GAME OVERVIEW

Object of the Game

To earn money by powering up cities and making Colorado as clean and efficient as possible.

How many Colorado cities can YOU light up?

- Purchase energy plants and connect them to cities to power them up.
- Calculate costs, environmental impacts, revenue, and profits.
- Connect energy plants to cities with power connectors to light up Colorado.

Goal of the Game

The goal is to power up as many cities as possible, for as long as possible, while keeping environmental costs low. What's the best strategy to make it through four rounds and beyond?

MATERIALS INVENTORY

Game Board and Pieces

Your box comes with an iPad and USB with an introductory video that includes background information, an introduction to the game, and rules for play. You will also find five color-coded game sets (and their corresponding game pieces) that contain the following:

A **iPad**

B **Game Board** – Colorado map with cities, power plant locations, and renewable energy key

C **Sliding Calculator** – Used by the **Banker** to keep track of city revenue and environmental costs, resulting in annual profits, as you light up cities.

D **Gameplay Instructions** – Each group gets at least four so everyone can see them.

E **Tally Sheets** – Each group gets one so the **Accountant** can keep track of their expenses. Optional Challenge Round columns are on a separate sheet.

F **Power Plant Dice** (set of 90) – Five sides represent solar, wind, hydro, coal, and gas power plants. The **Builder** places them in the square openings on the board.

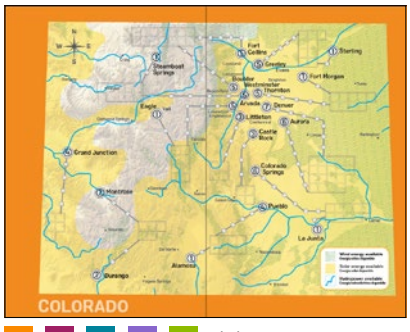
G **Power Connectors** (Set of 80) – Used by the **Engineer** to connect plants to cities along the small squares on the game board.

H **City Power Markers** (set of 25) – Used to show which cities are powered up.

I **OPTIONAL Challenge Game Chance Cards** (one set of 10 cards) – Used in Challenge Game rounds to add new challenges and chance to the game.

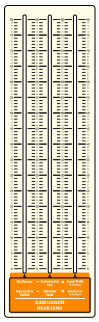
A

B



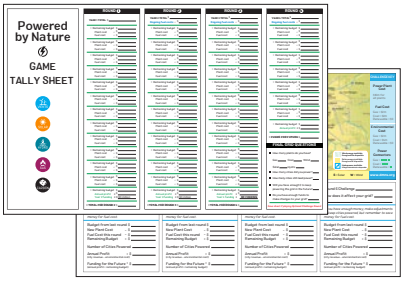
(5) game boards

C



D

E



F

G

H

I OPTIONAL

TEACHER INSTRUCTIONS

Prior to Class

- Review entire Teacher Guide.
- Watch the introduction video on the iPad, or through the USB.
  (If you prefer, you can refer to page 16 and do the introduction yourself.)
- Familiarize yourself with the rounds and moves in the columns on the tally sheet.
- Plan for an hour of class time for playing the Powered by Nature game.
- If desired, post the game rules and vocabulary words.

Briefly Introduce Game

Tell students that the object of the Powered by Nature game is to earn money by powering up cities and making Colorado as clean and efficient as possible. Tell them that they will divide up into teams, which will:

Explica a los estudiantes que el objetivo del juego Powered by Nature es ganar dinero suministrando energía a las ciudades y haciendo que Colorado sea lo más limpio y eficiente posible. Diles que se van a dividir en cuatro equipos para:

- Purchase energy plants and connect them to cities to power them up.

  Comprar plantas energéticas y conectarlas a las ciudades para darles energía.

- Calculate costs, environmental impacts, revenue, and profits.

  Calcular los costos, el impacto en el medio ambiente, ingresos y ganancias.

- Connect energy plants to cities with power connectors to light up Colorado.

  Conectar las plantas energéticas con las ciudades por medio de conectores de energía para iluminar a Colorado.

