# LAPORAN PEKERJAAN

## Periode September s/d Desember 2023

APLIKASI SMART OPERATION PLTU BENGKAYANG

Oleh:

Prof. Ir. Yazid Bindar,PhD dan Tim LAPI ITB

SMART OPERATION

# SMART OPERATION

PROPERTY OF
PT PLN Unit Pembangkit Kalimantan

DEVELOPED BY
PTLAPTOP (@Yazid Bindar and Team)

*Ready*

EMMISSION

OPERATION
FORECASTING

SMART OPERATION

CONVERSION | COAL BLEND | CALCULATION

INPUT DATA

| ADB | | DAFB | | ARB | |
|---|---|---|---|---|---|
| C | 51.6 % | N | 1.03 % | MC | 41.48 % |
| H | 3.87 % | TOTAL SULPHUR | 0.37 % | ASH | 8.65 % |
| O | 13.53 % | | | TOTAL SULPHUR | 0.19 % |
| ASH | 12.14 % | | | | |

CONVERT | RESET

ARB

| | | | | | |
|---|---|---|---|---|---|
| C | 36.77 % | O | 9.64 % | S | 0.19 % |
| H | 2.76 % | N | 0.51 % | MC | 41.48 % |

Insert To

COAL ID I | COAL ID II | COAL ID III

**OPERATING CONDITION**

○ O2 Content in FG

O2 Content %

○ PA and SA

| SAMPLE IDENTIFICATION | | COAL FEEDER UNIT #1 / 35 MW | | | | |
|---|---|---|---|---|---|---|
| DATE OF REPORT | | 7-Dec-22 | | | | |
| NO | PARAMETERS | UNITS | AR | ADB | DB | DAF |
| 1 | Total Moisture | % | 41.48 | - | - | - |
| | **PROXIMATE** | | | | | |
| 2 | Moisture in Analysis | % | - | 17.88 | - | - |
| 3 | Ash Content | % | 8.65 | 12.14 | 14.78 | - |
| 4 | Volatile Matter | % | 27.75 | 38.94 | 47.42 | 55.64 |
| 5 | Fixed Carbon | % | 22.12 | 31.04 | 37.8 | 44.36 |
| 6 | Total Sulphur | % | 0.19 | 0.26 | 0.32 | 0.37 |
| 7 | Carbon | % | 36.77 | 51.6 | 62.83 | 73.74 |
| 8 | Hydrogen | % | 2.76 | 3.87 | 4.71 | 5.53 |
| 9 | Nitrogen | % | 0.51 | 0.72 | 0.88 | 1.03 |
| 10 | Oxygen | % | 9.64 | 13.53 | 16.48 | 19.33 |
| 11 | CGV | Kcal/Kg | 3366 | 4723 | 5751 | 6749 |

