gerd.Dispatch

For the sake of simplicity, all equations are stated for the one area case. In the model, equation 2a needs to hold for each area. Equations 3d, 3c and 3f are optional and can be switched on and off in the settings.

Sets

g	Generator
i	Interconnector
s	Storage
t	Time

Variables

$u_{g,t}$	Status (on/off) of generator g at t
$v_{g,t}$	Start-up of generator g at t
$w_{g,t}$	Shut-down of generator g at t
$p_{g,t}$	Production of generator g at t
$c_{s,t}$	Charge of storage s at t
$d_{s,t}$	Discharge of storage s at t
$x_{i,t}$	Interconnector flow over i at t

Parameters

DT_t	Demand at t
P_g^{max}	Maximum power output of generator g
P_g^{min}	Minimum power output of generator g
$P_{g,t}^{must-run}$	Must-run power of generator g at t
UT_g	Minimum up-time of generator g
DT_g	Minimum down-time of generator g
$C_{g,t}^{var}$	Variable costs of generator g at t
$C_{g,t}^{start}$	Start-up costs of generator g at t
S_s^{max}	Maxmimum capacity of storage a
S_s^{ini}	Initial capacity of storage a
η_s	Efficiency of charging of storage s
K_s	Maximum charging and discharging capacity of storage s
$X_{i,t}$	Interconnector capacity of i at t

Objective function

$$\min \sum_g \sum_t p_{g,t} \cdot C_{g,t}^{var} + v_{g,t} \cdot C_{g,t}^{start} \tag{1a}$$

Energy balance

$$\sum_g p_{g,t} + \sum_i x_{i,t} - \sum_s c_{s,t} + \sum_s d_{s,t} - DT_t = 0 \tag{2a}$$

Generators

$$p_{g,t} \geq P_g^{min} \cdot u_{g,t} \tag{3a}$$

$$p_{g,t} \leq P_g^{max} \cdot u_{g,t} \tag{3b}$$

$$\sum_{\tau=t-UT_g+1}^{t} v_{g,\tau} \leq u_{g,t} \tag{3c}$$

$$\sum_{\tau=t-DT_g+1}^{t} w_{g,\tau} \leq 1 - u_{g,t} \tag{3d}$$

$$u_{g,t} - u_{g,t-1} = v_{g,t} - w_{g,t} \tag{3e}$$

$$p_{g,t} \geq P_{g,t}^{must-run} \cdot u_{g,t} \tag{3f}$$

Storages

$$c_{s,t} \leq K_s \tag{4a}$$

$$d_{s,t} \leq K_s \tag{4b}$$

$$\sum_{\tau|\tau\leq t} (\eta_s \cdot c_{s,\tau} - d_{s,\tau}) \leq S_s^{max} \tag{4c}$$

$$\sum_{\tau|\tau\leq t} (d_{s,\tau} - \eta_s \cdot c_{s,\tau}) \leq S_s^{ini} \tag{4d}$$

Cross-border flows

$$x_{i,t} \leq X_{i,t} \tag{5a}$$

$$x_{i,t} \geq -X_{i,t} \tag{5b}$$