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LAMPIRAN

Lampiran 1 Data operasional PLTU PT. Rekind Daya Mamuju

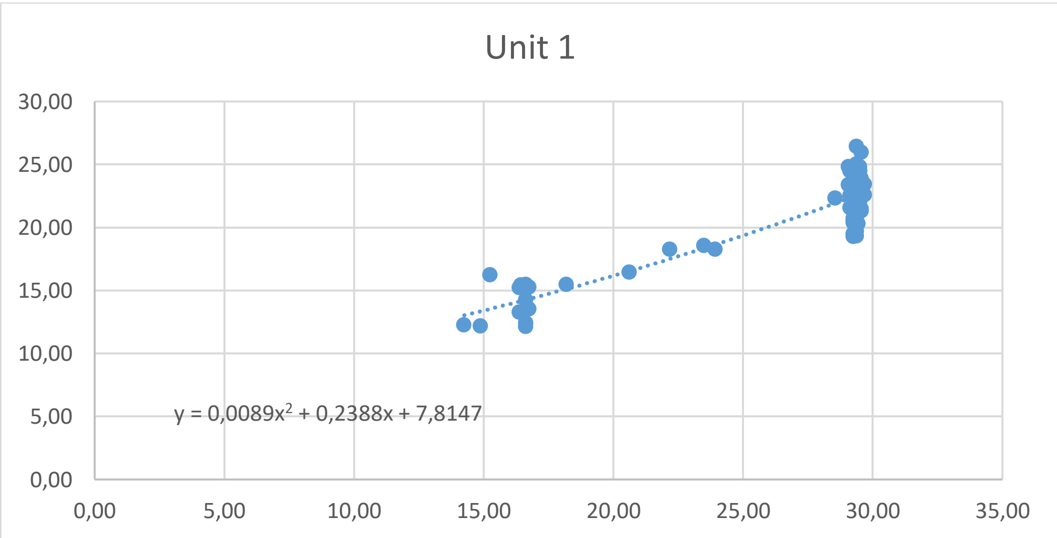
Date	Hours	GGO raw (mWH)		CC (Ton)		TOTAL PEMAKAIAN BATU BARA (TON)
		unit1	unit2	UNIT-1	UNIT-2	GAR ≤ 3900
18/10/2022	1:00 AM	28,06	22,63	21,83	20,16	41,98
18/10/2022	2:00 AM	16,50	14,63	13,16	12,09	25,25
18/10/2022	3:00 AM	16,50	14,88	12,41	12,09	24,50
18/10/2022	4:00 AM	16,44	14,56	12,14	13,03	25,17
18/10/2022	5:00 AM	16,50	14,88	13,56	12,09	25,66
18/10/2022	6:00 AM	25,81	23,06	19,31	18,06	37,37
18/10/2022	7:00 AM	29,19	23,88	20,25	20,13	40,37
18/10/2022	8:00 AM	29,19	24,00	21,52	19,08	40,59
18/10/2022	9:00 AM	29,25	23,63	21,39	19,13	40,52
18/10/2022	10:00 AM	29,19	23,25	21,36	19,20	40,56
18/10/2022	11:00 AM	29,19	22,75	20,31	18,16	38,47
18/10/2022	12:00 PM	29,25	21,81	21,36	18,17	39,53
18/10/2022	1:00 PM	29,00	21,63	20,52	17,16	37,67
18/10/2022	2:00 PM	29,25	21,94	21,52	17,14	38,66
18/10/2022	3:00 PM	29,31	22,00	20,80	18,14	38,94
18/10/2022	4:00 PM	29,18	21,94	20,73	17,09	37,83
18/10/2022	5:00 PM	29,13	22,13	20,52	18,16	38,67
18/10/2022	6:00 PM	29,31	21,81	21,39	18,14	39,53
18/10/2022	7:00 PM	29,19	22,63	20,48	17,03	37,52
18/10/2022	8:00 PM	29,25	23,13	20,59	19,13	39,72
18/10/2022	9:00 PM	29,49	23,50	20,33	18,16	38,48
18/10/2022	10:00 PM	29,06	23,63	20,56	18,06	38,62
18/10/2022	11:00 PM	29,38	24,13	21,92	19,13	41,05
19/10/2022	12:00 AM	22,88	19,38	15,40	15,17	30,58

