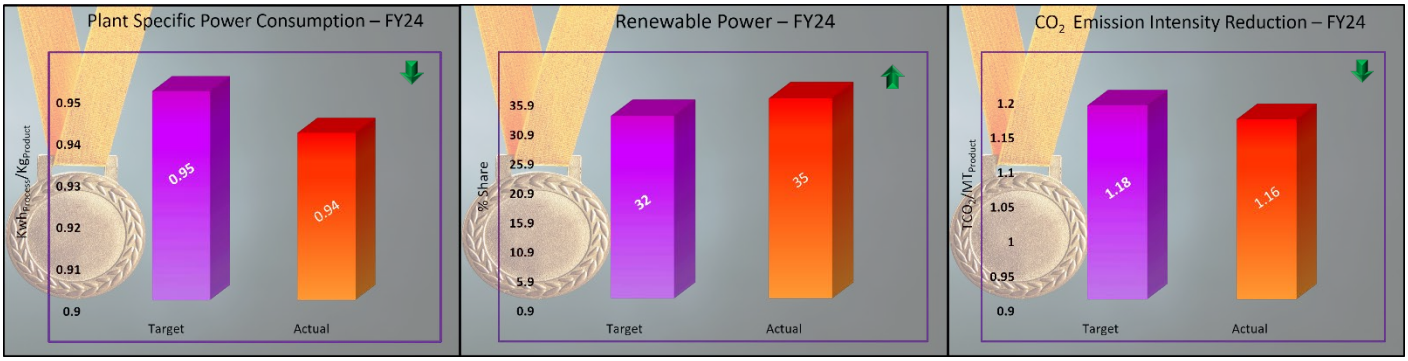


Exhibit-6

Baseline period: Timeframes for our baseline and reporting periods is last/previous financial year (12 Months).

Reporting period: Financial year 2023-2024 (From April'23 to March'24).

Energy Performance Indicators EnPI(s): used for monitoring and assessment of energy performance are,

1. Power Consumption ($Kwh_{Process}/Kg_{Product}$).
2. Steam Generation ($Kg_{Steam}/Kg_{Product}$).

Total energy consumption: Total energy use of all buildings of the plant (Kwh, GJ).

Relevant variables affecting energy consumption:

1. Power Consumption of Process Equipments.
2. Power Consumption of Utility Equipments.
3. Compressed Air Generation & Consumption.
4. Refrigeration Generation & Consumption.
5. Steam Generation & Consumption.

Normalization: Where Apollo Tyres has data indicating that relevant variables significantly affect energy performance, we carry out normalization of the EnPI value(s) and corresponding Energy Baselines (EnB(s)).

EnB(s) will be revised in the case of one or more of the following:

- EnPI(s) no longer reflect the organization's energy performance
- there have been major changes to the static factors
- according to a pre-determined method.

Apollo Tyres retains information of EnB(s), relevant variable data and modifications to EnB(s) as documented information. Data Analysis Tools such as Energy management Software, Data visualization software, Statistical Analysis software are used for the analysis of Energy performance improvement. For Energy saving measurement and verification, we adopted IPMVP (International Performance Measurement and Verification protocol), and relevant option is selected.

Management review meeting is conducted every 6 months where all the energy performance indicator is reviewed, Risk, Issue affecting energy performance is also investigated. Legal Compliance and Capex project approval for energy improvement were being discussed.

Internal audit is conducted through certified internal auditors once in 6 Months and a report is presented to top management.

Transparency

Once the policy is approved, it is displayed prominently in every place of Apollo Tyres, Chennai Plant where it is visible to all the employees and contractual workers and visitors. We also celebrate theme of the month on energy conservation and energy saving where we get awareness about the certification and all about ISO. Also, we pave the way for employees to participate in energy competitions, drawing competitions to enhance awareness among all employees. This proactive approach helps Apollo Tyres to continuously enhance its energy management practices and achieve its long-term sustainability goals. The awareness communicated to the whole plant is shown in Exhibit-7.

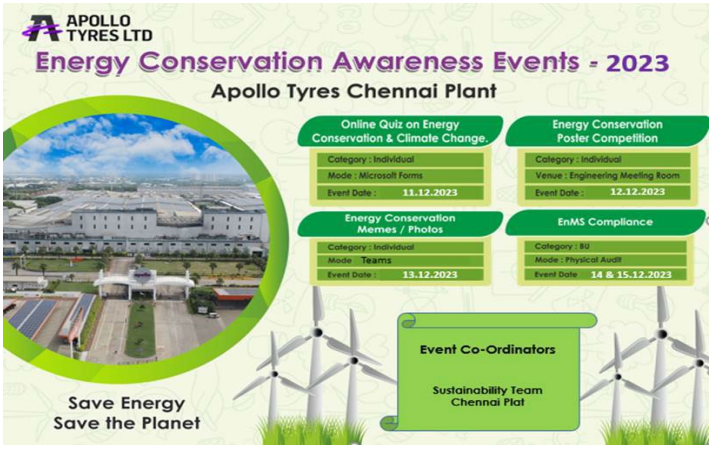


Exhibit -7

What We Can Do Differently

Monitoring nearly all energy forms, including electricity and thermal energy, through digital platforms with a coverage of 98% is impressive progress. This high level of metering and monitoring lays a strong foundation for efficient energy management and optimization. The future-plan is transforming existing energy data into the cloud and harnessing advanced statistical tools, artificial intelligence (AI), and machine learning (ML) techniques towards a forward-thinking approach to energy management.

Ongoing Energy Review maturity has improved and Measurement and Monitoring of Key energy sources like steam, Compressed Air, Chilled water has improving YOY and all Relevant variables affecting the energy performance of each of the identified EnPIs is being monitored. Impact of Relevant variables is being validated using higher statistical tools like MRA, Scatter, etc.,