

Step-by-step computer exercise

Objective:

We want to build a combination of power plants that will be our advice to the Pennsylvania Governor for the new plants to be built in Pennsylvania over the next 25 years. The combination must make 60 TWh of electricity and reduce the CO₂ by 50% from that released by an original plan.

Teacher Led Group Exercise:

Notice that your screen looks like the one on the power point presentation. Also notice that there are three combinations saved. Since we want to make one of our own, highlight the combo 3 and press the delete button. Hit yes to delete the combination.

1. Hit reset to send everything back to zero.
2. First, build 5 energy efficiency. Notice that you have 2.5 TWh of electricity, which is 4%. The electricity produced shows that too. Notice that you costs are actually negative. The first bit of energy efficiency saves you money on your electricity bill.
3. Build 12 more energy efficiency for a total of 17 plants or 8.5 TWh or 14%. Notice you are saving \$2.18 on your electric bill.
4. Now build 9 wind farms, for a total of 4.5 TWh. Notice that your natural gas back-up has increased a lot too. You are making 10.1 TWh from natural gas, or 17%. CO₂ is at 14%, water use in 2,000 olympic pools per year, land use is 2,500 football fields and health costs are still \$0
5. Look at the CO₂ amount. Build 1 coal option 1 CO₂ released plant.
 - a. How many TWh that 1 coal plant is making?
 - b. What % is that?
 - c. How much is the total electricity that's being produced?
 - d. How much CO₂, land use, water use, health costs, increase in electric bill?
6. Look at the CO₂ amount.
 - a. How much is it?
 - b. Build 1 coal-to-gas option 2 plant. Now how much is it?
 - c. Why doesn't it change the CO₂ released by all that much?
7. Now, increase energy efficiency again. As you do, watch the increased cost. From 14% EE to 15%, the cost actually goes down by 10 cents. From 15% to 16% it goes up by about \$1. Hit the EE up one more time. It goes up by a lot again, This is because the 15% mark is the tipping point when energy efficiency gets a little more expensive. It is still cheaper than some

- options up to 20%, so increase it the whole way right now. A warning tells you at 20%, you can't build anymore.
8. Now build 6 natural gas plants, for a total of 11 gas plants. Your bar graph should show 25% solid bar and 17% striped bar. Why? Notice that the 11 that is shown for natural gas in the build center is the *total* gas plant – including both the number of plant to back up wind and the number of plants you built yourself.
 9. Now build 1 wind farm. You get a CO₂ warning.
 - a. Why?
 - b. What are the four ways we could reduce CO₂?
 10. Reduce the wind by 1.
 - a. What can I build now that doesn't release CO₂?
 11. Build 2 nuclear plants. It should tell you that you have reached your goal.
 12. Now notice a % change column popped up in the impacts center. This column only shows itself when you are above 60 TWh.
 - a. What is the land use of this combo?
 - b. How does it compare the original plan?
 - c. Why is it so much larger?
 - d. How much CO₂, increased monthly bill cost, cost of everything else you buy?
 13. Save this combination by hitting save. It will tell you that you have reached your goal. Say yes to saving your combination. Name it practice. See it show up in the saved box.
 14. Let's say you were interested in the other saved combinations. Highlight combo 2. Then press the recall button. It will bring up combo 2. Now highlight practice, hit recall and it will bring practice back up.
 15. Let's say that you want to compare your 3 combinations. Hit the compare button. A new screen should pop up. Here you can see your 3 combinations. This area shows....and this area shows....etc. (go through all the areas)
 16. Now go back to the tool by hitting the other button. Delete all the saved combos. **Reset** your combination.

Individual Exercise:

Now you will get a chance to make a few combinations yourself. We ask you to make 3 combinations and save them all. Then, we ask you to look at the compare screen and decide which one you would like to use as your advice to the governor. When you are done and you have decided on a combination, write down your combination on the sheet of paper we are providing now. On the first page of the new handout, we have written out the problem question. On the second page, record your combinations.