

Slow Reveal Graph – Where does Arizona’s electricity come from? Teacher Notes

This lesson and follow up lesson were designed to address the following Arizona Science Standard for 4th grade: 4.P4U3.4 (NGSS-P: 4-ESS3-1) **Engage in argument from evidence** on the use and impact of renewable and nonrenewable resources to generate electricity.

The Google Slide Deck for Teachers for this slow reveal graph and the follow up lesson where students try to identify mystery state electricity profiles can be found here:

<https://stemazing.org/slow-reveal-graph-arizona-electricity/>

Advanced Teacher Preparation

Print single sided copies of the blank graph for them to fill in as it is revealed. Print double-sided, stapled copies of the notice and wonder pages for students to complete as you go through the frames of the slow reveal graph. These documents are included at the end of this file.

Engagement Suggestions

The whole point of a slow reveal graph is for students to not know what the graph is about until it is revealed so try not to give a hint or accidentally reveal what the graph is about until you get to that point in the lesson.

Bring up the Slow Reveal Graph and go through the frames one at a time in slideshow view. We recommend the slow reveal graph with the sentence frames included on the slides but you can also choose to use the version of the slow reveal that doesn’t have as much on each slide. Allow time for students to think on their own during the Alone Zone time so they can notice, wonder, and make guesses about the graph topic without distraction chatting with others. Then let elbow partners share out ideas. Keep repeating this process as indicated on the slow reveal graph frames. For your convenience, the notes from the slides are included below for you to print out and reference if needed.

Teacher Notes from Slides

1st Frame – Slide 1: Alone Zone: Give students time to consider what they notice and what they wonder without talking to others. They should record their noticings and wonderings on their worksheet.

1st Frame – Slide 2: Elbow Partners: Let students discuss with their elbow partners what they notice and what they wonder.

1st Frame – Slide 3: After recording at least two ideas on their worksheet, have students make guesses about what they think the graph could be about. Encourage wacky and creative ideas to build a culture of sharing ideas. Ask them to share out ideas with the class.

1st Frame – Safety Slide

2nd Frame – Slide 1: Have students update their copy of the graph with the new information they have received – the percentages. Alone Zone: Give students a minute to notice what is new without talking to others and also to record some wonderings. They should record their noticings and wonderings on their worksheet.

2nd Frame – Slide 2: Elbow Partner: What information did we just learn? How does it change your thinking about this graph? Any new ideas about the graph? What might this graph be about? What is the graph not about? Have students make a guess, with some justification, about what the missing percentage is for the green value. All observations, wonderings, and predictions should be recorded on their worksheet. Have students share out guesses for the missing percentage and their reasoning.

2nd Frame – Safety Slide

2nd Frame – Reveal – Shows the 11.7% missing percentage. Have students update their copy of the graph with the missing percentage.

2nd Frame – Reveal – Safety Slide

3rd Frame – Slide 1: Have students update their copy of the graph with the new information they have received – the symbols inside each circle. They should draw them as best they can. Alone Zone: Give students time to consider what they notice and what they wonder without talking to others. They should record their noticings and wonderings on their worksheet.

3rd Frame – Slide 2: Elbow Partner: What information did we just learn? How does it change your thinking about this graph? Any new ideas about the graph? What might this graph be about? What is the graph not about? All observations, wonderings, and predictions should be recorded on their worksheet. Have students share out ideas about what the graph might be about.

3rd Frame – Safety Slide

4th Frame – Slide 1: Have students update their copy of the graph with the new information they have received – the title and subtitle of the graph and one of the titles of the categories – Petroleum. Alone Zone: Give students time to consider what they notice and what they wonder without talking to others. They should record their noticing and wonderings on their worksheet.

4th Frame – Slide 2: Elbow Partner: Ask students to discuss what the other energy sources might be. They should record their guesses on their worksheet.

4th Frame – Safety Slide

4th Frame – Reveal: Have students update their copy of the graph with the new information they have received – the other primary energy source categories – Coal, Natural Gas, Renewable Energy, and Nuclear Energy. Elbow Partner: Ask students if they are surprised by anything in the graph. They may be surprised by the relatively low percentage of renewable energy and relatively high percentages of natural gas and nuclear power. (As a note, Arizona is home to the Palo Verde Nuclear Generating Station. This is the largest nuclear power plant in the United States and also the only nuclear power plant in Arizona.)

Extended Discussion

You could ask students what they think the percentage for Renewable Energy producing electricity should be and why it is not higher than it is already. You could ask them to think about what kinds of renewable energy are included in that category. (Note: For Arizona, the renewable energy is approximately split equally between hydroelectric (~49%) and solar (~44%) with small contributions from wind (5%) and biomass (2%).)

Special thanks to STEMAZing Teacher Leader Kathy Hartley for help in the development of the student worksheets for this lesson.

Name _____ Date _____

(_____)



(_____)

(_____)

(_____)

(_____)

(_____)

Name _____

Date _____

Slow Reveal Graph – 1st Frame

| I notice... | I wonder... |
|--|-------------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| I think this graph might be about... _____ | |
| _____ or _____ | |

Slow Reveal Graph – 2nd Frame

| | |
|---|---|
| Now, I notice... | Now, I wonder... |
| <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> | <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> |
| Now, I think this graph might be about... <hr/> _____ or _____ | |
| I believe the missing percentage is _____ because _____ <hr/> _____. | |

Slow Reveal Graph – 3rd Frame

| | |
|---|-------------------------------------|
| Now, I notice... | Now, I wonder... |
| <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> | <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> |
| Now, I think this graph might be about... <hr/> or <hr/> | |

Slow Reveal Graph – 4th Frame

| |
|---|
| I think the other symbols represent <hr/> <hr/> <hr/> <hr/> |
|---|