ECE 333 Green Electric Energy

Homework 5

due Friday, October 7, 2014

The quiz for this HW is based on the assigned problems below and examples in slides
QUIZ- October 9,2014

Reading:

Text: From Masters' 2nd edition

- appendix A
- chapter 7.8

Solve the following problems:

Text: 7.12

Problem 1. Better windows for a building adds $\$3/ft^2$ of window but saves $\$0.55/ft^2$ in the reduced heating, cooling and lighting costs. With a discount rate of 12%

a. What is the NPV of the better windows over a 30-year period with no escalation in the value of the annual savings?

b. What is the IRR with no escalation rate?

c. What is the NPV if the savings escalate at 7% per year due to fueling savings?

d. What is the IRR with the escalation rate?

Problem 2. A 30 *kW PV* systems on a building reduces the peak demand by 25 *kW* and reduces the annual electricity demand by 60,000 *kWh/yr*. The *PV* systems cost $135,000 to install, has no annual maintenance costs, and have an expected lifetime of 30 years. The utility rate structure charges $0.07/*kWh* and $9/*kW* per month on demand

a. What annual savings in utility bills will the *PV*s deliver?

b. What is the *IRR* on the investment with no escalation in utility rate?

c. What is the *IRR* on the investment if the annual savings on utility bills increases 6% per year?

Problem 3. A small, 10-*kW* wind turbine that costs *$*15,000 has a capacity factor of 0.25. If it is paid for with a 6-*%*, 20-*year* loan and it is an equal payment cash flow set, what is the cost of the electricity generated if the wind turbine always works at 10-*kW*?

Problem 4. A 2-*kW PV* systems with capacity factor 0.20 costs *$*8,000 after various incentives have been accounted for. It is to be paid for with a 5*%*, 20-*year* loan. Since the household has a net income of *$*130,000 per year, their marginal federal tax bracket is 30.5*%*

a. Do a calculation by hand to find the cost of *PV* electricity in the first year

b. Set up a spreadsheet to show the annual cash flow and annual electricity price for this system.

Problem 5. A *PV* systems that generates 8,000 *kWh/yr* cost *$*15,000. It is paid for with a 6*%*, 20-*year* loan. Ignoring any tax implications, what is the electricity cost from the *PV* systems