State-space model of the islanded microgrid (IMG) which consists of wind turbine generator (WTGs), microturbines (MTs), photovoltaic panels, battery energy storage system (BESS) and flywheel energy storage system (FESS), can be summarized as follows:

$$
A = \begin{bmatrix}
0 & 0 & \dfrac{-1}{M_{wt}} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\[2ex]
K_I & 0 & \dfrac{-K_P}{M_{wt}} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\[2ex]
0 & \dfrac{-1}{T_{wt}} & \dfrac{-K_{df}-2H_{eq}}{2H_{eq}T_{wt}} & 0 & \dfrac{-K_{df}}{2H_{eq}T_{wt}} & 0 & 0 & \dfrac{-K_{df}}{2H_{eq}T_{wt}} & 0 & \dfrac{K_{df}}{2H_{eq}T_{wt}} & \dfrac{K_{df}}{2H_{eq}T_{wt}} & \dfrac{2H_{eq}K_{pf}+K_{df}D_{eq}}{2H_{eq}T_{wt}} \\[2ex]
0 & 0 & 0 & \dfrac{-1}{T_{f\_Mea}} & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dfrac{1}{T_{f\_Mea}} \\[2ex]
0 & 0 & 0 & 0 & \dfrac{-1}{T_{mt}} & \dfrac{1}{T_{mt}} & 0 & 0 & 0 & 0 & 0 & 0 \\[2ex]
0 & 0 & 0 & 0 & 0 & \dfrac{-1}{T_g} & \dfrac{1}{T_g} & 0 & 0 & 0 & 0 & 0 \\[2ex]
0 & 0 & 0 & \dfrac{-1}{R_{eq}T_{wi}} & 0 & 0 & \dfrac{-1}{T_{wi}} & 0 & 0 & 0 & 0 & 0 \\[2ex]
0 & 0 & 0 & 0 & 0 & 0 & 0 & \dfrac{-1}{T_{id}} & \dfrac{1}{T_{id}} & 0 & 0 & 0 \\[2ex]
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dfrac{-1}{T_{inv}} & 0 & 0 & 0 \\[2ex]
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dfrac{-1}{T_{BESS}} & 0 & \dfrac{1}{T_{BESS}} \\[2ex]
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & \dfrac{-1}{T_{FESS}} & \dfrac{1}{T_{FESS}} \\[2ex]
0 & 0 & \dfrac{1}{2H_{eq}} & 0 & \dfrac{1}{2H_{eq}} & 0 & 0 & \dfrac{1}{2H_{eq}} & 0 & \dfrac{-1}{2H_{eq}} & \dfrac{-1}{2H_{eq}} & \dfrac{-D_{eq}}{2H_{eq}}
\end{bmatrix}
$$

$$
B = \begin{bmatrix} 0 & 0 \\ 0 & 0 \\ \dfrac{1}{T_{wt}} & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & \dfrac{1}{T_{wi}} \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \dots \rightarrow E = \begin{bmatrix} \dfrac{1}{M_{wt}} & 0 \\ \dfrac{K_P}{M_{wt}} & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & \dfrac{1}{T_{inv}} \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{bmatrix} \dots \rightarrow R_a = \begin{bmatrix} 0 \\ 0 \\ \dfrac{K_{df}}{2H_{eq}T_{wt}} \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ \dfrac{-1}{2H_{eq}} \end{bmatrix}
$$

$$C = [0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1]$$

$$D = [0 \quad 0]$$

Parameter	Value	Parameter	Value
D_{eq}	0.018	K_I	0.15
H_{eq}	0.1667	K_{df}	0.2
R_{eq}	4.5	K_{pf}	2
T_{f_Mea}	0.02	T_{FESS}	0.01
T_g	0.4	T_{BESS}	0.01
T_{mt}	0.08	T_{id}	0.004
T_{wi}	0.1	T_{inv}	0.04
T_{wt}	0.2	k_p	0.25
M_{wt}	0.3878	k_i	0.022
K_P	1.5	Δf	60 Hz