

Consider a system with symmetric efficiency of 80%. compute the initial soc such that the margin from the limits are symmetric when delivering a power

$$\overline{\text{soc}}(t+1) = \text{soc}(0) + \eta P(t) \frac{\Delta T}{E}$$

$$\underline{\text{soc}}(t+1) = \text{soc}(0) - \frac{1}{\eta} P(t) \frac{\Delta T}{E}$$

$$100\% - \overline{\text{soc}}(t+1) = \underline{\text{soc}}(t+1) - 0\%$$

$$1 - \text{soc}(0) - \eta P(t) \frac{\Delta T}{E} = \text{soc}(0) - \frac{1}{\eta} P(t) \frac{\Delta T}{E}$$

$$1 - 2\text{soc}(0) = \left(-\frac{1}{\eta} + \eta\right) P(t) \frac{\Delta T}{E}$$

$$2\text{soc}(0) = 1 + \left(\frac{1}{\eta} - \eta\right) P(t) \frac{\Delta T}{E}$$

$$\text{soc}(0) = \frac{1 + \left(\frac{1}{\eta} - \eta\right) P(t) \frac{\Delta T}{E}}{2} \Rightarrow \text{soc}(0) = 0.5 + P(t) \frac{\Delta T}{2E} \left(\frac{1}{\eta} - \eta\right)$$