Also let them know that each team will receive a game board and other materials after they watch a video from the Museum about how to play the game.

También explica que cada equipo va a recibir un tablero de juego y otros materiales después de que miren un video del museo sobre cómo jugar el juego.

TEACHER INSTRUCTIONS CONT.

Initial Setup

- Divide students into five teams, as close to the same size as possible (4 – 6 is best). Have each team sit together the way they will during gameplay.
- Play introductory video *(or follow instructions on page 16)*
  - Pass out materials during video (or immediately afterward if not using technology). Provide each team with a game board (one), sets of game pieces, game instructions (five), tally sheets (one), sliding calculators (one), and pencils.

NOTE: Once independent gameplay begins, it will be helpful to carry the Teacher Guide around with you, open to pages 12-15, Rules of the Game and Quick Guide.

Start Round 1

After the video, each team has 3 minutes to:

- Pick roles and take responsibility for the materials they will need. Depending on group size, have each team pick one or two people for these roles:
  - Banker to pay attention to the budget and use the sliding calculator

    Banquero(a) que cuide el presupuesto y use la regla de cálculo.
  - Builder to hold and place power plant cubes

    Constructor(a) que tenga y ubique los cubos de las plantas energéticas .
  - Accountant to hold and track spending on the tally sheet

    Contador(a) que tenga y haga seguimiento de los gastos en la hoja de registro .
  - Engineer to hold and place power connectors

    Ingeniero(a) que tenga y ubique los conectores de energía.
- Make sure accountants record $130 m at the top of the Round 1 column.

  Asegúrate de que los contadores registran 130 millones de dólares en la parte de arriba de la columna de la Ronda 1.
- Begin Round 1 by having each team buy power plants for Grand Junction.
  - Watch teams to see how they are doing.

TEACHER INSTRUCTIONS CONT.

Pause the class to check progress. Have at least two teams answer these questions:

- What power plants did you use and why?

  ¿Cuáles plantas energéticas usaron y por qué?

- How much did you spend on plants and fuel?

  ¿Cuánto gastaron en las plantas y en combustible?

- How much did you earn for powering Grand Junction? ($4 million city revenue minus environmental costs)

  ¿Cuánto ganaron por suministrar energía a Grand Junction? (Ingresos de 4 millones de dólares en la ciudad menos los costos del medio ambiente).

Finish Round 1

Give students 10 minutes to light up as much of Colorado as they can in the rest of Round 1, leaving Grand Junction on the board.

- Remind students to record costs for plants and fuel on the tally sheet, and to keep cumulative track of city revenue and environmental costs on the sliding calculator.

  Recuerda a los estudiantes que lleven registro de los costos de las plantas y del combustible en la hoja de registro y que lleven un seguimiento acumulado de los ingresos y de los costos medioambientales de la ciudad en la regla de cálculo.

- **Optional**: Have the class start with western Colorado so teams can easily compare their Round 1 results.

  Opcional: Pide a la clase que empiece con la parte oeste de Colorado de modo que los equipos puedan comparar fácilmente los resultados de la Ronda 1.

Pause the class to check progress. Have at least two groups answer these questions:

- Did you spend all of your Round 1 money?

  ¿Gastaron todo su dinero de la Ronda 1?

- What types of power plants did you use?

  ¿Qué tipo de plantas energéticas usaron?

- How many cities were you able to power up?

  ¿A cuántas ciudades pudieron suministrar energía?

Compare results between the two groups. Ask for advantages and disadvantages of power plant types.

Compara los resultados entre dos grupos. Pregunta cuáles son las ventajas y desventajas de los diferentes tipos de plantas energéticas.

TEACHER INSTRUCTIONS CONT.

Continue Independent Gameplay – Rounds 2 and 3

Give students 16 minutes to play Rounds 2 and 3.

- Remind students that they get another $130 million at the beginning of these two rounds, which they will add to their profit and remaining funds from the previous round.

