PT Laju Perdana Indah Komering – South Sumatera Energy Audit Report

13rd November 2024

Project no:	**Energy Audit and Pre-feasibility Study in Industries under the Energy Partnership Programme between Indonesia and Denmark (INDODEPP)**
Report:	**Energy Audit Report PT Laju Perdana Indah**
Date:	**13rd November 2024**
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Executive Summary

1.1 Introduction

The Directorate of Energy Conservation (DEC) under the Ministry of Energy, Mineral and Resources (MEMR) in Indonesia has embarked on a mapping of energy intensive industries which is in its early phase. The aim is to update information on energy consumption in a selection of industries starting with a focus on the food and beverage sector (F&B). This will support work on developing national industry benchmarks for energy efficiency and set a future direction for industries with high energy consumption. MEMR coordinates with the Ministry of Industry (MOI) on existing available data and is the key partner for this activity. This activity will specifically support empirical data gathering through review of available information on energy consumption and conducting energy audits within the selected F&B sub-sector.

The first objective of this project supported by INDODEPP is to conduct a relevant number of energy audits to get an empirical reference for energy consumption as well as the potential value of implementing energy efficiency measures in the food and beverage sector. The potential will be highlighted for reduction of energy consumption, reduction of energy costs and reduction of CO_2 emissions.

The second objective of the project is to share findings from the energy audits through a workshop/seminar with the private sector and relevant stakeholders from food and beverage sector.

The outcome of this project will provide input to the efforts of strengthening national and regional focus on energy efficiency at energy intensive industries and at the same time provide valuable suggestions and ideas for specific energy saving projects to be implemented in selected industries.

This energy audit report for PT. Laju Perdana Indah documents the main findings and results for the energy audit that was carried out in end August 2024 with great assistance from PT. Laju Perdana Indah (LPI).

1.2 Plant description

PT Laju Perdana Indah (LPI), established in 1992, is a subsidiary of Indofood Agri Resources Ltd (IndoAgri), a vertically integrated sugarcane plantation company with approximately 12,000 hectares of land. PT LPI engages in two main activities.

The first activity involves sugarcane cultivation and development. The development of sugarcane plants is carried out by the Research and Development Division, while the cultivation is managed by the Plantation Division, which is divided into four regions, each covering an area of 3,000 hectares.

The second activity involves the processing of harvested sugarcane into refined white sugar. This is managed by the Factory Division, which is responsible for coordinating the operations within the factory. The processing of sugarcane takes place during the harvesting and milling season (on-season), which typically begins in April and continues until all the available sugarcane has been processed.

The plant for energy audit purpose was selected at Ogan Komering, South Sumatera Island. Total current energy consumption of LPI in 2023 was 612,443 MWh or 52,661 ton oil equivalent (TOE) that is mandatory to implement energy management at 4000 TOE (46,520 MWh) above referred to Government Regulation Number 33 Year 2023. Factory layout is shown in Figure 1.

