



TITLE: El Pueblo Energy Game

teachgeocivics.com

<p>Grade band: 9-12 Subject: Social Studies Topic: Energy Sources</p>	
Introduction	<p>Students will be introduced to the town of El Pueblo de la Energia where they have a river, a forest and a need for energy sources for the people in the town. Due to its location, the town is often hit with hurricanes and other major storms that sometimes leave the town without access to energy, having to wait for days for crews to come fix the downed electricity poles. There are a number of businesses, government offices, and residents who rely on electricity to power their devices, refrigerate their food, and ensure access to government services, including healthcare, sanitation, and lights. Students will be assigned roles to find energy for them.</p>
Purpose	<p>Students will pretend they are city council members, city managers or city clerks who have to decide how to get the energy that the town needs for its residents, business owners, and for government entities to function. They will have to balance the costs of procuring the energy with the impact to the environment, costs to the residents, and the health and needs of the town residents. The purpose of this game is to show students how policy makers balance the short and long term needs of the community while addressing issues of climate change, extreme weather, and sustainability.</p>
Materials	<ul style="list-style-type: none"> ● Student worksheet with Physical Map of El Pueblo de Energia with rules for each city councilmember, city manager and city clerk. ● 1 set of Role Cards for each Pueblo Team-each team member gets or chooses 1 of the Role Cards. Make sure that whoever is the City Manager has a laptop to download a copy of the Google sheet Pueblo de Energia spreadsheet that has all of the formulas. ● Digital copy of Google sheets spreadsheet of Pueblo Energy Game for each Pueblo team's city manager and city clerk to download and manipulate based on city councilmember's decisions. ● Copy of Game Rules for each Pueblo team members. ● 1 Copy of Protocols for each City Manager of each team.

- Copy of reflection sheet for each student.



Instructions

Students are each elected city council members for the town of Pueblo that have been placed on a task force to find viable and sustainable sources of energy for the residents, business owners and government of the town of Pueblo. Factors that must be taken into account include the fact that there are often hurricanes or massive storms that hit the town of Pueblo that knocks down traditional power poles. Pueblo is in a rural area so it takes repair crews days and even weeks for the electricity to be repaired so keep this in mind as a factor when deciding what energy to provide.

Activity Materials & Answer Keys

1. Teacher is provincial governor who tracks turns by town/Pueblo. Here are names of teams: Pueblo Rojo, Pueblo Azul, Pueblo Amarillo, Pueblo Verde, Pueblo Rosa, Pueblo Morado.
2. Each Pueblo team of 7 students will be assigned these different roles by handing out the role cards. (See Role Cards).

Title	Role
City Manager	You download a copy of the game board and institute the changes to the land that the majority (over 50% of councilmembers) of council members decide to do with the land in the fictional city of Pueblo.
City Clerk and Treasurer	You are documenting the decision that the majority of city council members voted on for

	the type of energy to provide, tracking revenues for the city, and documenting all of the factors that are on the sheet.
Councilmember #1	You are the Environmental Council Member-priority is to have as much cleared land and trees and protect the river. You care about the happiness of the population.
Councilmember #2	You are the Accountant Council Member- you want to save as much money as possible and not spend any money.
Councilmember #3	You are the Fossil Fuel Councilmember- your campaign was funded by natural gas, coal, and hydroelectric companies. You want at least one, if not all, of these facilities, so you can get reelected.
Councilmember #4	You are the Hot Wind Councilmember- your campaign was funded by wind and solar energy companies who have promised to get you elected as mayor if you get clean energy. You want to advocate for renewable energy that does not produce damaged land.
Councilmember #5	You are the Chamber of Commerce Councilmember- you are representing local businesses that want maximum happiness so that the population grows and they have more customers. Your goal is to get as close to 240 people as possible.

3. The student who is the city manager for each Pueblo team needs to download their own copy of the Google spreadsheet to manipulate the tiles based on decisions made by city council member votes for their own pueblo team. City clerk will keep track of the decisions made and impact to energy, happiness, and treasury on the city clerk/treasurer worksheet.
4. Hand out copies of rules and worksheets to each student to keep track of votes made for each turn.
5. City Council members look at the board and decide how much power they need to avoid population decline. They discuss options available: what they want to build and where they want to build it. Options include: Wind turbines, Solar, Large Batteries, Geothermal, Natural Gas, Hydroelectric, Coal, Nuclear, Concentrated solar power

