Financial Analysis Lab

[*Note*: This lab was assigned in the course Practicum in Sustainability – Reducing Dickinson's Carbon Footprint, taught by Neil Leary in fall 2012 at Dickinson College. In this lab, students learn to evaluate GHG mitigation projects using financial metrics such as pay-back period, net present value, and cost per ton of carbon reduction. Students also learn some basic skills for working with Excel spreadsheets. An Excel spreadsheet template is provided with this lab to facilitate financial calculations. Time needed: 2 hours.]

Conodoguinet College is considering construction of a biomass combined heat and power (CHP) plant to provide steam to heat its campus and generate electricity. Estimates of oil consumption, electricity purchases, wood chip consumption, capital and operating & maintenance costs, and energy prices for two scenarios are presented in the table below. In the base case, the existing central energy plant would provide all steam heat for the campus, and all electricity consumption would be purchased from a public utility. In the alternate case, a CHP plant is constructed that would provide 85% of Conodoguinet's steam heat and 40% of its electricity consumption during its useful lifetime. The CHP plant has a capital cost of $5.5 million and is expected to last 25 years.

	Base Case	Alt. Case: CHP Plant
No. 2 heating oil consumption (gals/yr)	250,000	37,500
Electricity purchases (kWh/yr)	2,200,000	1,320,000
Wood chips (tons/yr)	0	4,500
Capital cost ($)	0	$5,500,000
Operating & Maintenance cost ($/yr)	$10,000	$60,000
Price no. 2 heating oil ($/gal)	$3.00	$3.00
Price electricity ($/kWh)	$0.10	$0.10
Price wood chips ($/ton)	$50.00	$50.00

Using the information in the table, and the excel spreadsheet provided with this lab assignment, answer the following questions.

1. What is the payback period for the CHP plant?

2. What is the Internal Rate of Return for the biomass plant? (Use Excel's help feature to search for IRR. It will give you instructions for creating a formula that will calculate the IRR).

3. For a discount rate of 5%, what is the NPV of the CHP plant?

4. How much would the CHP plant reduce CO2 emissions over its 25 year life? What is the cost per metric ton of CO2 reduction?

5. Evaluate the sensitivity of NPV of the CHP plant and cost per ton of CO2 reduced to variations in the discount rate and prices of fuel oil, wood chips and electricity using the scenarios described in the following table and discount rates of 3%, 5%, 7%, 9% and 11%. Graph your results.

Base Prices	High Oil Price	High Wood Chip Price	High Electricity Price
P elec = 0.10	P elec = 0.10	P elec = 0.10	P elec = 0.14
P oil = $3.00	P oil = $3.50	P oil = $3.00	P oil = $3.00
P wood = $50.0	P wood = $50.0	P wood = $75.0	P wood = $50.0