  Recuerda a los estudiantes que van a recibir otros 130 millones de dólares al comienzo de estas dos rondas, lo que aumentará sus ganancias y los fondos restantes de la ronda anterior.

- Remind students again to record costs for plants and fuel on the tally sheet, and to keep cumulative track of city revenue and environmental costs on the sliding calculator.

  Recuerda a los estudiantes de nuevo que lleven registro de los costos de las plantas y del combustible en la hoja de registro, y que lleven un seguimiento acumulado de los ingresos y de los costos medioambientales de la ciudad en la regla de cálculo.

Pause the class to compare strategies and have students assess their Colorado power grid so far. Have at least two groups answer these questions:

- How many cities were you able to power?

  ¿A cuántas ciudades pudieron suminitrar energía?

- How much money do you have left?

  ¿Cuánto dinero les queda?

- Do you think you will be able to keep your grid powered up without any additional funding?

  ¿Piensan que van a poder mantener su red con energía sin fondos adicionales?

TEACHER INSTRUCTIONS CONT.

Continue Independent Gameplay – Round 4

Have students play Round 4 for 8 minutes with **NO** new funding, to test out their predictions.

- Use only the money that is left over from previous rounds.

  Usen solo el dinero que queda de las rondas anteriores.

End gameplay, and have students assess their Colorado power grid. Have at least two groups answer these questions:

- Were you able to power up all of Colorado and keep it going?

  ¿Pudieron suministrar energía a todo Colorado y mantenerse bien?

- Do you have any money left for the future? How much?

  ¿Les queda algo de dinero para el futuro? ¿Cuánto?

Clean Up and Put Away

Please ask students to place all their pieces in the labeled containers.

> **NOTE:** If going on to the Challenge Game, teams should keep their original tally sheets and either keep the game board set up or record details on the additional Challenge Game tally sheet.

- Encourage students to keep their pieces with their game board and not to mix pieces with those of other teams.

  Anima a los estudiantes a que mantengan sus piezas del tablero de juego y que no mezclen las piezas con las de otros equipos.

- Replace materials in box for the next classroom to use.

  Reemplaza los materiales de la caja para que estén listos para el uso de otra clase.

TEACHER INSTRUCTIONS CONT.

OPTIONAL Challenge Rounds for Advanced Play

If there is extra time to continue or play the game again, students can play Challenge Game Rounds. The Challenge Game uses a deck of 10 chance cards and a different, additional tally sheet. More-detailed instructions are on pages 19-20 of the Teacher Guide.

- If teams are doing the Challenge Game they should hold on to their original tally sheets and either keep the game board set up or record details on the Challenge Game tally sheet.

  Si los equipos están jugando el juego del reto (Challenge Game), deberían mantener las hojas de registro originales y mantener ya sea el tablero de juego listo o registrar los detalles en la hoja de registro del juego del reto.

- Each team shuffles their chance cards, and draws one for each additional challenge round, or the teacher can draw the cards from a single deck for all the teams. Cards represent a good and bad factor beyond the players' control, along with consequences for the team's power grid.

  Cada equipo revuelve sus cartas y escoge una por cada ronda adicional de reto, o el maestro puede escoger las cartas de un paquete de cartas, para todos los equipos. Las cartas representan un factor bueno y uno malo que está fuera de las manos de los jugadores, junto con las consecuencias de estos factores en la red de energía del equipo.

- In challenge rounds, you still can't move or remove a power plant but you can shut it down.

  En las rondas de reto, todavía no se puede mover o quitar una planta eléctrica, pero sí pueden cerrarse.

TEACHER INSTRUCTIONS CONT.

OPTIONAL Wrap-Up Questions

What worked well on your power grid?

¿Qué funcionó bien en su red de energía?

What were some challenges to powering Colorado?

¿Cuáles fueron algunos de los retos de suministrar energía a Colorado?

What types of power plants do you think work best in Colorado?

¿Qué tipo de plantas energéticas piensan que funcionan mejor en Colorado?

What are some of the problems that need to be solved, or ideas you have for the future to power more of Colorado by renewables and other energy sources?