Lampiran 2 Tabel harga batu bara

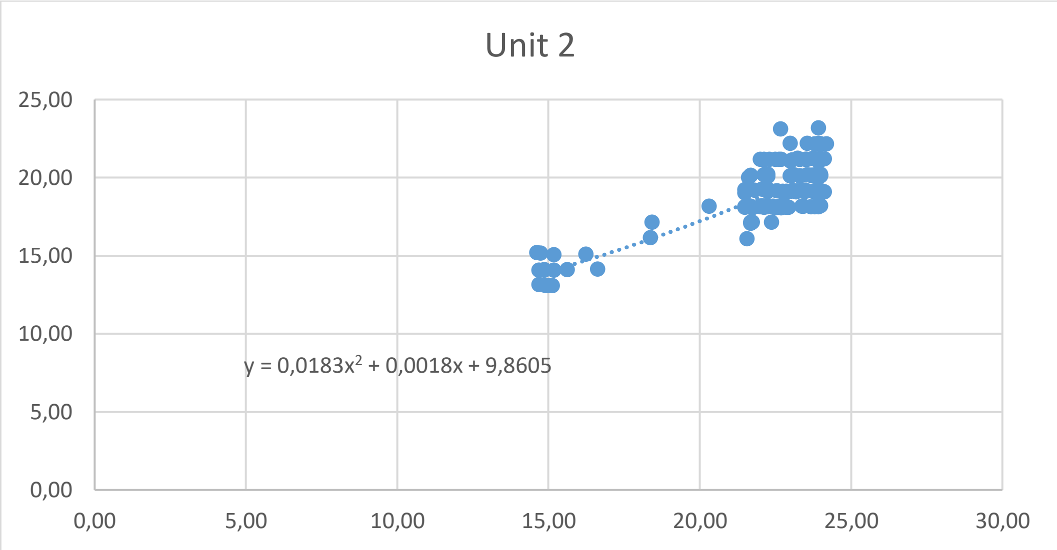
TABEL HARGA MINERAL DAN BATUBARA ACUAN

Komoditas	Oktober 2022	November 2022	Desember 2022	Januari 2023
Batubara (USD/ton)	330.97	308.2	281.48	305.21
Batubara (hba 1) (USD/ton)	-	-	-	-
Batubara (hba 2) (USD/ton)	-	-	-	-
Nikel (USD/dmt)	22081.25	22374.77	23907.73	27482.62
Kobalt (USD/dmt)	51264	51510.68	51510.45	51494.76
Timbal (USD/dmt)	1935.83	1943.09	2031	2156.9
Seng (USD/dmt)	3342.58	2994.16	2927.73	3082.81
Alumunium (USD/dmt)	2324.05	2225.5	2282.98	2393.71
Tembaga (USD/dmt)	7901.75	7608.77	7890.73	8235.57
Emas sebagai mineral ikutan (USD/ounce)	1716.37	1666.39	1690.86	1775.03
Perak sebagai mineral ikutan (USD/ounce)	18.79	19.3	20.19	22.31
Mangan (USD/dmt)	4.17	4.03	4.07	4.08
Bijih Besi Laterit/Hematit/Magnetit (USD/dmt)	1.45	1.39	1.27	1.52
Bijih Krom (USD/dmt)	3.74	3.84	4.04	3.92
Konsentrat Ilmenit (USD/dmt)	8.19	7.8	7.65	7.93
Konsentrat Titanium (USD/dmt)	15.33	14.32	14.09	14.2