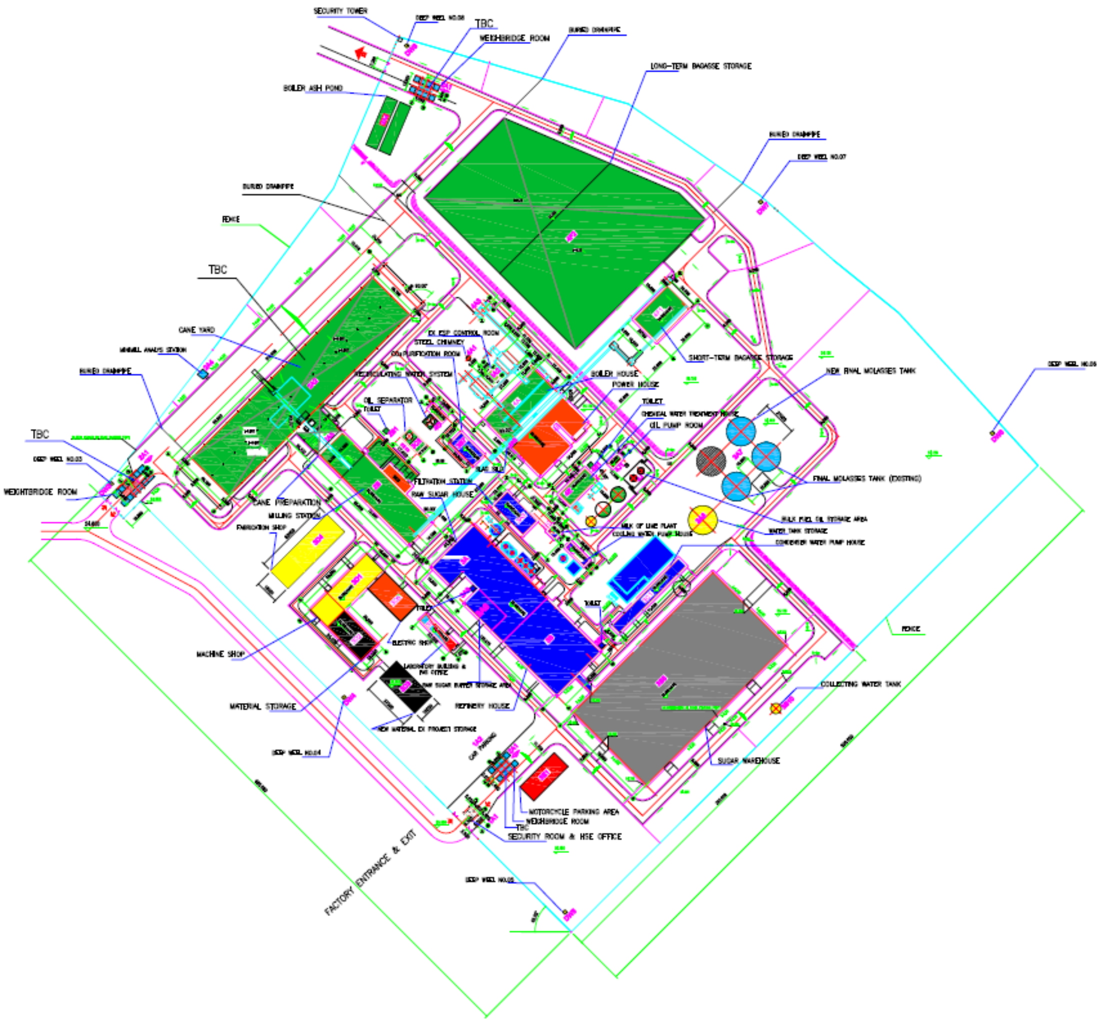


Figure 1. Perusahaan Industri Ceres facilities

1.3 Operation

The LPI facility operates 24 hours a day for 7 to 9 months per year or around 245 days, depending on the weather conditions that affect the harvest season. Each day three working shifts are present 8 hours. The production has historically amounted as shown in Table 1.

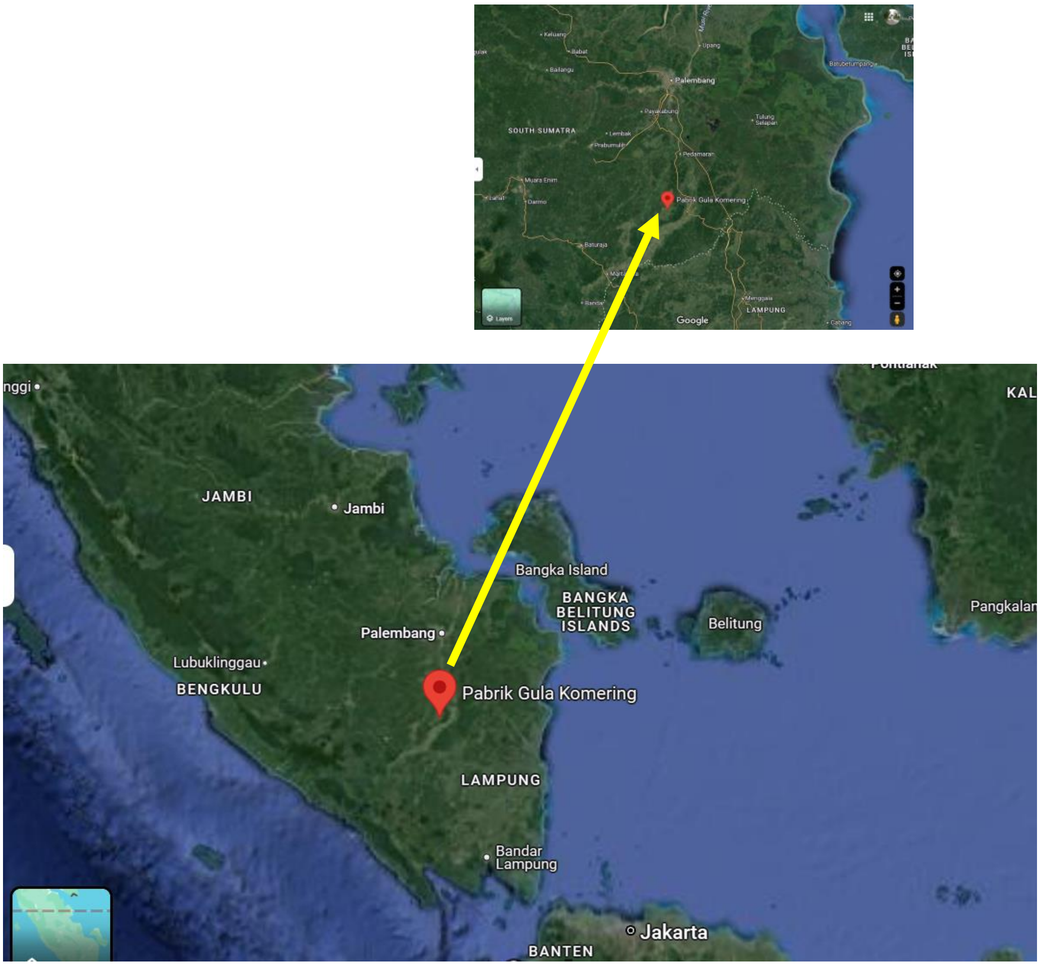
Table 1. Yearly production of each processing line