¿Cuáles son algunos de los problemas que necesitan ser resueltos o ideas que tienen para el futuro, para suministrar energía a más áreas en Colorado con fuentes renovables y otras fuentes de energía?

- How would you store energy for times when the sun is not shining and the wind is not blowing?

  Answer: *Batteries*

  ¿Cómo almacenarían energía para los momentos en que el sol no está brillando y el viento no está soplando?

  ***Respuesta**: Baterías*

- How might you maximize the power produced by renewable energy sources?

  Answer: *Put them in areas that are consistent (sun, water, wind)*

  ¿Cómo aprovecharían al máximo la energía producida por fuentes de energía renovable?

  ***Respuesta**: Ponerlas en áreas que reciben consistentemente sol, agua y viento.*

GAMEPLAY INSTRUCTIONS

For every move in each round:

1 Buy a power plant. Place on board with picture of plant type pointing up. Record on tally sheet.

Gas Hydro Wind Solar Coal

$10 million per power plant

2 Buy fuel if it is a **non-renewable** energy plant. Record on tally sheet.

$2 million per gas or coal plant per round

3 Calculate and record the remaining budget on tally sheet.

4 Mark environmental costs on slide calculator.

- (minus) $2 million

- (minus) $4 million

= $0

5 Connect power to city with power connectors

6 Mark city revenue on slide calculator each time you light up a city.

Grand Junction

- **ADJUST SLIDE CALCULATOR** after each move, and keep it going through all rounds.
- **AFTER EACH ROUND**, figure out **annual profit** on the calculator (city revenue minus environmental costs). Add to remaining budget at bottom of column.
- **ADD** the **next year's funding**. Record total budget for the following round at bottom of the column—and at the top of the next one.
- **START EACH ROUND** by first paying the **fuel costs for all plants on the board.**

INSTRUCCIONES PARA JUGAR

En cada turno de cada ronda se debe:

1 Comprar una planta eléctrica. Ponerla en el tablero de juego con una foto del tipo de planta indicando hacia arriba. Hacer el registro en la hoja de registro.

Gas Hídrica Viento Solar Carbón

$10 millones por planta eléctrica

2 Comprar combustible si es una planta de energía no renovable. Hacer el registro en la hoja de registro.

Gas Carbón

$2 millones por planta energética de gas o carbón, por ronda

3 Calcular y llevar registro del presupuesto restante en la hoja de registro.

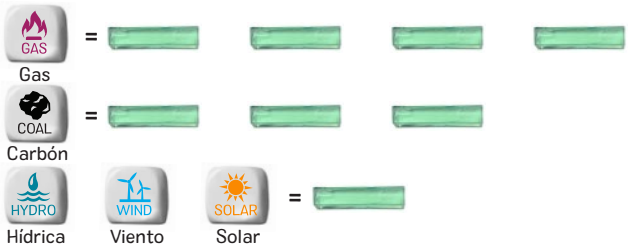
4 Marcar los costos medioambientales en la regla de cálculo.

Gas - (menos) $2 millones

Carbón - (menos) $4 millones

Hídrica Viento Solar = $0

5 Conectar la energía a la ciudad con los conectores de energía.



Gas Carbón Hídrica Viento Solar

6 Marcar los ingresos de la ciudad en la regla de cálculo cada vez que iluminan a una ciudad.

Grand Junction

- **AJUSTAR LA REGLA DE CÁLCULO** después de cada turno y continuar ajustándola en todas las rondas.
- **DESPUÉS DE CADA RONDA**, calcular la **ganancia anual** en la regla de cálculo (los ingresos de la ciudad menos los costos medioambientales). Sumar el presupuesto restante en la parte de abajo de la columna.
- **SUMAR** los **fondos del año siguiente**. Registrar el presupuesto total para la siguiente ronda, en la parte de abajo de la columna, y en la parte de arriba de la siguiente columna.
- **EMPEZAR CADA RONDA** pagando primero los **costos de combustible para todas las plantas en el tablero de juegos.**

RULES OF THE GAME

1. One person (or two) in each team needs to be responsible for each job:
   - **BUILDER** puts energy plants in place
   - **ACCOUNTANT** fills out the tally sheet
   - **ENGINEER** places power connectors
   - **BANKER** uses the slide calculator

2. Make decisions as a group, and make sure everyone knows when any move has been made so they can do their job (like the accountant's tally sheet).

