PT. Dian Swastatika Sentosa (DSS) Serang Power Plant Executive Summary Report

May - July 2024

DIREKTORAT JENDERAL ENERGI BARU TERBARUKAN DAN KONSERVASI ENERGI (EBTKE)
Jujur, Profesional, Melayani, Inovatif, Berarti

PT. Konservasi Energi Solusi Indonesia

Danish Energy Agency

EMBASSY OF DENMARK *Jakarta*

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Prepared by:	**PT. Konservasi Energi Solusi Indonesia (KEnSI)**
QA by:	**Peter Kristensen, Chief Advisor, Viegand Maagøe** **Emil Rosendal Albæk, Project Leader, Viegand Maagøe**
Approved by:	**Nadeem Niwaz, Danish Energy Agency**

VIEGAND MAAGØE A/S

ZEALAND
Head office
Nørre Søgade 35
DK 1370 Copenhagen K
Denmark

T +45 33 34 90 00
info@viegandmaagoe.dk
www.viegandmaagoe.dk

CBR 29688834

JUTLAND
Samsøvej 31
DK 8382 Hinnerup

1 Description of Company

PT. DSS Serang berlokasi di Jl. Raya Serang No.KM, RW.76, Kragilan, Kec. Kragilan, Kabupaten Serang, Banten 42184, Indonesia. It is a subsidiary of Sinarmas Group operating multiple line of business including power and steam generation. Under its power and steam generation, PT DSS operates 4 (four) captive power plants with a total capacity of 300 megawatt, located in Serang (1 unit), Tangerang (1 unit), and Karawang (2 units).

Figure 1 Geographical presence of PT DSS Tbk

PT DSS Serang produces steam and power (cogeneration) exclusively for PT. Indah Kiat Pulp & Paper Mill in Serang, Banten, Indonesia. It operates 5 boiler units, with each unit has a generator turbine including 3 generator turbines with the Dong Fang China brand and 2 ABB (Asea Brown Boveri) brand generator turbines.

Table 1 Boiler Capacity

Name	Type	Power (MW)
Boiler #1	Dong Fang One Stage Regulating Extraction condensing	220
Boiler #2	Dong Fang One Stage Regulating Extraction condensing	220
Boiler #3	Dong Fang One Stage Regulating Extraction condensing	220
Boiler #6	ABB Two Stage Regulating Extraction Condensing	300
Boiler #7	ShangHai Electric Group One Stage Regulating Extraction condensing	300

The technical specifications that the installed capacity of turbines and generators in turbines units 1-3 and 6 used to carry out electricity production are described in the table below.

Table 2 Turbine Capacity

Name	Type	Power (MW)
Turbin #1	Dong Fang One Stage Regulating Extraction condensing	35
Turbin #2	Dong Fang One Stage Regulating Extraction condensing	35
Turbin #3	Dong Fang One Stage Regulating Extraction condensing	35
Turbin #6	ABB Two Stage Regulating Extraction Condensing	70
Turbin #7	ShangHai Electric Group One Stage Regulating Extraction condensing	70

2 Specific Energy Consumption

The scope of the energy audit is the power plant and utilities supporting these activities, including electrical systems, boiler water systems and cooling systems. Boundary of audit is Power Plant Unit 1, Unit 2, Unit 3 and Unit 6. Energy type included in the scope of the audit are coal and electricity. Fuel (oil) is not included in the scope of the audit because the amount is insignificant and does not have a direct effect on the Organization's production process.

Coal is purchased from various suppliers with average heating value of 5,500 kCal/kg with total consumption in 2023 is 765,443 ton/year. Coal is used as boiler fuel to generate steam with total generated from 4 boilers is 4,305,433 ton/year in 2023. Steam is used in 2 processes, i.e. steam turbine (2,451,433; 57%) and paper mill (1.854.000 ton/year; 47% of total). Steam turbine generated 316 GWh/year in 2023 calculated based on daily production of 1,053 MWh/day. Total power consumption is of two types, power plant auxiliary load (around 20% of total power) and plant consumption (around 80%). In addition to own generated power, Plant also purchases electricity form PLN as much as 186 GWh/year.