Furnace In Temp degC

High Temp Superheater degC

Low Temp Superheater degC

Economizer degC

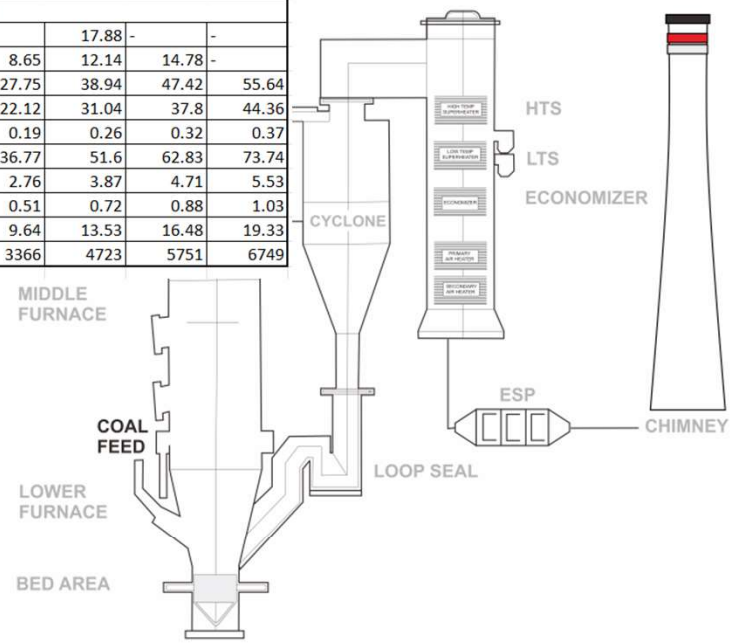
**PERFORMANCE**

NPHR Kcal/kWh

Thermal Efficiency -%

Boiler Efficiency -%

**IBUSTION SYSTEM**
**KAYANG 2X50 MW**




FLUE GAS

Volumetric Flow (db) Nm3/h

SO2 %-db mg/Nm3

CO2 %-db Nm3/h

NO2 %-db mg/Nm3

Description

EMMISSION

OPERATION FORECASTING

# DATA OPERASI

| Time | TIME | 7/12/2022 19:00 |
|---|---|---|
| AMMW_TODCS.AV | UNIT POWER (GENERATOR) | 40.73 |
| MCS12MCS01A02.AV | COAL FEED | 31.09 |
| 10HLA10CF101_BC.AV | PAF(A) OUTLET AIR FLOW | 35054.73 |
| 10HLA20CF101_BC.AV | PAF(B) OUTLET AIR FLOW | 29672.67 |
| 10HLA60CF101_BC.AV | SAF(A) OUTLET AIR FLOW | 37377.76 |
| 10HLA70CF101_BC.AV | SAF(B) OUTLET AIR FLOW | 51454.32 |
| 10HBK10CT021.AV | FURNACE OUTLET TEMP.(LEFT) | 865.91 |
| 10HBK10CT022.AV | FURNACE OUTLET TEMP.(RIGHT) | 880.55 |
| 10HBK10CT017.AV | FURNACE BOTTOM TEMP.A(LEFT) | 817.39 |
| 10HBK10CT019.AV | FURNACE BOTTOM TEMP.A(RIGHT) | 848.53 |
| 10HBK10CT018.AV | FURNACE BOTTOM TEMP.B(LEFT) | 804.38 |
| 10HBK10CT020.AV | FURNACE BOTTOM TEMP.B(RIGHT) | 842.52 |
| 10HBK10CT013.AV | BED UPPER PART TEMP.A(LEFT) | 804.59 |
| 10HBK10CT015.AV | BED UPPER PART TEMP.A(RIGHT) | 816.89 |
| 10HBK10CT014.AV | BED UPPER PART TEMP.B(LEFT) | 817.13 |
| 10HBK10CT016.AV | BED UPPER PART TEMP.B(RIGHT) | 828.49 |
| 10HBK10CT009.AV | BED MIDDLE PART TEMP.A(LEFT) | 801.94 |
| 10HBK10CT011.AV | BED MIDDLE PART TEMP.A(RIGHT) | 836.82 |
| 10HBK10CT010.AV | BED MIDDLE PART TEMP.B(LEFT) | 892.44 |
| 10HBK10CT012.AV | BED MIDDLE PART TEMP.B(RIGHT) | 884.67 |
| 10HBK10CT005.AV | BED LOWER PART TEMP.C(FRONT) | 885.98 |
| 10HBK10CT008.AV | BED LOWER PART TEMP.C(REAR) | 909.01 |
| 10HBK10CT004.AV | BED LOWER PART TEMP.B(FRONT) | 865.55 |
| 10HBK10CT007.AV | BED LOWER PART TEMP.B(REAR) | 949.82 |
| 10HBK10CT003.AV | BED LOWER PART TEMP.A(FRONT) | 877.88 |
| 10HBK10CT006.AV | BED LOWER PART TEMP.A(REAR) | 915.05 |
| 10HBK10CT001.AV | AIR CHAMBER TEMP.A(FRONT) | 179.34 |