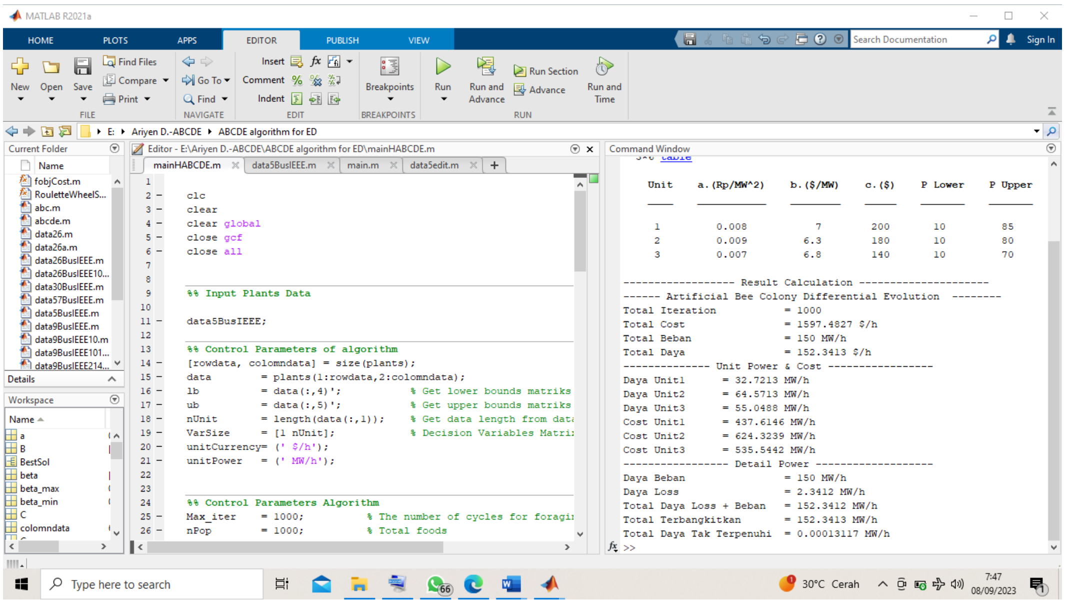
Lampiran 3 Fungsi konsumsi batu bara unit 1 menggunakan metode *least square*



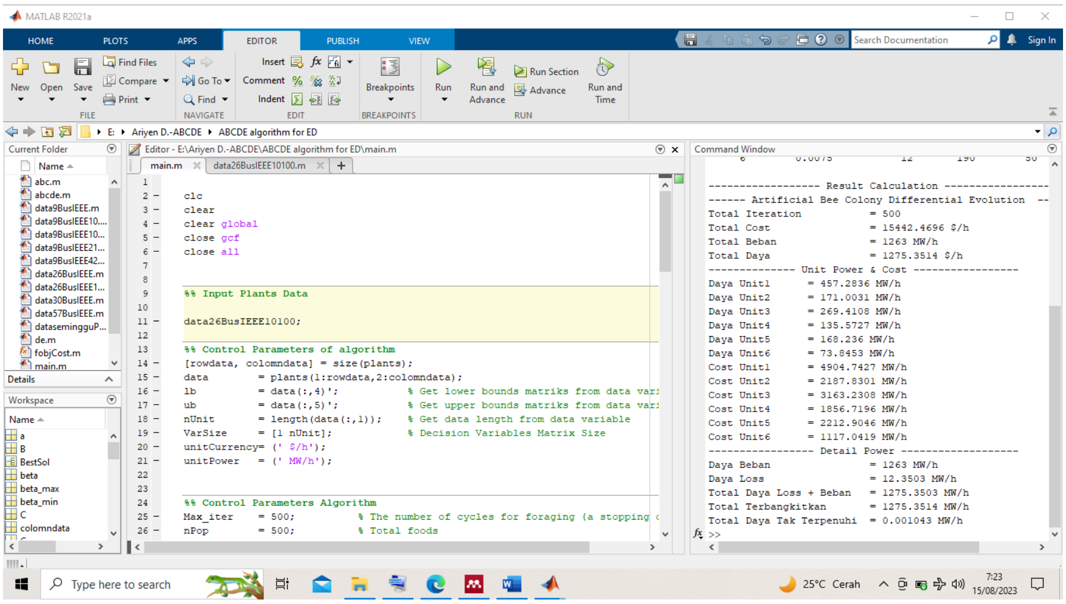
Lampiran 4 Fungsi konsumsi batu bara unit 2 menggunakan metode least square