Table 3 Energy Balance of Plant

Yearly consumption	**MT/y**	**GJ/y**	**Gcal/year**	**GWh/y**	**GWh/y**	**%**
Coal Consumption	765.443	17.614.379	4.209.938	4.893	4.893	
Boiler 1	158.284	3.642.430	870.562	1.012		
Boiler 2	211.683	4.871.252	1.164.257	1.353		
Boiler 3	175.554	4.039.840	965.545	1.122		
Boiler 6	219.923	5.060.857	1.209.574	1.406		
Electricity form PLN					186	
Total					5.079	100,0%
Steam	ton/y	GJ/y	MWh/y	GWh/y		
Boiler 1	884.680	3.096.381	860.106	860		
Boiler 2	1.171.318	4.099.613	1.138.781	1.139		
Boiler 3	988.600	3.460.100	961.139	961		
Boiler 6	1.260.834	4.412.920	1.225.811	1.226		
Total Steam Flow	4.305.433	15.069.014	4.185.837	4.186	4.186	82,4%
Steam to Plant (Paper Mill)	Ton/y	GJ/y	MWh/y	GWh/y		
PM 1	468.000	1.638.000	455.000	455		
PM 2	348.000	1.218.000	338.333	338		
PM 3&6	564.000	1.974.000	548.333	548		
PM 4&5	474.000	1.659.000	460.833	461		
Total steam to PM	1.854.000				1.803	35,5%
Steam to turbine	Ton/y	GJ/y	MWh/y	GWh/y		
Generator 1	503.720	1.763.021	489.728	490		
Generator 2	666.927	2.334.243	648.401	648		
Generator 3	562.890	1.970.116	547.254	547		
Generator 6	717.895	2.512.634	697.954	698		
Total steam to STG	2.451.433	8.580.014	2.383.337	2.383	2.383	46,9%
Power Produced				GWh/y		
G1				166,2		
G2				173,1		
G3				177,27		
G6				318		
Total Power Produced					834	16,4%

The energy performance of boiler #6 at 4.36 (tons of steam/tons of coal), boiler #3 at 4.9 (tons of steam/tons of coal), boiler #2 is 5.26 (ton steam/ton coal) and boiler #1 is 5.81 (ton steam/ton coal).

Table 4 EnPI of Boilers

Months	Sum of Coal consumption-Boiler 1 (Ton)	Sum of Main steam-Boiler 1 (Ton)	Average of EnPI-Boiler 1 (Ton steam/Ton coal)	Sum of Coal consumption-Boiler 2 (Ton)	Sum of Main steam-Boiler 2 (Ton)	Average of EnPI-Boiler 2 (Ton steam/Ton coal)	Sum of Coal consumption-Boiler 3 (Ton)	Sum of Main steam-Boiler 3 (Ton)	Average of EnPI-Boiler 3 (Ton steam/Ton coal)	Sum of Coal consumption-Boiler 6 (Ton)	Sum of Main steam-Boiler 6 (Ton)	Average of EnPI-Boiler 6 (Ton steam/Ton coal)
Jan-23	18,893.75	114,618.00	6.07	9,596.31	53,408.25	2.87	19,255.81	116,476.00	6.04	23,808.31	137,030.66	5.69
Feb-23	17,393.31	98,947.25	5.68	17,911.00	100,404.50	5.6	17,622.88	99,860.00	5.65	23,200.69	126,112.06	5.41
Mar-23	11,951.25	58,127.75	3.13	19,534.56	97,495.25	4.98	19,905.13	101,095.00	5.07	25,477.00	128,429.69	4.98
Apr-23	6341.13	38,681.25	2.03	18907.31	108877.25	5.75	18955.69	109246	5.77	26143.75	161909.56	6.12
May-23	19409.81	105834.75	5.45	19343.5	106335.75	5.5	1836.25	12052.25	6.31	25244.94	149281.56	5.9
Jun-23	19211	102,598.75	5.34	18671.69	101639.5	5.44				25367.06	148596.38	5.86
Jul-23	19,453.00	110,394.25	5.66	19,363.63	110,069.00	5.67	9003.06	53,627.00	2.68	23,577.88	145,243.63	5.87
Aug-23	5,600.13	33,046.50	6.9	18,608.56	104,613.00	5.62	18,683.44	104,685.50	5.59	23,777.63	136,769.25	5.72
Sep-23				17,034.31	93,695.00	5.5	17,028.19	92,541.00	5.43	20,744.31	113,106.38	5.43
Oct-23	16,739.06	91,991.25	6.17	18,187.75	100,485.00	5.53	18,309.81	101,594.25	5.55			
Nov-23				16,232.44	91,776.50	5.08	16,469.81	93,220.00	5.09			
Dec-23	13,973.25	79,154.00	5.55	18,292.06	102,529.00	5.61	18,483.56	104,203.00	5.64			
Grand Total	158,263.94	884,680.25	5.20	211683.12	1171328	5.26	175553.63	988600	5.35	217341.57	1246479.2	5.66

