Background

This Excel spreadsheet is intended to support the use of *Generate: The Game of Energy Choices*

Generate is an interactive game that allows students to explore energy choices and teaches the considerations and costs in deciding what type of energy generation to build. These materials are for educational purposes only.

All additional materials for the game are included at:
https://www.epa.gov/climate-research/generate-game-energy-choices
For any problems or feedback, please contact: Rebecca Dodder at dodder.rebecca@epa.gov

Instructions

0. Before starting, make sure the carbon dioxide ($CO_{2)}$ price is set at zero for the first round of the

CO_2 Cost
0

Ideally, the Excel sheet is projected on a screen for the class to see all scores.

1. Once all teams have finished their energy mix, fill in the number of pieces used for each energy type.

Hint: Leaving blanks for the unused pieces allows students to see/compare the energy mixes more easily.

	Team 1	Team 2	Team 3	Team 4	Team 5
Nuclear					
Coal					
Coal-Existing					
Coal-CCS					
Natural Gas					
Wind Small					
Wind Large					
Wind with Battery					
Solar Small					
Solar Large					
Solar with Battery					
Efficiency Small					
Efficiency Large					

	Team 1
Nuclear	
Coal	
Coal-Existing	5
Coal-CCS	
Natural Gas	10
Wind Small	7
Wind Large	
Wind with Battery	
Solar Small	1
Solar Large	
Solar with Battery	
Efficiency Small	
Efficiency Large	

2. Check that all teams have correctly filled in their grid.

There are two checks. Have all of the grid squares been covered? Have at least 8 small pieces been used? The small pieces are needed to fill in the bottom row, and may represent a Renewable Portfolio Standard.

Grid squares not covered	✗ 4	✗ 16	✓ 0	✗ -16	✓ 0
Small Needed	✗ 1	✓ 0	✓ 0	✓ 0	✓ 0

Missing pieces, 1 small piece is

Too few pieces. 16 grid squares

Too many pieces. Try recounting. Or, the students may have gone past the white grid.

Zeroes and green checks.

3. Show the students their total scores and rankings. 1 (in green) is the lowest cost solution, 5 (in red) is the mo

For the first round, with CO_2 set to zero, the "Total Cost of CO_2" will be zero for all teams. Therefore, the "TOTAL Cost" is the Cost to Build and Operate.

Ask the students to discuss their ranking and total score, and why they differed from the other teams.

Cost (Build and Operate)	7890	8145	7710	8130	8415

Total Cost of CO_2	0	0	0	0	0
TOTAL Cost	7890	8145	7710	8130	8415
Team Ranking	2	4	1	3	5

4. **Before starting the next round, change the CO_2 cost to show students how the rankings change.**

   These rounds will now include a cost of the economic damages associated with CO_2. This will factor into the TO

Cost (Build and Operate)	7890	8145	7710	8130	8415
Total Cost of CO_2	2070	1728	2052	1800	1314
TOTAL Cost	9960	9873	9762	9930	9729
Team Ranking	5	3	2	4	1

5. **Continue to change the CO_2 cost for each round, and repeat starting with Step 1.**

6. **Optional: Scores for all rounds can be copied to compare results. Copy the TOTAL cost.**

   Hint: Do not use CTRL+V to copy the scores. Doing that will link those cells to the "TOTAL cost" and change when the CO_2 cost changes. Either "Paste as value" or type in the TOTAL score for each round. This is particularly useful to see the cost reductions for the "Energy Efficiency" round.

Score Keeping for All Rounds					
	Team 1	Team 2	Team 3	Team 4	Team 5
Round 1					
Round 2					
Round 3					
Round 4					
Round 5					

7. **For additional information on playing rounds with a CO_2 limit or water limit, please see the Instructor's Guide**

Team 2	Team 3	Team 4	Team 5
4	6	4	3
9	6	10	7
8	8	8	8
3	2	2	7

st expensive.

)TAL cost.

for details.