Year	White Chrystaline Sugar Product, Ton
2022	49,525
2023	50,565
January – July 2024	23,066

1.4 Location

Address:

Sungai Balak, Kec. Cempaka
Kabupaten Ogan Komering Ulu Timur,
Sumatera Selatan 30657
Indonesia



1.5 Methodology

The objective of the energy audit is both to provide the data necessary to establish the baseline for the energy consumption for Ceres and to estimate the potentials for increasing energy efficiency in the F&B sector. The site visit was prepared with main data collected in a questionnaire.

A tree-day site visit was planned and conducted from the 27th until 29th of August 2024. In the site visit the local consultant PT. Langgeng Ciptalindo fielded eight people, six engineers and two technicians under the leadership of Pak Rusmanto.

The site visit was commenced with a meeting between the LPI management and team, representatives from EBTKE and the auditing team. At the meeting, information was given about LPI as well as the EBTKE and DEA cooperation and the objective of the audit.

The auditing started with a walk through for understanding the process and get an overview. During the audit information was gathered from LPI, data was taken from meters and measurements was conducted when needed. Every morning and evening a status meeting was held with the LPI team to coordinate the next steps. The site visit was concluded with a common recapitulation.

1.6 Overall findings

1.6.1 Specific energy consumption

PT Laju Perdana Indah can be divided into two areas: the biomass cogeneration power plant and sugar mill production area, with the main product being white crystalline sugar.

Total energy consumption for the plant based on Year 2022, 2023, and January - July 2024. Data are shown in Table 2. By relating the total energy consumption with the production volume, the specific energy consumption (SEC) is found. Table 3 shows SEC in the last 2 years and Jan – July 2024. In 2023, SEC was reduced against 2022 that indicates the impact in successfully applying several energy conservation implementations.

Table 2. Annual total energy consumption for each processing line.

Remarks	2022	2023	Jan-Jul 2024
Electricity (Bagasse Co-Generation), MWh	32,017	31,062	14,905
FDF (Force Draft Fan)	657	637	306
IDF (Induced Draft Fan)	1,344	1,304	626
FDF (Force Draft Fan)	652	633	304
IDF (Induced Draft Fan)	1,366	1,325	636
FWP (Feed Water Pump) 2	1,049	1,018	488
Others in Transformator 1	205	199	95
Secondary Air Fan 1	162	157	75
Others in Transformator 2	381	370	177
Secondary Air Fan 2	185	179	86
Others in Transformator 3	3,226	3,130	1,502
Carding Drum	226	219	105
Mixed Juice Pump	97	94	45
Mill Cool Water Pump	178	173	83
Others in Transformator 4	3,913	3,797	1,822
Evaporator Vacum Pump	98	95	46
Compressor 1	508	493	237
Compressor 2	500	485	233