3 Energy Saving Potential

3.1 Boiler

1. Controlling the boiler air fuel ratio with projected total coal saved 704,15 ton/year
2. Controlling blowdown with projected total coal saved 13.488,57 ton/year
3. Replacement of boiler total cost saved 3.191.414 USD/year
4. Routine maintenance with projected total coal saved 1,168 ton/year

3.2 Electricity

1. Replacement of ID Fan 1A with a super-premium efficiency motor with projected electricity saving of 49,9 MWh/year
2. Replacement of FD Fan 1A with a super-premium efficiency motor with projected electricity saving of 36,9 MWh/year
3. The improvement in cooling tower performance with projected electricity saving of 23 MWh/year
4. Replacement of Boiler Feed Water Pump 1with a super-premium efficiency motor with projected electricity saving of 79,4 MWh/year

3.3 Summary

Recommendation of energy saving opportunities are summarized as follow.

Table 5 Energy Saving Recommendation

No	Energy Saving Opportunity	Energy source	Annual Saving/ Reduction			
			Ton	MWh	Total (MWh)	% of saving
1	Air fuel ratio control	Coal	704,15		3.466,81	0,09%
2	Blowdown control	Coal	13.488,57		62.431,13	1,76%
3	Boiler replacement	Coal			2.096.169,74	41,27%
4	Routine maintenance	Coal	1,17		5,53	0,00%
5	Super-premium efficiency motor ID Fan 1A	Electricity		49,90	49,90	0,01%
6	Super-premium efficiency motor FD Fan 1A	Electricity		36,90	36,90	0,00%
7	Improvement in cooling tower performance	Electricity		23,00	23,00	0,00%

No	Energy Saving Opportunity	Energy source	Annual Saving/ Reduction			
			Ton	MWh	Total (MWh)	% of saving
8	Super-premium efficiency motor Boiler FWP	Electricity		75,40	75,40	0,01%
9	Installation of VSD	Electricity		628,16	628,16	0,08%

No	Energy Saving Opportunity	Energy source	Annual Saving/ Reduction		Investment	Payback
			IDR Million	tCO2	IDR Million	(Year)
1	Air fuel ratio control	Coal	11.970,55	1.131,66	-	-
2	Blowdown control	Coal	229.305,69	21.677,79	-	-
3	Boiler replacement	Coal	38.444,19	291.124,89	363.000,00	9,44
4	Routine maintenance	Coal	19,86	1,88	-	-
5	Super-premium efficiency motor ID Fan 1A	Electricity	69,86	41,92	510,00	7,30
6	Super-premium efficiency motor FD Fan 1A	Electricity	51,66	31,00	510,00	9,87
7	Improvement in cooling tower performance	Electricity	32,20	19,32	-	-
8	Super-premium efficiency motor Boiler FWP	Electricity	105,56	63,34	785,40	7,44
9	Installation of VSD	Electricity	879,42	527,65	693,00	0,79