Nomenclature

|  |  |
| --- | --- |
| *Sets:* |  |
|  | Index of generating units, from 1 to G. |
|  | Index of unit startup types, from 1 to S. |
|  | Index of time periods, from 1 to T. |
|  | Index of number of randomly selected samples in the test set, from 1 to N. |
| *Parameters:* |  |
|  | Cost coefficients of unit *g*. |
|  | Hot/cold startup cost of unit *g*. |
|  | Load demand at period *t*. |
|  | Maximum/minimum power output of unit *g*. |
|  | Initial power output of unit *g* at the last period of the previous day. |
|  | Power output of unit *g* during the *i*th period of the startup/shutdown process. |
|  | Ramp-up/ramp-down rate of unit *g*. |
|  | Up/down spinning reserve requirement at period *t*. |
|  | Duration of the startup/shutdown process of unit *g*. |
|  | Cold start periods of unit *g*. |
|  | Minimum on time/off time of unit *g*. |
|  | Number of periods that the unit *g* has been online/offline before the scheduling horizon. |
|  | Time defining the period limits of the startup type *s* of unit *g*. |
|  | Number of periods during which the unit *g* must be online/offline. |
|  | Initial state of unit *g* (state in the last period of the pervious day, 1: online; 0: offline). |
|  | Real state of unit *g* at period *t*. |
| *Variables:* |  |
|  | Predicted state of unit *g* at period *t* from neural network. |
|  | Startup type cost of unit *g* at period *t*. |
|  | Cost of the startup process of unit *g* at period *t*. |
|  | Production cost of unit *g* at period *t*. |
|  | Prediction error of unit *g* at period *t*. |
|  | Power output above  of unit *g* at period *t*. |
|  | Real power output of unit *g* at period *t*. |
|  | Up/down spinning reserve of unit *g* at period *t*. |
|  | Periods that unit *g* has been shut down until period *t*. |
|  | State of unit *g* at period *t* (1: online; 0: offline). |
|  | Startup state of unit *g* at period *t* (1: startup; 0: unchanged). |
|  | Shutdown state of unit *g* at period *t* (1: shutdown; 0: unchanged). |
|  | Indicated state of startup type *s* of unit *g* at period *t* (1: unit *g* selects startup type *s* and has been previously down within  periods; 0: otherwise). |

A. Objective Function









B. Constraints







