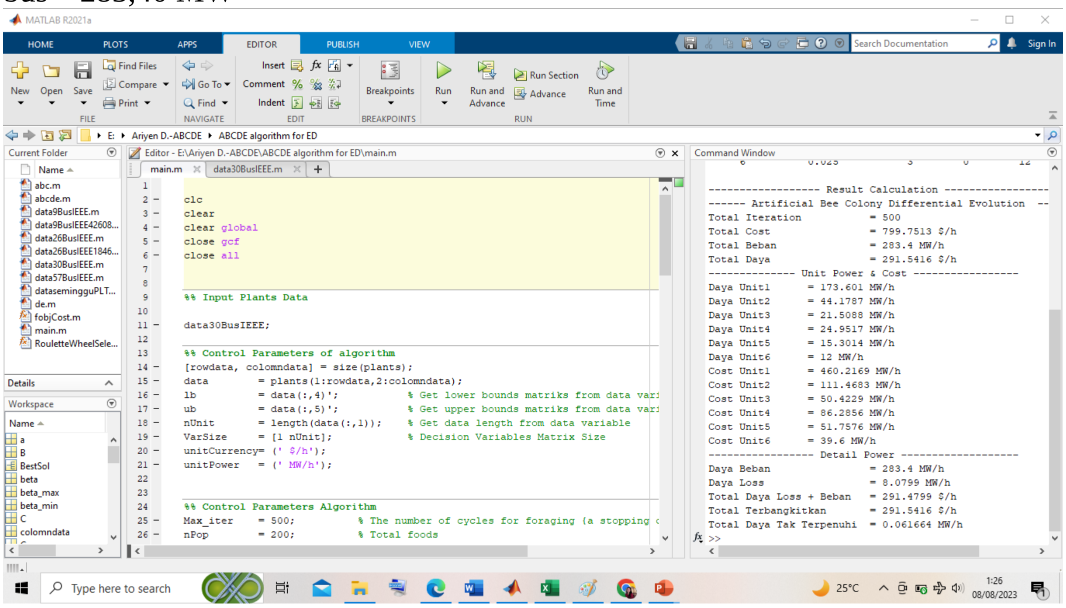
Lampiran 5 Hasil simulasi optimasi menggunakan metode HABCDE sistem 5 bus – 150 MW



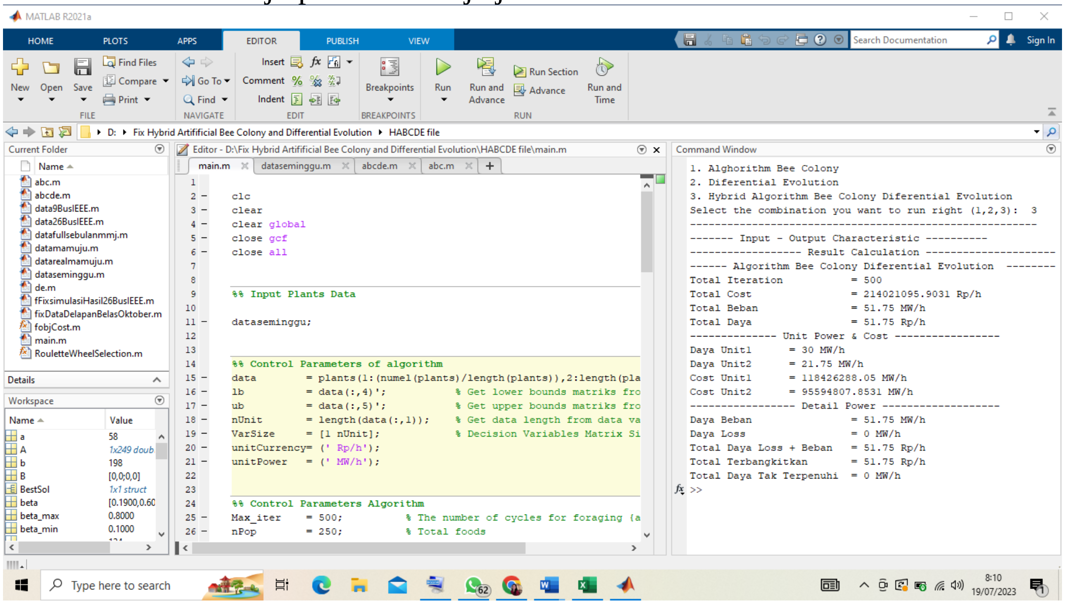
Lampiran 6 Hasil simulasi optimasi menggunakan metode HABCDE sistem 26 bus – 1263 MW



