Spreadsheets and Net Present Value

Physics and Mathematics of Sustainable Energy

College of the Atlantic. October 17, 2025

Instructions

- Work on your own or with at most one other person. Please do not work in groups larger than two.
- There is nothing to hand in associated with this lab. However, the spreadsheet model we start to build today will be used in next week's lab, for which there will be a small report due. Also, we'll use what we do today in class on Monday.

In these exercises you'll build two spreadsheets. I'll show you how step by step. Please use google sheets, since this way if you're stuck you can share the sheet with me and I can jump in and see what's going on. Go to your google drive and click New and then Google Sheets.

Exercise One: Build a spreadsheet that analyzes the following situation, which should be familiar from today's class: You are considering an investment that will pay you $2000 for the next three years.

- Build a spreadsheet that calculates the net present value of this investment
- Make it so that you can adjust the discount rate.
- Currencies should have a $ in front of them and be rounded to the nearest tens of dollars.
- It should be possible for someone (other than you!) to understand your spreadsheet easily without having to look inside any cells and read formulas.
- Also add a column that tallies up the total revenue.

Exercise Two: You wish to buy 16 solar panels, each of which has a nameplate capacity of 450 Watts. The electricity is worth $0.25 per kWh. Assume the panels last ten years.

1. How much energy will the panels generate each year?
2. How much is this energy worth? This is your yearly revenue.
3. Build a spreadsheet to analyze this situation. Your spreadsheet should:
    - Make it so that you can adjust capacity factor, cost per kWh, and discount rate.
    - Calculate the NPV
    - Include a column that tallies total revenue over time
4. Add a column that includes the amount of CO_{2e} saved every year. Assume a lifecycle ghg emissions of 46g/kWh for solar and 300 g/kWh for the average Maine electricity that your solar would be replacing.