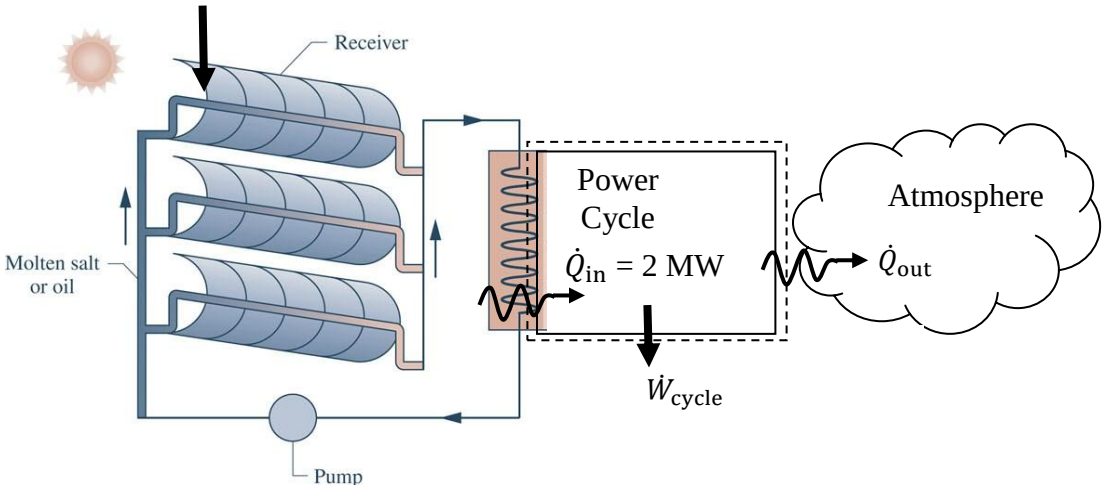
Problem 2.85

A concentrating solar collector system, as shown in Fig. P2.85, provides energy by heat transfer to a power cycle at a rate of 2 MW. The cycle thermal efficiency is 36%. Determine the power developed by the cycle, in MW. What is the work output, in MW·h, for 4380 hours of steady-state operation? If the work is valued at \$0.08/kW·h, what is the total dollar value of the work output?



The power developed is

$$\dot{W}_{cycle} = \eta \dot{Q}_{in} = (0.36)\ (2\ \text{MW}) = 0.72\ \text{MW}$$

For 4380 hours of steady-state operation

$$W_{cycle} = \dot{W}_{cycle} \Delta t = (0.72\ \text{MW})(4380\ \text{h}) = 3153.6\ \text{MW·h} \longleftarrow$$

The total dollar value is

$$\text{\$ Value} = (3153.6\ \text{MW·h})(\$0.08/\text{kW·h})\left|\frac{10^3\ \text{kW}}{1\ \text{MW}}\right| = \$252{,}300 \longleftarrow$$