3. If you have more power connectors than you need from one move, you can put them in holes to another city if they are from the same power grid.

4. Once you've bought and placed a power plant, you can't move or remove it.

5. A round is finished when the team has filled up all the spaces on the tally sheet for that round or has run out of time or money.

6. If you happen to run out of money, that round is done for your team. Do the math at the bottom of the column and move on to the next.

7. If time is called and you have not finished a round, do the math at the bottom of the column based on what you have done so far and move on.

8. Keep the slide calculator set at the end of the round and then add on from there for the next round.

REGLAS DEL JUEGO

1. Una persona (o dos) en cada equipo necesitan ser responsables por cada uno de estos trabajos:
   - Un(a) **CONSTRUCTOR(A)** que ubica a las plantas energéticas en su lugar.
   - Un(a) **CONTADOR(A)** que llena la hoja de registro.
   - Un(a) **INGENIERO(A)** que ubica los conectores de energía.
   - Un(a) **BANQUERO(A)** que usa la regla de cálculo.

2. Tomen las decisiones en grupo y aseguren que cada uno(a) se entera cuando se ha hecho cualquier movimiento de modo que puedan hacer su trabajo (como por ejemplo el registro en la hoja de registro del contador).

3. Si tienen más conectores de energía de los que necesitan en un turno, pueden ponerlos en agujeros para otras ciudades, si están en la misma red de energía.

4. Una vez que compren y ubiquen una planta eléctrica, no pueden moverla o quitarla.

5. Una ronda se termina cuando el equipo ha llenado todos los espacios en la hoja de registro de esa ronda, o se queda sin tiempo o sin dinero.

6. Una vez se queden sin dinero, es el final de esa ronda para su equipo. Hagan los cálculos matemáticos en la parte de abajo de la columna y sigan a la siguiente.

7. Si se acaba el tiempo y no han terminado una ronda, hagan los cálculos matemáticos en la parte de abajo de la columna con base en lo que han hecho hasta el momento y sigan adelante.

8. Mantengan la regla de cálculo lista al final de cada ronda para sumar lo de la ronda siguiente.

QUICK GUIDE

Total time: 60 min.

1 Assign students to teams (ideally equally divided groups of 4 to 6).

2 Play intro video. **3 min.**
Pass out materials while video is playing.

3 Get teams started by giving them 3 minutes to pick roles **3 min.**
— **Builder / Engineer / Banker / Accountant** —
— Constructor(a) / Ingeniero(a) / Banquero(a) / Contador(a) —
and work together to power up Grand Junction on their own.

4 Pause class to check progress and have at least two groups share strategies. **5 min.**

QUESTIONS:

- What power plants did you use and why?
  ¿Cuáles plantas energéticas usaron y por qué?
- How much did you spend on plants and fuel?
  ¿Cuánto gastaron en las plantas y en combustible?
- How much did you earn for powering Grand Junction?
  Answer: $4 million city revenue minus environmental costs
  ¿Cuánto ganaron por suministrar energía a Grand Junction?
  Respuesta: *Ingresos de 4 millones de dólares en la ciudad menos los costos medioambientales*

10 min.

5 Have teams light up as much of Colorado as they can with the rest of the $130 million funding for Round 1. Ask them to start with western Colorado.

REMINDER: Record costs for plants and fuel.
Keep track of city revenue and environmental costs.

5 min.

6 Pause class to check progress and have at least two groups share strategies.

QUESTIONS:

- Did you spend all of your Round 1 money?
  ¿Gastaron todo su dinero de la Ronda 1?
- What types of power plants did you use?
  ¿Qué tipo de plantas energéticas usaron?
- How many cities were you able to power up?
  ¿A cuántas ciudades pudieron suministrar energía?
- What are advantages and disadvantages of power plant types?
  ¿Cuáles son las ventajas y desventajas de los diferentes tipos de plantas energéticas?