INPUT AIR FLOW

OUTLET FURNACE AREA

BOTTOM FURNACE AREA

BED AREA

SMART OPERATION

CONVERSION | COAL BLEND | CALCULATION

## COAL BLENDING TYPE

(•) Single ( ) Double ( ) Triple

| | COAL ID-I | COAL ID-II | COAL ID-III | COAL BLEND |
|---|---|---|---|---|
| Coal Feed | 31.09 T/h | T/h | T/h | T/h |
| Composition | 100 -% | -% | -% | -% |
| Ult-Analysis | | | | |
| C | 36.77 %-arb | %-arb | %-arb | %-arb |
| H | 2.76 %-arb | %-arb | %-arb | %-arb |
| O | 9.64 %-arb | %-arb | %-arb | %-arb |
| N | 0.51 %-arb | %-arb | %-arb | %-arb |
| S | 0.19 %-arb | %-arb | %-arb | %-arb |
| MC | 41.48 %-arb | %-arb | %-arb | %-arb |
| ASH | 8.65 %-arb | %-arb | %-arb | %-arb |

GCV 3435.73 kcal/kg

CALCULATE RESET

## OPERATING CONDITION

( ) O2 Content in FG

O2 Content 7.89 %

(•) PA and SA

Primary Air 64727.4 Nm3/h

Secondary Air 88832.08 Nm3/h

Air Temp 179.34 degC

Steam Flow 125 T/h

Nett Generator Output 40.73 MWh

## AIR

Total Air

Excess Air 58.54 -%

## FURNACE

Furnace In Temp 869.86 degC

High Temp Superheater 779.43 degC

Low Temp Superheater 699.61 degC

Economizer 418.21 degC

## PERFORMANCE

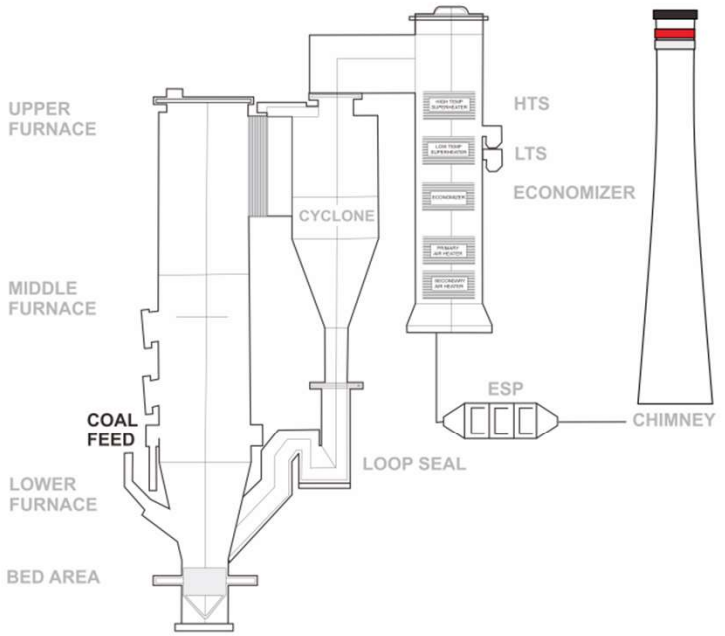
NPHR Kcal/kWh

Thermal Efficiency -%

Boiler Efficiency -%

SWITCH CALCULATION

**BOILER COMBUSTION SYSTEM**
**PLTU BENGKAYANG 2X50 MW**




## FLUE GAS

Volumetric Flow (db)

150852.16 Nm3/h

SO2

0.03 %-db

783.9 mg/Nm3

CO2

14.15 %-db

21339.35 Nm3/h

NO2

0.08 %-db

1726.79 mg/Nm3

Description

Kadar SO2 yang dihasilkan melebihi Standar Baku Mutu Emisi Pembangkit

EMMISSION

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CONVERSION | COAL BLEND | CALCULATION

## COAL BLENDING TYPE

(•) Single ( ) Double ( ) Triple

| | COAL ID-I | COAL ID-II | COAL ID-III | COAL BLEND |
|---|---|---|---|---|
| Coal Feed | 31.09 T/h | T/h | T/h | T/h |
| Composition | 100 -% | -% | -% | -% |
| Ult-Analysis | | | | |
| C | 36.77 %-arb | %-arb | %-arb | %-arb |
| H | 2.76 %-arb | %-arb | %-arb | %-arb |
| O | 9.64 %-arb | %-arb | %-arb | %-arb |
| N | 0.51 %-arb | %-arb | %-arb | %-arb |
| S | 0.19 %-arb | %-arb | %-arb | %-arb |
| MC | 41.48 %-arb | %-arb | %-arb | %-arb |
| ASH | 8.65 %-arb | %-arb | %-arb | %-arb |