Remarks	2022	2023	Jan-Jul 2024
Others in Transformator 5	5,103	4,951	2,376
Evaporator Vacum Pump	73	70	34
Compressor 3	506	490	235
Compressor 4	375	364	174
Others in Transformator 6	2,701	2,621	1,258
Centrifugal	1,102	1,069	513
Others in Transformator 7	1,318	1,278	613
Cooling Tower Fan 1	492	477	229
Cooling Tower Fan 2	306	297	142
Cooling Tower Fan 3	294	286	137
Others	5,001	4,852	2,328
Thermal, MWh	808,552	612,443	327,575
Boiler 1, MWh	385,406	291,928	156,142
Boiler 2, MWh	423,146	320,515	171,432
Ton Oil Equivalent (TOE)*)	**69,523**	**52,661**	**28,166**

**) Total energy in TOE is only thermal energy from bagasse as boiler fuel*

Table 3. Specific energy consumption (SEC)

Remarks	2022	2023	Jan-Jul 2024
Thermal, MWh	808,552	612,443	327,575
Electricity (Bagasse Co-Generation), MWh	32,017	31,062	14,905
HP Steam (Bagasse Co-Generation), Ton	651,143	576,837	270,600
LP Steam 97% (Bagasse Co-Generation), Ton	630,301	558,374	261,939
Total Sugar Production, Ton	49,525	50,565	23,066
SEC, MWh/Ton Sugar	0.65	0.61	0.65
SEC, Ton Bagasse/Ton Sugar	7.04	5.78	6.51
SEC, Ton Steam/Ton Sugar	13.15	11.41	11.73

**) Electricity is generated from bagasse co-generation powerplant*

**) LP steam is generated from steam turbine back pressure (steam turbine generator and mills steam turbine) with an estimated proportion of approximately 97%.*

1.6.2 Energy saving potential

The energy savings are assessed in relation to Best Available Technology (BAT) and will therefore also include savings that are not financially profitable with current energy prices, but which may become so in the future.

The subsequent energy saving proposals are based on estimations. As an example, the energy efficiency for all motors is compared with the BAT motor with the same rated power and a standardised investment per motor has been used. The feasibility of a replacement shall be examined with the actual conditions of the individual motor. In case of replacement due to break down it is always advisable to substitute with a motor according to BAT as motors have a long lifetime.

Thermal energy

Saving potential for thermal energy from boiler delivered into the plant are included in the Table 4.

Electricity

Saving potential for electricity consumption delivered into plant is included in the Table 5.

Table 4. Thermal energy distribution to production line and saving potential

THERMAL ENERGY	Estimated Consump-tion, MWh	Share of consump-tion, %	Saving potential, MWh	Estimated CO2-emission reduction, ton	Estimated Investment, mill. IDR	Estimated payback period, years
Boiler 1	291,928	48	-	-	-	-
Boiler 2	320,515	52	-	-	-	-
Bagasse Dryer			31,256	-	25,000	3.8
Repair and Maintenance of Steam Turbine Generators and Mills			7,021	-	4,000	1.6
O_2 Monitoring			8,344	-	900	0.5
Boiler drain heat recovery system			7,476	-	2,092	3.4
Steam Trap Replacement			641	-	150	0.6
IN TOTAL	**612,443**	**100**	**54,738**	**-**	**31,002**	**2.6**

Table 5. Electricity distribution to production line and saving potential

ELECTRIC ENERGY	Estimated Consumption, MWh	Share of consumption, %	Saving potential, MWh	Estimated CO2 emission reduction, ton	Estimated Investment, mill. IDR	Estimated payback period, years
FDF 1 (Force Draft Fan)	637	2.05	-	-	-	-
Install VSD FDF 1	-	-	200	-	1,000	4.8
IDF 1 (Induced Draft Fan)	1,304	4.20		-	-	-
Install VSD IDF 1	-	-	431	-	1,450	3.2
FDF 2 (Force Draft Fan)	633	2.04		-	-	-
Install VSD FDF 2	-	-	432	-	1,450	3.2
IDF 2 (Induced Draft Fan)	1,325	4.27		-	-	-
Install VSD IDF 2	-	-	196	-	1,200	4.9
FWP (Feed Water Pump) 2	1,018	3.28	-	-	-	-
Others in Transformator 1	199	0.64	-	-	-	-
Secondary Air Fan 1	157	0.51	-	-	-	-
Others in Transformator 2	370	1.19	-	-	-	-
Secondary Air Fan 2	179	0.58	-	-	-	-
Others in Transformator 3	3,130	10.08	-	-	-	-
Carding Drum	219	0.71	-	-	-	-
Mixed Juice Pump	94	0.30	-	-	-	-
Mill Cool Water Pump	173	0.56	-	-	-	-
Others in Transformator 4	3,797	12.22	-	-	-	-
Evaporator Vacuum Pump	95	0.31	-	-	-	-
Compressor 1	493	1.59	-	-	-	-
Compressor 2	485	1.56	-	-	-	-
Others in Transformator 5	4,951	15.94	-	-	-	-