QUICK GUIDE CONT.

Total time: 60 min.

7 Have students play Rounds 2 & 3. **16 min.**

REMINDER: Teams get another $130 million in funding for Round 2 and again for Round 3. They add this to profit and remaining funds from the previous round.

8 Pause class to compare strategies and have students assess their power grid. **10 min.**

QUESTIONS:
- How many cities were you able to power up?
  ¿A cuántas ciudades pudieron suministrar energía?
- How much money do you have left?
  ¿Cuánto dinero les queda?
- Can you keep your grid powered up without more funding?
  ¿Pueden mantener su red con energía sin más fondos?

9 If there's time, let students play Round 4 with **NO** new funding, to test their predictions. **8 min.**

QUESTIONS:
- Were you able to power up all of Colorado and keep it going?
  ¿Pudieron suministrar energía a todo Colorado y mantenerlo así?
- Do you have any money left? How much?
  ¿Les quedó algo de dinero? ¿Cuánto?

10 Clean up and put away

If teams are doing the Challenge Game they should hold on to their original tally sheets and either keep the game board set up or record details on the different, additional Challenge Sheet.

WRAP-UP QUESTIONS AND CHALLENGE GAME ROUNDS ARE OPTIONAL.

INTRODUCTION

For teacher background or in place of video

Background

With its natural beauty, rich resources, and thriving cities, many people want to live in Colorado. With all those people comes more demand for energy to power homes and businesses. Power companies have the tough job of balancing the power grid so that electricity meets demand. As population grows, so does the challenge of providing energy in a way that is efficient, affordable, and protects natural resources. Colorado uses different methods to generate the electricity we use to power our lights and electronic devices.

Introduce Game

Powered by Nature is a game of strategy and skill. The object of the game is to earn money by powering up cities and making Colorado as clean and efficient as possible. How many Colorado cities can YOU light up? Teams will:

- Purchase energy plants and connect them to cities to power them up.
- Calculate costs, environmental impacts, revenue, and profits.
- Connect energy plants to cities with power connectors to light up Colorado.

The goal is to power up as many cities as possible, for as long as possible, while keeping environmental costs low. What will your team's best strategy be to make it through four rounds and beyond? Success is determined by the number of powered cities and by how you manage your budget.

Review Vocabulary

Electricity: The electricity we use is generated in power plants, causing electrons to move along power lines to buildings and back to the plant. The same phenomenon also causes lightning and static electricity in nature.

Electricidad: *la electricidad que usamos es generada por plantas eléctricas, que causan que los electrones pasen a través de los cables de electricidad a los edificios y de regreso a la planta. El mismo fenómeno también causa los rayos y la electricidad estática en la naturaleza.*

Power Plants: Large structures that generate the movement of electrons to provide electricity.

Plantas energéticas: *Estructuras grandes que generan el movimiento de electrones para suministrar electricidad.*

INTRODUCTION CONT.

For teacher background or in place of video

Power Grid: The combination of power plants and power lines used to generate and move electricity to homes and other structures.

Red eléctrica: *la combinación de plantas eléctricas y redes eléctricas usadas para generar y mover electricidad a hogares y otras estructuras.*

Renewables: Energy generated from sources that do not run out, such as solar from sunlight, wind power, and hydropower from moving water.

Renovables: *energía generada de fuentes que no se acaban, como la solar de la luz del sol, energía del viento y la energía hidroeléctrica de agua en movimiento.*

Non-Renewables: Fossil fuels are the remains of dead plants and animals from a long time ago. Coal and gas take millions of years to form and a short amount of time to burn, so these resources will eventually run out.

No renovables: *los combustibles fósiles son los restos de plantas y animales que murieron hace mucho tiempo. El carbón y el gas toman millones de años en formarse y poco tiempo para quemarse, así que estos recursos eventualmente se van a acabar.*

Revenue: The income generated from the sale of goods or services, such as electrical power. In this game, city revenue is based on the city's size and population.