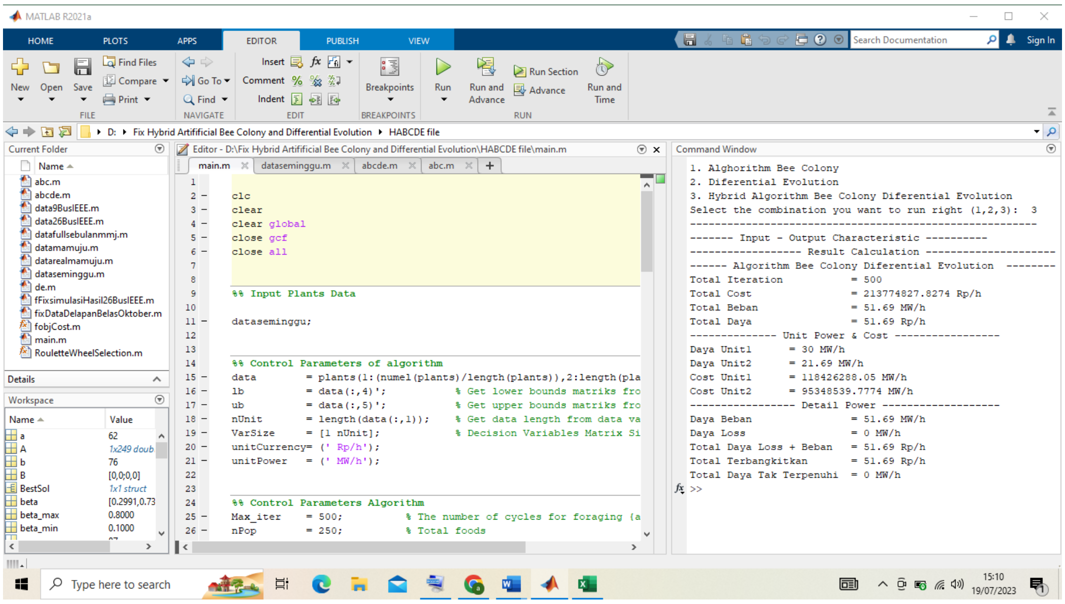
Lampiran 7 Hasil simulasi optimasi menggunakan metode HABCDE sistem 30 bus – 283,40 MW



Lampiran 8 Hasil simulasi optimasi menggunakan metode HABCDE untuk sistem PLTU Mamuju pada hari kerja jam 01:00 am.



Lampiran 9 Hasil simulasi optimasi menggunakan metode HABCDE untuk sistem PLTU Mamuju pada hari kerja jam 01:00 am.



