**PHarvestRegulatoryLimit**

150 kW

Maximum harvest power allowed by series regulations.

### sLap Powertrain Limits

By default Dynamic Lap will automatically optimise powertrain deployment to minimise laptime. Sometimes it is useful to evaluate the cost of non-optimal energy strategies which may be easier to implement or provide some strategic benefit. In addition to strategy weights a new feature has been introduced to specify `sLap Dependent Motor Deployment Limits` & `sLap Dependent Motor Harvest Limits` as a function of sLapCentreLine (better reference than sLap which can vary according to the racing line length). This makes it possible to define your own deployment profile to assess the cost of various compromises. The limits provide an upper bound for deployment and lower bound for harvest. The simulation can choose to deploy below the limit where it is not beneficial, but a strategy weight can be used to encourage deployment at the limit.

### Storage

The battery model can vary between either a simple source of energy and a full thermal battery model. The e-store has a maximum harvesting energy and a maximum deployment energy (both per lap) defined by *EHarvestMax* and *EDeploymentMax*/*EDeploymentRegulatoryMax*. It is *EDeploymentMax* or *EDeploymentRegulatoryMax* to which you should point your exploration in order to do a sweep of deployable energy. PBatteryMax can be used to limit power output from the battery. This is particularly helpful to limit multiple electric motors which are more powerful than the battery supply.

Battery efficiency is split between storage efficiency (charging) and deployment efficiency. Each of these efficiencies can be a constant value, or a flexible map. At the time of writing users can map only between temperature and efficiency, however these maps have been implemented as flexible maps and we can (at our customers' behest) add additional map terms. An alternative to the efficiency map is the internal resistance model, where we model battery voltage as a function of SoC, and battery losses as I^2 * internalResistance.

In addition to the efficiency maps, users can now implement both storage and deployment derate conditions, which will limit the charging or discharging power of the battery according to temperature and SoC. These conditions can also be extended to other variables, clients should contact Canopy do discuss their needs.

| Parameter | Definition |
|---|---|
| EHarvestMax | Maximum allowable energy harvest per stint/lap. |
| EDeplomentMax | Maximum allowable net energy deployment per stint/lap. |
| EDeplomentRegulatoryMax | Maximum allowable net energy deployment per stint/lap, taking account of regulatory efficiency, eRoundTripRegulatory. |
| eStoreEfficiency | Efficiency of energy storage into the battery, implemented either as a scalar or as a flexible map. |
| eDeployEfficiency | Efficiency of energy storage from the battery, implemented either as a scalar or as a flexible map. |
| eRoundTripRegulatory | Allows us to simulate the FE regulation: "braking regen added to allowable energy delivery based on factor of 0.75". |
| EBatteryMaxCapacity | Maximum rated battery capacity. |
| rBatteryRatedEfficiency | The rated capacity is measured at some discharge rate. We want to know the true internal charge. Rated efficiency = EBatteryMaxCapacity/True internal charge. |
| rStateOfChargeInitial | Initial SoC at start of stint/lap. |
| rStateOfChargeMinimum | Minimum allowable SoC. |
| Battery storage derate conditions | Conditions defining battery scharge power according to SoC and temperature. |
| Battery deployment derate conditions | Conditions defining battery discharge power according to SoC and temperature. |
| PBatteryMax | Maximum instantaneous power output from the battery. |
| thermalBoundaryConditions | Defines whether the boundary conditions are periodic (start and end temperatures equal) or with a fixed |