Ganancias: *los ingresos generados por la venta de bienes o servicios como energía eléctrica. En este juego, los ingresos de la ciudad se basan en el tamaño y la población de la ciudad.*

How to Play

Each team will purchase and place different kinds of power plants, and buy fuel, to supply power to cities. In each round, teams can make a profit based on their choices, working to power the most cities while keeping environmental costs low, and retain money for future purchases and operations.

Each round of the game represents about one year. We will play four rounds, starting with some practice moves at the beginning of Round 1. You will get $130 million in funding for each of the first three rounds, but not the fourth.

INTRODUCTION CONT.

For teacher background or in place of video

Start Round 1 as a Whole Group

Have each team begin Round 1 by buying a coal power plant for Grand Junction.

"To practice, let's each buy a coal plant and place it near Grand Junction. Place one of the cubes on the map on the Grand Junction power grid, with the coal side of the cube facing up. Record the cost of $10 million. Now let's purchase fuel and record it too. We'll also record environmental costs on the sliding calculator. Now add the right number of power connectors on the dashed lines on the map between Grand Junction and its power grid."

"Para practicar, cada uno compre una planta de carbón y ubíquenla cerca de Grand Junction. Ubiquen uno de los cubos en el mapa en la red eléctrica de Grand Junction, con el lado de carbón en el cubo, hacia arriba. Registren el costo de 10 millones de dólares. Ahora compren combustible y también regístrenlo. También se debe hacer registros de los costos medioambientales en la regla de cálculo. Ahora sumen el número de la derecha de los conectores de energía en las líneas de puntos en el mapa, entre Grand Junction y su red eléctrica."

NOTE: One coal plant won't fill up all the power connectors . . .

NOTA: *Una planta de carbón no va a llenar a todos los conectores de energía...*

"Oops! We didn't quite make it. Which renewable energy plant could we buy to make up the difference? Follow the same steps."

"¡Oh oh! No alcanzamos. ¿Cuál planta de energía renovable podríamos comprar para completar la diferencia? Sigamos los mismos pasos."

"We made it! Now we can record our city revenue ($4 million for Grand Junction) on the sliding calculator too."

"¡Lo logramos! Ahora podemos registrar nuestos puntos para ciudades (cuatro para Grand Junction) en la regla de cálculo."

Move On to Finish Round 1 Independently

Refer to Teacher Instructions pages 5-7 and/or Quick Guide for the rest of the game.

OPTIONAL CHALLENGE GAME

After teams complete the initial four rounds, the teacher can add in Challenge Cards that introduce real-life scenarios and additional rigor.

The goal of challenge rounds is to have students think more deeply about different energy sources and to introduce more complex problem solving. In these rounds, teams **DO NOT** get additional investment funds.

*El objetivo de las rondas de reto es que los estudiantes piensen más a fondo sobre las diferentes fuentes de energía y presentarles resolución de problemas más complejos. En estas rondas, los equipos **NO** reciben fondos adicionales de inversión.*

Instead, they...

use existing funds to adjust their grid to try to keep as many of the cities powered up as possible.

usen fondos existentes para ajustar su red y tratar de mantener el suministro de energía el mayor número de ciudades posible.

Ideally, the Challenge Game is played as a continuation of the first four rounds, using each team's board from the end of the original game. However, if your class is unable to keep the board set up after Round 4, you can have students...

use the map provided on the Challenge Game tally sheet to record their board for use in Challenge Game play.

usen el mapa suministrado en la hoja de registro del juego del reto para registrar el tablero que usarán en el juego del reto.

Challenge Game Play

1. Each team gets a deck of cards, shuffles them, draws one card per round, and then makes adjustments as directed by the cards. (Alternatively, the teacher could choose to use one deck and choose and read one card to the whole class.)