GCV 3435.73 kcal/kg

CALCULATE RESET

## OPERATING CONDITION

(•) O2 Content in FG

O2 Content 7.89 %

( ) PA and SA

Primary Air

Secondary Air

Air Temp 179.34 degC

Steam Flow 125 T/h

Nett Generator Output 40.73 MWh

### AIR

Total Air 157888.17 Nm3/h

Excess Air 63.01 -%

### FURNACE

Furnace In Temp 656.9 degC

High Temp Superheater 420.3 degC

Low Temp Superheater 391.65 degC

Economizer 314.1 degC

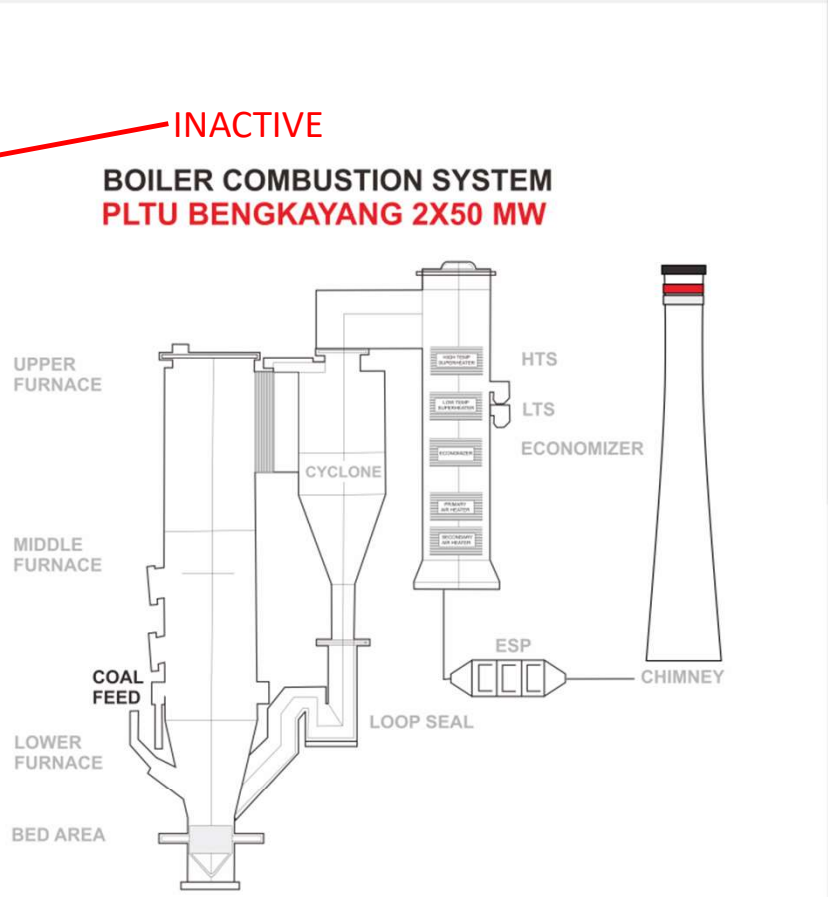
### PERFORMANCE

NPHR 2622.56 Kcal/kWh

Thermal Efficiency 32.82 -%

Boiler Efficiency -%

INACTIVE




## FLUE GAS

Volumetric Flow (db)

