

Subject
Science
Mathematics

Renewable energy 3: Keeping track of the power

Grade 5- 6

Summary

Students will plan a trip from Martinique to Barbados, keeping track of the amount of energy being used.

Overall Expectations.

Students will apply their understanding of equipment that uses power.

Specific Expectations Number sense and Numeration

Select and perform computation techniques appropriate to specific problems involving whole numbers and decimals and determine whether the results are reasonable.

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BACKGROUND

Imagine that a battery is like a bucket of water with a spigot that allows water to flow. If you open (or turn on) the spigot a **little**, just a **trickle of water** flows out. The bucket will take a while before it's empty. Going back to the battery, if you have a piece of electronic equipment that requires just a little bit of power, such as a light, then a little bit of energy comes from the battery to power the light. So, just a **trickle of energy** flows out of the battery.

Imagine that the spigot on the bucket is fully opened. A lot of water flows out and the bucket empties very quickly. Returning to your battery, if you use a piece of electronic equipment that needs a lot of energy, then you'll use a lot of energy in a short period of time. This is one way to think about how power from the batteries is used on Amanzi.

We keep track of the daily use of energy that we generate, by recording the amount of energy stored in our **battery bank**, using our **battery meter**. (Remember, in Lesson 1, we mentioned that our battery bank is made up of 4 6-volt batteries). We use Math and Science to keep track of our energy consumption.

Here is a picture of our electrical battery meter, called the Link 10. It's connected to our battery bank. In the picture, the voltage meter reads 11.95 volts. To be fully charged, the meter reading will be 12.85 volts. That means we have 480.00 amp hours in the battery bank. When the reading drops **below** 11.00 volts, we have to charge our batteries. If the wind generator is putting in electrical current, the number on the meter will increase automatically, as the wind blows. It's nice to watch that happen.

It is best for the life of the batteries to keep topping them up rather than draining them completely. You can think of what's good for the batteries like this – if you're active in sports all day- what's the best way to *re-hydrate* yourself? Is it better to drink a lot of water at the end of



Amanzi's Voltmeter / Amppmeter. It tells us the charge on our battery bank & how much power we're using or charging at any given time

the day when you are VERY thirsty or is it best to take sips throughout the day? Which choice will make you feel better?

Challenge

Amanzi is planning an overnight sailing trip to Barbados from Martinique. As a member of the crew, you are asked to help determine what electronic equipment can be used while sailing.

Activity

The trip from the island of Martinique to Barbados is approximately 120 nautical miles (nm). Amanzi travels at 6 nm/hour. Our engine has been giving us problems, so we will not use it on this trip. We have a perfect weather window, so the sailing will be easy. It will take 20 hours to sail to Barbados. Our battery bank is full with 480.00 amp hours. We don't want the battery bank to drop below 150 amp hours. Referring to the information you used in the chart in Lesson 2, answer the following questions.

- a) To give us a break from steering all the time, we want to use the self-steering autopilot, Refer to the chart in lesson 2 to determine how many amps/hour the autopilot uses. Calculate how long Amanzi can use the self-steering autopilot on this trip?
- b) Keeping in mind the trip's duration, navigational lights will be needed. We will likely sail a minimum of 8 hours using these lights for safety (so other boats can see us). Referring to the chart in lesson 2, how much power will the navigation lights use during the entire trip?
- c) How many hours can the self-steering autopilot be used together with the navigation lights during this trip? Refer to the chart in lesson 2 and your answers in a) and b). Is there any other electrical equipment using power at the same time as the self-steering autopilot and nav lights?

Thanks for keeping Amanzi safe and getting us to the next destination, crew.