

Solar Powered City



Adapted from the Lesson Study by: Cindy Cooper
George Mason University, COMPLETE Math
Fall 2015

The Task

Solar panels collect energy from the sun so people can use that energy to power things in their homes. Is it possible to power an entire city by using only solar energy? New York City uses about 164,380 kilowatt hours of electricity each day. Usually, it takes 25 solar panels to produce about 5 kilowatt hours of electricity. How many solar panels would it take to power all of New York City for one day?

Big Ideas

- Multiplicative/Proportional reasoning involved with scaling up quantities
- Estimating results of multiplication with large numbers
- Recording and representing relations with tables, charts, graphs, equations, and words

Standards of Learning for Grades 3-4-5

5.4 single-step and multistep practical problems involving whole numbers.

Standards of Learning for Grades 6-7-8

6.1 describe/compare data using ratios

7.4 single and multistep practical problems with proportional reasoning

7.12 The student will represent relationships with tables, graphs, rules, and words.

8.3a solve practical problems involving rational numbers, percent, ratios and proportion

8.14 The student will make connections between any two representations (tables, graphs, words, and rules) of a given relationship.

Process Goals

- Problem Solving and Reasoning – Students will apply their sense of number to consider the reasonableness of results in such a large city. Students will also have to find ways to approach a problem where they do not have a prescribed solution pathway. Then, students will justify their methods to other classmates who may have approached the problem differently.
- Connections and Representations – Students may make use of a variety of representations to keep track of the coordinated quantities in order to reach a solution. 7th and 8th graders may make connections between proportions and real world problems.
- Communication – Students may use words, pictures, tables, or equations to communicate their thinking and solution pathways to others.

Related Task – World’s Largest Cookie

The world’s largest chocolate chip cookie was created using 40,000 pounds of cookie dough! (The recipe is listed below.) A school wants to make a smaller version of this cookie to feed all 800 students in their school. They decide that each pound of dough will feed 4 students. How many pounds of chocolate chips will they need? (recipe included on blackline master)

Related Task – An Apple a Day

Have you ever heard someone say, “An apple a day keeps the doctor away”? At a local grocery store, you can buy a bag of 8 apples for \$5.00. If everyone in your family ate one apple every day, how much money would your family spend in one year on apples?

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Lesson Plan



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Materials

- Extra paper for students to sketch out ideas
- Manipulatives, such as cubes or chips
- Chart paper, for recording ideas for class discussion.

Facilitating Task

- As students work, circulate around the class, listening for places students may be stuck, and for strategies you may want to be shared with the class.
- Whole class discussion: Select a few students to share their approaches to discuss the math ideas in this task.

Misconceptions

- Students may have difficulty coordinating quantities and keeping track of what each number represents in the context of the problem (kilowatt hours, panels)
- Students may have difficulty working with the large number of kilowatt hours required for New York.

Suggested Prompts or Questions

Supporting thinking:

- What have you done so far? What will you need to figure out next?
- How will you know if your answer makes sense?
- What does that number represent in the story?
- How will you keep track of which number is the solar panels and which number is kilowatt hours?

Extending thinking:

- If we looked at the energy used in a different city, how could you use what you've already figured out to solve that problem quickly?
- What do you think about using solar power for large cities? Where could we put all those solar panels?

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Name _____

Date _____

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Answer the question using pictures, words, tables, graphs, and/or symbols.