155180.85 Nm3/h

SO2

0.03 %-db

762.03 mg/Nm3

CO2

13.75 %-db

21339.35 Nm3/h

NO2

0.08 %-db

1678.62 mg/Nm3

Description

Kadar SO2 yang dihasilkan melebihi Standar Baku Mutu Emisi Pembangkit

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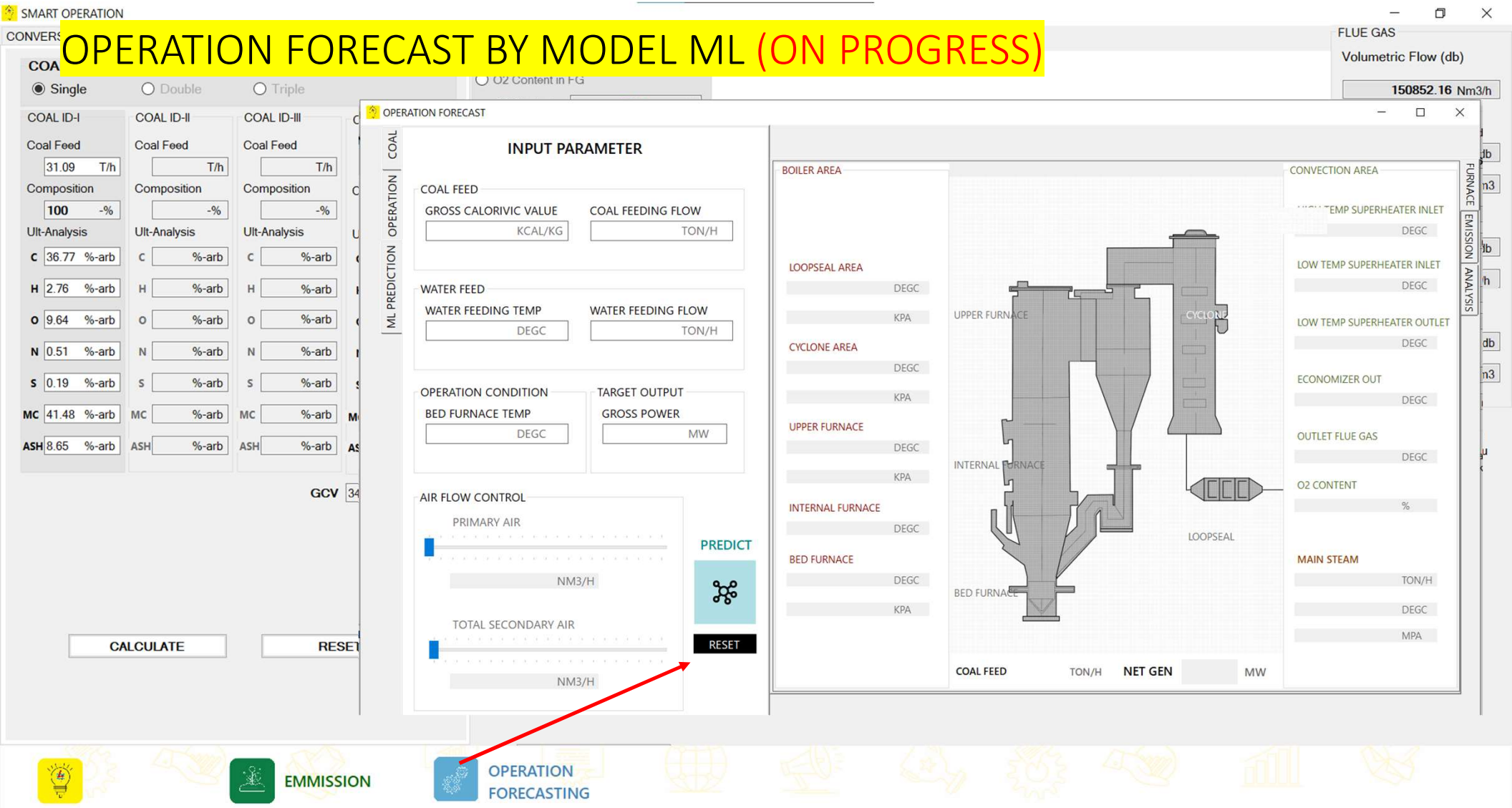
# OPERATION FORECAST BY MODEL ML (ON PROGRESS)




EMMISSION

OPERATION FORECASTING

- TIM PELAKSANA
- Ketua Tim : Prof. Ir. Yazid Bindar, M.Sc, IPM, PhD
- Tenaga Ahli Utama: 1. Dr. Ir. Abrar Riza, MT
  2. Dr.-Ing. Ir. Anton Irawan, MT, IPM, Asean Eng
  3. Teguh Kurniawan, ST.,MT, PhD
  4. Hafid Alwan, ST.,MT
- Engineer: 1. Asep Kurniawan, ST
  2. Imam Mardhatillah Fajri ST. MT.,
  3. Anisa Helena Isma Putri, ST