- Each facility has different costs and size restrictions -space they take up on the board. You have limited space in the town of Pueblo.
 - The only tiles NOT changeable are the 8 Pueblo tiles (brown in the center) of the game board.
 - The river only has the option of being a river or being a hydroelectric dam.
6. City council members need to look at all options and consider the power generated, power needs met, population happiness, amount of money in the treasury, surplus power sold, and power profit, as well as impact on the population. Explain the grid by referring to letters and numbers.
- **How to win:** You get a certain number of turns while keeping your population high. (10 turns for an hour long game, but it could go for as long as you want).
 - 10 minutes to introduce the game and put kids in groups of 7 -5 city council members, 1 city manager and 1 city clerk.
 - **How to lose:** everyone leaves town. People would leave town if they are unhappy. If there are no people, there are no customers for the businesses. Population is just a number in the box.
 - Power needs are not met right now and the population is unhappy and are starting to leave. If you get more power you will get more income.
 - There are 100 people starting and the max population is 240. You can attract more people by creating a better environment. Power needs met, needs to be balanced with a decent environment.
 - The more damaged land you have, the more impact on happiness and, for every 6 damaged lands, it impacts happiness. Because power needs are not met, population happiness impact is.
 - Starting happiness is 7.
 - The more damaged land you have, the more people will leave.
 - You can change damaged land back to clear land-just grass, no trees.
 - You have to clear land if you want to build anything.
 - Cost of clearing trees so you can build an energy facility is \$1 per square.
 - You need 24 to provide enough power for the whole Pueblo.
 - Starting treasury is \$35.
 - Bigger facilities like nuclear power take 1 turn of being under construction. It doesn't cost anything but you change the tile during that turn.

Teams will decide what they want to build and where they want to put it. It has to be within their budget, and they have to consider all of these factors:

- Power it will generate;
- Impact on the environment;
- Impact on happiness of the population;
- Cost of facility;
- Space it takes up-facility.

The higher the population, the more taxes go up that the people pay you. Less people means less taxes paid to you.

7. You want to keep the population high so you can collect more taxes, collect more money and provide more energy.

If you have more than 24 (minimum energy needed to supply the entire town) then you have excess energy that you can sell back and make more money for your pueblo.

Win condition is to keep at least 100 people and provide enough energy needed for the town. Make sure the impact population is positive by the end of the game. Damaged land must be adjacent to the power facility itself or adjacent to other damaged land. Damaged land must be a different square each turn. They can fix the damaged land by clearing it for the cost of \$1 and it takes 1 turn.

8. Vocabulary:

- **Cleared land:** land that has had trees removed so that it is ready for construction or a project
- **Damaged land:** land that has been physically harmed by energy source/power facility
- **Under construction:** land that cannot be used because it takes time to build the power facility
- **Wind turbine:** a rotating device that converts the kinetic energy of wind into electrical energy
- **Photovoltaic Solar (aka. PV Solar):** system is composed of one or more solar panels combined with an inverter and other electrical and mechanical hardware that use energy from the Sun to generate electricity
- **Large Battery:** battery used to store energy created by solar or wind energy for nighttime or non-windy time use by residents of the Pueblo
- **Geothermal:** power produced through the conversion of geothermal steam or water to electricity that can be used by consumers
- **Natural Gas:** a flammable gas, consisting largely of methane and other hydrocarbons, formed from the remains of plants and animals, occurring naturally underground and used as fuel
- **Hydroelectric Dam:** electricity produced from generators driven by turbines that convert the potential energy of moving water into mechanical energy
- **Coal:** a combustible black or dark brown rock consisting mainly of carbonized plant matter, found mainly in underground deposits and widely used as fuel
- **Concentrated Solar Power (CSP):** use mirrors to concentrate the sun's energy to drive traditional steam turbines or engines that create electricity
- **Nuclear Power:** electricity generated by power plants that derive their heat from fission in a nuclear reactor
- **Dispatchable energy:** a source of electricity that can be turned on or off to adjust the power output supplied to the electrical grid
- **Non-dispatchable energy:** the electricity generation from technologies that cannot (or have limited ability to) adjust their power output to match electricity demand, as their source is weather-dependent like solar and wind

**Cells that are highlighted are the ones that matter the most.*

Extension:

- If you want to make it easier for students, provide more cleared land (for example middle schoolers).
- If you want to provide more of a challenge, have more trees or give them an environmentally damaging facility at the beginning like coal or natural gas. To be really, really challenging, start with a nuclear power plant, and make students fix the damage.