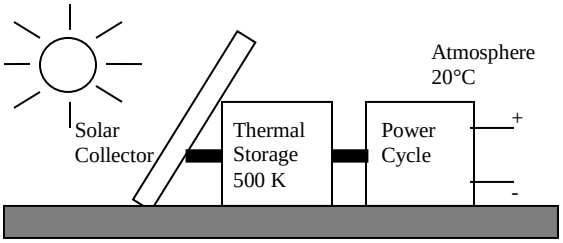
ABE – 201 Fall 2016

Homework Set 11
Due Wednesday 10/26/2016 at the beginning of class

1. (7.5 pts) An inventor claims to have developed a power cycle capable of delivering a net work output of 410 kJ for an energy input of heat of 1000 kJ. The system receives heat from hot gases at 500K and discharges energy to the atmosphere at 300K. Should you invest in his new company? Why or why not?

2. (7.5 pts) A solar collector receives solar radiation at a rate of 0.315 kW per m^2 and delivers the heat to a storage unit whose temperature remains a constant 500 K. A power cycle receives heat from the storage unit, generates electricity at the rate of 570 kW and discharges heat to the atmosphere (20°C). For operation at steady state, calculate the theoretical minimum solar collector area required.



3. (5 pts) A Carnot heat engine is operating at a thermal efficiency of 55 percent by taking 2100 Btu/min heat from the heat source at 350°C. The waste heat from this engine is rejected to a nearby lake.
(a) What is the power output of the engine in horse power?
(b) What is the maximum temperature of that the lake could be?