ELECTRIC ENERGY	Estimated Consumption, MWh	Share of consumption, %	Saving potential, MWh	Estimated CO2 emission reduction, ton	Estimated Investment, mill. IDR	Estimated payback period, years
Evaporator Vacuum Pump	70	0.23	-	-	-	-
Compressor 3	490	1.58	-	-	-	-
Compressor 4	364	1.17	-	-	-	-
Others in Transformator 6	2,621	8.44	-	-	-	-
Centrifugal	1,069	3.44	-	-	-	-
Others in Transformator 7	1,278	4.12	-	-	-	-
Cooling Tower Fan 1	477	1.54	-	-	-	-
Cooling Tower Fan 2	297	0.96	-	-	-	-
Cooling Tower Fan 3	286	0.92	-	-	-	-
Others	4,852	15.62	-	-	-	-
Reducing the air inlet temperature of compressor			27	-	160	5.6
Pressure Demand Controller for Compressor			151	-	400	2.5
Transformer			158	-	2,108	11.9
Upgrading motor class efficiency up to IE3-IE5 with VSD			4,662	-	9,828	2.0
In Total	**31,062**	**100**	**6,673**	**-**	**17,396**	**2.7**

1.6.3 Saving strategy when implementing an energy management system (EnMS)

PT Laju Perdana Indah continues to develop an energy monitoring system. It is indicated by the increasing energy monitoring installed on both utility and production line. The implementation of Energy Management System (EnMs) will improve monitoring and evaluating energy performance This monitoring is crucial for understanding the current condition regarding energy performance, as it can help identify opportunities for efficiency improvements and energy savings.

1. Root cause analysis
   - helps understand sources of energy waste
   - finds out why equipment is not operating
2. Finds out the power quality
   - finds out how good the quality of electricity is on the network, whether there are voltage or frequency fluctuations
   - finds out the harmonic distortion that appears
3. Measurement and verification
   - able to estimate energy usage trends in a facility
   - verifies the benefits of implementing energy conservation
4. Cost allocation
   - Can help estimate the cost of goods sold
   - Benchmarking with other similar tools or process

For it is highly recommended to install EnPIView application software to obtain advantages as follows :

1. Knowing the details of the energy consumed, utilized, and lost energy.
2. Analyzing losses both in total and partial to eliminate losses.
3. Setting energy baseline (EnB) and performing normalization if necessary.
4. Calculating Energy Performance Indicator (EnPI).
5. Providing warnings when decreasing in energy performance and identify areas / equipment that can be improved
6. Tracking annual progress of energy intensity and efficiency.

The EnPIView application will provide the above information in real time and can be monitored anywhere as long as connected with internet network.

1.7 Present situation

Currently, LPI receives its electricity supply from steam produced in boilers using bagasse as fuel to drive the steam turbine, a process commonly referred to as cogeneration. The electricity generated by the steam turbine is 31,062 MWh/year, while the total thermal consumption is 612,443 MWh (based on 2023 data). Electricity is used for the main equipment in the production line, from raw materials to packaging, utilities, and lighting, while thermal energy is used to produce high-pressure steam at 30 barg, which is distributed to each turbine.

1.8 Different ways of electrification

During the planting season or when there is no sugar production, LPI typically generates electricity using diesel generators before. Currently, LPI utilizes PLN power grid during this season for office operations and other activities. However, it is not easy to send surplus electricity, if any, from the generators to the grid related with legal document.

Switching from diesel generators to the PLN power grid offers many advantages:

- Cost Savings: The cost of PLN electricity is lower than that of diesel oil, and less maintenance.
- Reliability: The PLN power supply is more reliable and plug and play.
- Environmental Friendliness: PLN electricity reduces emissions and noise compared to diesel generators.
- Energy Efficiency: PLN electricity is more efficient, reducing energy waste.
- Convenience: No need maintenance cost