List of Symbols

A_i = input-output coefficient (Gcal/Hour)

a_i = cost coefficient (Baht/Hour)

B_i = input-output coefficient (Gcal/MWh)

b_i = cost coefficient (Baht/ MWh)

B_{ij} = the ij^{th} element of the loss coefficient square matrix

B_{i0} = the i^{th} element of the loss coefficient vector

B_{00} = loss coefficient constant

CI_i = the i^{th} cost index

$Cost_{max}$ = maximum total generator fuel cost at $P_{i,max}$, $i = 1,\ldots,N$ (Baht)

$Cost_{min}$ = minimum total generator fuel cost at $P_{i,min}$, $i = 1,\ldots,N$ (Baht)

$CP_{rep,j}$ = cumulative reproduction probability of the j^{th} individual

C_i = input-output coefficient (Gcal/$(MW)^2$h)

c_i = cost coefficient (Baht/$(MW)^2$h)

$C_i(P_i(t))$ = generator fuel cost of the i^{th} generating unit at time period t (Baht/time period)

$C_i^*(P_i)$ = generator fuel cost with penalty factor of the i^{th} generating unit (Baht)

$C_T(t)$ = total generator fuel cost at time period t (Baht/time period)

DR_i = down ramp limit of the i^{th} generating unit (MW/time period)

D_i = decimal integer value of binary string of the i^{th} generating unit

$f_j(t)$ = fitness value of the j^{th} individual at time period t

$IC_i(P_i)$ = incremental cost of the i^{th} generating unit (Baht/MWh)

K_Δ = ZBF scaling factor

LB_i^k = lower bound of the i^{th} generating unit at the k^{th} iteration (MW)

MD_i = matrix dimension of the i^{th} generating unit

N = total number of on-line generating units to be dispatched

NP = specified population size

$N^{(k,m)}$ = perturbation vector at the k^{th} iteration and m^{th} trial

$\boldsymbol{P}'$ = power loading vector of a candidate solution consisting of $P_1,\ldots, P_{R-1}, P_{R+1},\ldots,P_N$

PF_i^k = penalty factor of the i^{th} generating unit at the k^{th} iteration

$\boldsymbol{P}_{best}$ = the best power output loading vector consisting of $P_1,\ldots, P_{R-1}, P_{R+1},\ldots,P_N$

$P_D(t)$ = total real power load demand at time period t (MW)

P_{GD}^{k} = power gross demand at the k^{th} iteration (MW)

P_i = candidate power output of the i^{th} generating unit (MW)

$P_i(t)$ = real power output of the i^{th} generating unit at time period t (MW)

$P_{i,best}$ = the best power output of the i^{th} generating unit

$P_{i,high}(t)$ = the highest possible power output of the i^{th} generating unit at time period t, $Min\{P_{i,max},(P_i(t\text{-}1)+UR_i)\}$, (MW)

$P_i^j(t)$ = power output of the i^{th} generating unit of the j^{th} individual at time period t

$P_{i,low}(t)$ = the lowest possible power output of the i^{th} generating unit at time period t, $Max\{P_{i,min},(P_i(t\text{-}1)\text{-}DR_i)\}$, (MW)

$P_{i,int}$ = intemediate power output of the i^{th} generating unit (MW)

$P_{i,max}$ = maximum power output of the i^{th} generating unit (MW)

$P_{i,min}$ = minimum power output of the i^{th} generating unit (MW)

$P^{(k,m)}$ = power output loading vector at the k^{th} iteration and m^{th} trial consisting of $P_1,\ldots,P_{R\text{-}1},P_{R+1},\ldots,P_N$

P_L^k = transmission line loss at the k^{th} iteration (MW)

$P_L(t)$ = total transmission line loss at time period t (MW)

P_R = the R^{th} reference dependent power output (MW)

$P_{rep,j}$ = reproduction probability of the j^{th} individual

UR_i = up ramp limit of the i^{th} generating unit (MW/time period)

R = dependent reference unit

T = total number of time periods in the time horizon

UB_i^k = upper bound of the i^{th} generating unit at the k^{th} iteration (MW)

ΔF_t = changes in fuel cost between the new and old solution

Δ_k = searching step size at the k^{th} iteration

Δ_1 = initial searching step size

σ_1 = initial value of control parameter

σ_k = value of control parameter at k^{th} iteration