

$$Q = \Delta U - W$$

$$(Q = \Delta u - W)^{in} \Rightarrow (-\Delta u)^{in} = -(Q + W)^{in}$$

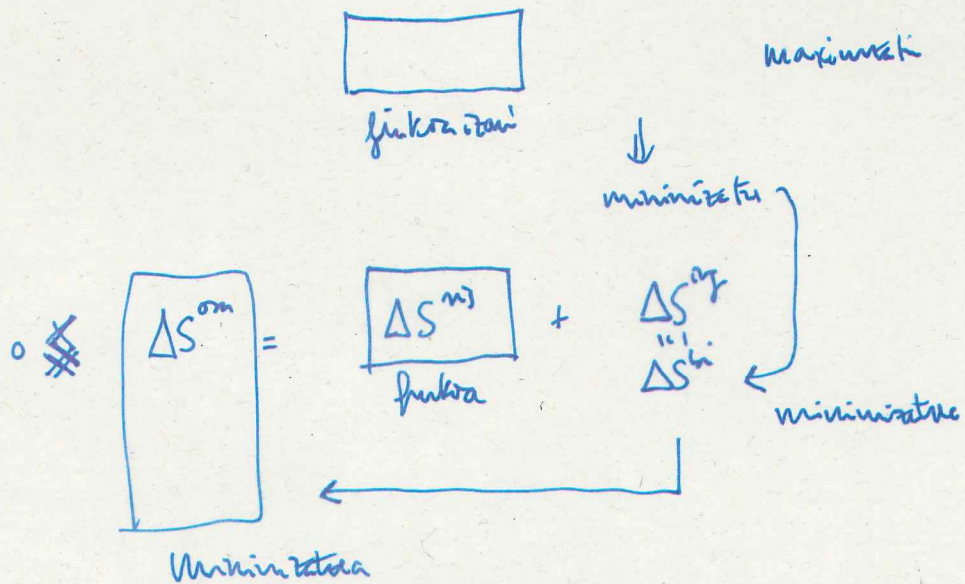
$$= -Q^{in} - W^{in}$$

$$= Q^{out} + W^{out}$$

$$(-\Delta u)^m = Q^i + W^i \quad 1P \quad (EKP)$$

$$\begin{aligned} \delta Q &= dU - \delta W \\ (\delta Q = dU - \delta W)^{fin} \\ (-dU)^{hi} &= -(\delta Q + \delta W) \\ -dU^{hi} &= \delta Q^{hi} + \delta W^{hi} \\ 0 &= dU + \delta Q^{hi} + \delta W^{hi} \end{aligned}$$

$$\delta W^{bi} = -dU - \delta Q^{hi}$$



2P (EEP)

$$dS + \frac{\delta Q_{hi}}{T_{hi}} \geq 0$$

$$\frac{\delta Q^{in}}{T^{in}} \geq -dS$$

$$-\frac{\delta Q_{\text{rev}}}{T_{\text{rev}}} \leq dS$$

$$- \delta Q^i \leq T^i dS$$

$$\begin{aligned}\delta Q &= dU - \delta W \\ dU &= \delta Q + \delta W \\ -dU &= -\delta Q - \delta W\end{aligned}$$

$$\delta W^{li} \leq -dU + T^{bi} dS$$

$$\begin{aligned} \delta W^i &\leq -\delta Q - \delta W + T^i ds \\ \delta W^i &= -T ds - \delta W + T^i ds \end{aligned}$$