**E-FAMS Parameters**

Table 1. SGs parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number | SG1 | SG2 | SG3 | SG4 |
| Capability (MW) | 5 | 6 | 3.5 | 3 |
| No-load cost ($/h) | 2.5 | 3 | 0.875 | 0.75 |
| Start-up cost ($/h) | 5 | 6 | 1.75 | 1.5 |
| Shut-down cost ($/h) | 0.5 | 0.6 | 0.175 | 0.15 |
| Generation cost ($/MWh) | 25 | 35 | 60 | 40 |
| Maximum online time (h) | 5 | 5 | 3 | 3 |
| Reserve cost ($/MWh) | 2.5 | 3.5 | 6 | 4 |
| Reserve activation cost ($/MWh) | 2.5 | 3.5 | 6 | 4 |
| PFR cost ($/MWh) | 2.5 | 3.5 | 6 | 4 |
| Minimum online time (h) | 5 | 5 | 3 | 3 |
| Ramp capacity (MW) | 1.5 | 1.8 | 1.05 | 0.9 |
| Minimum output (MW) | 1 | 2 | 1 | 0.8 |
| Inertia (s) | 3.4 | 5 | 4.5 | 4.7 |
| Droop factor (p.u.) | 1 | 1.2 | 0.7 | 0.6 |
| Response constant | 4 | 4 | 4 | 4 |

Table 2. ESD parameters

|  |  |
| --- | --- |
| Parameters | Value |
| Capability (MW) | 2 |
| SOCmax | 0.9 |
| SoCmin | 0.1 |
| Initial SOC | 0.375 |
| Qmax (MWh) | 4 |
| *η* | 0.9 |
| Cmax | 1.5 |
| Reserve cost ($/MWh) | 3.5 |
| Reserve activation cost ($/MWh) | 3.5 |
| PFR cost ($/MWh) | 3 |
| Inertia (s) | 4 |
| Droop factor (p.u.) | 0.5 |

Table 3. WT parameters

|  |  |
| --- | --- |
| Parameters | Value |
| Capability (MW) | 5 |
| PFR cost ($/MWh) | 2.5 |
| Inertia (s) | 5 |
| Droop factor (p.u.) | 1.15 |

Table 4. Power exchange line parameters

|  |  |
| --- | --- |
| Parameters | Value |
| Capability (MW) | 3.75 |
| Up/down reserve cost ($/MWh) | 10 |

Table 5. Forecast power

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Time (h) | Forecast power (MW) | | | |
| PV | Wind | Demand | DSRs |
| 1 | 0 | 3.551609942 | 12 | 0.202537764 |
| 2 | 0 | 4.098011472 | 11.625 | 0.206510574 |
| 3 | 0 | 4.506728489 | 10.875 | 0.200196375 |
| 4 | 0 | 4.234611854 | 10.5 | 0.200906344 |
| 5 | 0 | 3.824810707 | 10.5 | 0.21 |
| 6 | 0 | 1.366003824 | 10.875 | 0.186178248 |
| 7 | 0.037865 | 1.593671128 | 12 | 0.20060423 |
| 8 | 0.560395 | 1.548137667 | 14.625 | 0.206193353 |
| 9 | 1.603244 | 1.821338432 | 14.8125 | 0.19391994 |
| 10 | 2.62445 | 1.092803059 | 17.8125 | 0.215256798 |
| 11 | 3.4059 | 0.54640153 | 18.5625 | 0.214973565 |
| 12 | 3.9386495 | 0.683001912 | 18.75 | 0.19070997 |
| 13 | 4.14405 | 0.379445507 | 18.5625 | 0.168240181 |
| 14 | 4.16665 | 0.303556405 | 18.75 | 0.189577039 |
| 15 | 3.95045 | 1.062447419 | 18.75 | 0.186555891 |
| 16 | 3.451 | 1.548137667 | 18.1875 | 0.169969789 |
| 17 | 2.68965 | 2.458806883 | 18 | 0.136676737 |
| 18 | 1.74 | 2.458806883 | 18 | 0.131963746 |
| 19 | 0.7316235 | 1.639204589 | 17.4375 | 0.12081571 |
| 20 | 0.0937835 | 2.049005736 | 17.25 | 0.228610272 |
| 21 | 0 | 2.185606118 | 17.25 | 0.271344411 |
| 22 | 0 | 2.185606118 | 16.3125 | 0.277953172 |
| 23 | 0 | 3.278409177 | 15.9375 | 0.272526435 |
| 24 | 0 | 4.234611854 | 13.5 | 0.244169184 |

Table 6. Price

|  |  |  |  |
| --- | --- | --- | --- |
| Time (h) | Price ($/MWh) | | |
| Buy | Sell | DSRs |
| 1 | 31.97 | 25 | 1.5985 |
| 2 | 31.5 | 25 | 1.575 |
| 3 | 27.54 | 25 | 1.377 |
| 4 | 27.18 | 25 | 1.359 |
| 5 | 27.18 | 25 | 1.359 |
| 6 | 27.18 | 25 | 1.359 |
| 7 | 28.45 | 25 | 1.4225 |
| 8 | 28.81 | 25 | 1.4405 |
| 9 | 30.17 | 25 | 1.5085 |
| 10 | 31.75 | 25 | 1.5875 |
| 11 | 33.22 | 25 | 1.661 |
| 12 | 34.76 | 25 | 1.738 |
| 13 | 39.59 | 25 | 1.9795 |
| 14 | 43.17 | 25 | 2.1585 |
| 15 | 45.62 | 25 | 2.281 |
| 16 | 74.6 | 25 | 3.73 |
| 17 | 85.97 | 25 | 4.2985 |
| 18 | 143.82 | 25 | 7.191 |
| 19 | 116.38 | 25 | 5.819 |
| 20 | 46.06 | 25 | 2.303 |
| 21 | 45.74 | 25 | 2.287 |
| 22 | 36.25 | 25 | 1.8125 |
| 23 | 32.43 | 25 | 1.6215 |
| 24 | 32.84 | 25 | 1.642 |

Table 7. PWL-MFs coefficients

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SG Number | G1 | G2 | G3 | G4 |
|  | -0.334718645 | -0.225641313 | -0.121998253 | -0.056145571 |
|  | -0.334718645 | -0.095231331 | -0.256469716 | -0.056145571 |
|  | -0.073507373 | -0.452296073 | -1.230268326 | -0.142458199 |
|  | -0.161545397 | -0.71499356 | -0.421614759 | -0.283895944 |
|  | -0.680913825 | -1.166937948 | -0.049490891 | -0.528506142 |
|  | 0.003521303 | 0.003361842 | 0.001889988 | 0.001307652 |
|  | 0.003521303 | 0.002359936 | 0.00605376 | 0.001307652 |
|  | 0.001985466 | 0.003997648 | -0.00159753 | 0.001818734 |
|  | 0.00261623 | 0.003716896 | 0.001864291 | 0.002046342 |
|  | 0.003132721 | 0.001316575 | 0.001400843 | 0.001387606 |
|  | 0.004511834 | 0.004241028 | 0.002438751 | 0.001481276 |
|  | 0.004511834 | 0.002792191 | -0.001253445 | 0.001481276 |
|  | 0.002147973 | 0.006109226 | 0.008522734 | 0.002383602 |
|  | 0.003325303 | 0.008220201 | 0.005183159 | 0.00345098 |
|  | 0.00723602 | 0.011598114 | 0.001439184 | 0.005135439 |