   Cada equipo recibe un juego de cartas, las revuelve y escoge una por ronda. Después hace ajustes según lo que dicen las cartas. (De forma alternativa, el maestro puede escoger usar un juego de cartas, escoger y leer una carta para toda la clase).

2. Teams can then use the remaining funds they have available from the last round to adjust their grid and make it more resilient.

   Los equipos pueden usar sus fondos restantes disponibles de la última ronda y ajustar su red, para hacerla más resistente.

OPTIONAL CHALLENGE GAME CONT.

3. Teams can follow prompts on the Challenge Game tally sheet to track the effect on their grid as well as any changes they make.

   Los equipos pueden seguir instrucciones de la hoja de registro del juego del reto para hacer seguimiento al efecto que tiene en su red, así como cualquier cambio que quieran hacer.

4. Challenge Game can continue until up to six rounds have been completed.

   El juego del reto puedo continuar hasta completar seis rondas.

Challenge Game Rules

- Just as in the first game, students must continue to pay fuel costs each round to power fuel-burning plants. If they run low on funding they can shut down plants (see below).

  Al igual que en el primer juego, los estudiantes deben continuar pagando por los costos de combustible en cada ronda, para suministrar energía a las plantas que consumen combustible. Si se quedan con pocos fondos, pueden cerrar sus plantas (ver abajo).

- Power Plants cannot be removed or moved but may be shut down for a round if fuel is not purchased or renewables sources are not available.

  Las plantas eléctricas no pueden cambiarse o quitarse, pero pueden cerrarse en una ronda, si no se compra combustible o no hay disponibilidad de recursos renovables.

  - To shut a power plant down move it just outside the slot it occupied. To activate it move it back to the same slot. (If using the paper map, use pencil slash marks over plants.)

    Para cerrar una planta eléctrica, muévanla fuera del lugar en donde estaba. Para activarla, muévanla de regreso a su lugar original. (Si se usa el mapa de papel, se deben hacer rayas con lápiz sobre las plantas).

- If a plant is shut down for a round players must remove the number of power connectors indicated by the Power Tracker Key.

  Si una planta se cierra durante una ronda, los jugadores deben quitar el número de conectores de energía que indique el Power Tracker Key.

- If removal of power connectors results in a broken connection to a city, the city loses its power marker and is not counted for revenue until it is repowered.

  Si al quitar los conectores de energía se daña la conexión de una ciudad, la ciudad pierde su marcador de energía y no puede contarse como ingresos hasta que vuelva a recibir suministro de energía.

OPTIONAL CHALLENGE GAME CONT.

OPTIONAL Challenge Game Questions

- What are some considerations for plants dependent on renewable sources?

  ¿Cuáles son algunos de los aspectos que se deben tener en cuenta con las plantas que dependen de fuentes renovables?

  Renewables are dependent on weather and sun position to operate. They also take up more land space.

  Las plantas de energía renovable dependen del clima o de la posición del sol para funcionar. También ocupan más espacio en la tierra.

- What are some considerations for plants dependent on non-renewable energy?

  ¿Cuáles son algunos de los aspectos que se deben tener en cuenta con las plantas que dependen de energía no renovable?

  Fossil fuels have more environmental effects and their price can fluctuate based on supply and demand.

  Los combustibles fósiles tienen mayor impacto ambiental y su precio puede fluctuar con base en la oferta y la demanda.

- Do you think it is okay to let some people in Colorado be without power if we run low?

  ¿Piensan que está bien permitir que algunas personas en Colorado se queden sin energía si nos queda poca energía?

  Students can debate this, but teachers should share that power companies are required to meet changing demand of all their customers on a second-by-second basis.

  Los estudiantes pueden discutir esto, pero los maestros deben decirles que a las compañías de energía se les exige que cubran todos los cambios en la demanda de sus clientes segundo a segundo.

- What could you change to better balance your Colorado power grid?

  ¿Qué podrían cambiar para tener un mejor equilibrio en su red eléctrica de Colorado?

  What are three examples of ways to conserve energy?

  ¿Den tres ejemplos de maneras de ahorrar energía?