Lampiran 10 Program HABCDE

```
clc
clear
clear global
close gcf
close all


%% Input Plants Data

data5BusIEEE;

%% Control Parameters of algorithm
[rowdata, colomndata] = size(plants);
data         = plants(1:rowdata,2:colomndata);
lb           = data(:,4)';           % Get lower bounds matriks
from data variable
ub           = data(:,5)';           % Get upper bounds matriks
from data variable
nUnit        = length(data(:,1));    % Get data length from data
variable
VarSize      = [1 nUnit];            % Decision Variables Matrix
Size
unitCurrency= (' $/h');
unitPower    = (' MW/h');


%% Control Parameters Algorithm
Max_iter     = 1000;          % The number of cycles for foraging
{a stopping criteria}
nPop         = 1000;          % Total foods

%% Control Parameters of ABC algorithm
nOnlooker    = round(0.2*nPop);                          % Number of
Onlooker Bees
L            = round(0.5*nPop);     % Abandonment Limit Parameter
(Trial Limit)
a            = 0.9;                         % Acceleration
Coefficient Upper Bound


%% Control Parameters of DE Algorithm
beta_min = 0.2;    % Lower Bound of Scaling Factor
beta_max = 0.8;    % Upper Bound of Scaling Factor
pCR      = 0.8;    % Crossover Probability



%% Running Algorithm

disp '1. Artificial Bee Colony';
disp '2. Differential Evolution';
disp '3. Hybrid Artificial Bee Colony Differential Evolution';
```

```
func = input('Select the combination you want to run right
(1,2,3):  ');
disp ('--------------------------------------------------------');


if (func == 1)
    abc;
    disp('------- Input - Output Characteristic ----------');
    display(array2table(plants,'V',{'Unit' 'a.(Rp/MW^2)'
'b.($/MW)' 'c.($)' 'P Lower' 'P Upper'}));
    disp('----------- Result Calculation -------------');
    disp('--------- Artificial Bee Colony -----------');
elseif (func == 2)
    de;
    disp('------- Input - Output Characteristic ----------');
    display(array2table(plants,'V',{'Unit' 'a.(Rp/MW^2)'
'b.($/MW)' 'c.($)' 'P Lower' 'P Upper'}));
    disp('---------- Result Calculation -------------');
    disp('-------- Differential Evolution -------------');
else
    abcde;
    disp('------- Input - Output Characteristic ----------');
    display(array2table(plants,'V',{'Unit' 'a.(Rp/MW^2)'
'b.($/MW)' 'c.($)' 'P Lower' 'P Upper'}));
    disp('------------------ Result Calculation ------------------
---');
    disp('------ Artificial Bee Colony Differential Evolution  ---
-----');
end




display(['Total Iteration           = ',num2str(Max_iter)]);
display(['Total Cost                = ',num2str(BestSol.Cost)
,unitCurrency]);
display(['Total Beban               = ',num2str(Pd)
,unitPower   ]);
display(['Total Daya                =
',num2str(sum(BestSol.Position))   ,unitCurrency]);
disp('-------------- Unit Power & Cost -----------------');
for i=1:nUnit
display(['Daya Unit', num2str(i), '      =
',num2str(BestSol.Position(i)),unitPower   ]);
end
for i=1:nUnit
display(['Cost Unit', num2str(i), '      =
',num2str(BestSol.unitCost(i)),unitPower   ]);
end
disp('----------------- Detail Power -------------------');
display(['Daya Beban                = ',num2str(Pd)
,unitPower   ]);
display(['Daya Loss                 = ',num2str(sum(BestSol.Loss))
,unitPower   ]);
display(['Total Daya Loss + Beban   = ',num2str((Pd +
sum(BestSol.Loss))),unitPower]);
display(['Total Terbangkitkan       =
',num2str(sum(BestSol.Position))   ,unitPower]);
```

```
display(['Total Daya Tak Terpenuhi  = ',num2str(BestSol.Excess)
,unitPower   ]);




%% Ploting Data
% Pie
pie(BestSol.Position);
title('Optimal Load sharing between Generators');

% Plot
figure
plot(Convergence_curve) %Plot the PV Generation Profile 'r-*'
title('Iteration Curve')
xlabel('Iteration')
ylabel('Cost ($/h)')
xlim([1,iteration])
```