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| Flexlab building model | Environment | EPlus + FMU | |
| Parameters |  |  |
| Input | Q | Heat input to the room [W] |
| Output | room\_temp | Room temperature |
| lig | Lighting energy load |
| mels | Miscellaneous energy load |
| outdoor\_temp/RH | Outdoor temperature and humidity |
| solar\_radiation | Solar radiation |
| Battery model | Environment | Python | |
| Parameter | Ecap | battery capacity [J] |
| P\_cap\_charge | charging capacity [W] |
| P\_cap\_discharge | discharging capacity [W] |
| eta\_charge | charging efficiency |
| eta\_discharge | discharging efficiency |
| Input | a | control signal, [0,1] for charging, [-1,0] for discharging |
| Output | SOC | state of charge of the battery |
| Preal | real power input of the battery [W], positive for charging, negative for discharging |
| Key Equation | Preal = a \* P\_cap  Charging: der(E) = Preal \* eta\_charge  Discharging: der(E) = Preal / eta\_discharge | |
| Usage | from utilities.battery import Battery  battery = Battery(Ecap=10000000,  P\_cap\_charge=230,  P\_cap\_discharge=200,  eta\_charge=0.95,  eta\_discharge=0.9)  SOC[i],Preal[i] = battery.battery\_interact(control[i], hStep) | |
| PV model | Environment | Python | |
| Parameter | A | PV array area |
| eff | Efficiency of PV panel |
| effDcAc | Efficiency of inverter |
| Input | linc | Solar irradiation incident on array |
| Output | Pgen | Power generated by array |
| Key Equation | Pgen = linc \* A \* eff \* effDcAc | |
| Usage | from utilities.PV import PV  pv = PV(A=10, eff=0.18, effDcAc=0.85)  power[i] = pv.generate(linc[i]) | |

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| Flexlab building+Shading+HVAC | Environment | EPlus + FMU | |
| Parameters |  |  |
| Input | SaFr | Supply air flow rate [kg/s] |
| SaTemp | Supply air temperature [degC] |
| CwTemp | Cooling water supply temp [degC] |
| HwTemp | Heating water supply temp [degC] |
| Shading | 0 for shading off, 1 for shading on (block solar radiation), any non-zero number (such as 0.5) would be interpreted as 1 |
| Output | room\_temp | Room temperature [degC] |
| lig | Lighting energy load [W] |
| mels | Miscellaneous energy load [W] |
| FanPower | Fan power [W] |
| Cool | Cooling load consumed [W] |
| Heat | Heating load consumed [W] |
| Solar radiation | Solar heat gain [W] |
| Outdoor temp | Outdoor temperature |
| Outdoor RH | Outdoor relative humidity |
| Outdoor SI | Outdoor solar irradiation |