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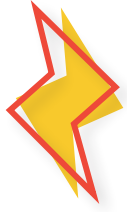
ENERGY STORAGE



ENERGY
EDUCATION

TOOL KIT

BY INSIDE EDUCATION



ENERGY STORAGE

GUIDING QUESTIONS

- How can energy be transformed from one form to another?
- Why would we want to store energy?
- What are some examples of energy storage?

The demand for electricity changes daily and seasonally. Electricity demand tends to be highest in the evening time (*when most people are at home*) and during the coldest and hottest months of the year (*when we need heating and cooling*). One way to avoid overloading the electricity system is to store electricity that we produce when demand is low, and then use it when demand is high.

We can make energy from renewable resources like solar and wind, but what about when the wind isn't blowing or the sun isn't shining? We can store electricity when we have extra so that we can use it when we need it. Batteries are one type of electricity storage that convert electrical energy into chemical energy.



Wind turbines. Source: TransAlta Corp (www.transalta.com).

Alberta is working on using large batteries that can store enough power for entire communities. In October 2020, TransAlta powered up Alberta's first wind-powered battery storage facility, called WindCharger, near Pincher Creek. This means that any extra power generated from nearby wind turbines can be used to charge up the Tesla Megapack batteries. If the wind dies down, or extra power is needed, the batteries can then resupply that stored energy as electricity back to Albertans!

Batteries charge long and slow (*think about how long you need to plug in a game controller before it is fully charged*), but there are other times where we need to save up a lot of energy very quickly! In these cases, we can use a system called a **flywheel** to rapidly store energy as mechanical energy!

TEST OUT THE ZECAR

The ZeCar works by storing energy in its flywheel, then transferring it to the wheels when it's placed on the ground. Give the car a push to get the flywheel spinning... hold it and see - then let it go! (You can even try setting it in motion directly on the flywheel!)

- Do you feel "resistance" to your efforts to set the flywheel in motion? If so, why?
- What becomes of the work done by you while setting the flywheel in motion?
- How far can the Zecar go on a level surface? Does the range of the car depend on the surface?
- Is the speed of the car the same from the time of release until it comes to rest? Why or why not?



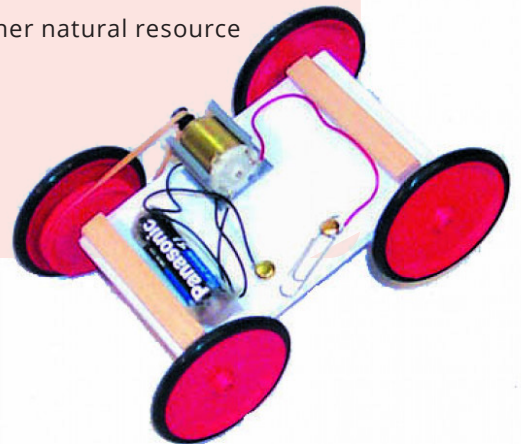
In this activity you'll get to explore a tiny flywheel on the ZeCar, the City of Edmonton is working with much larger ones to speed the charging of its fleet of electric buses.



TEST OUT THE ELECTRIC CAR

The electric car works by converting the electrical energy stored in the battery directly into mechanical energy through the small motor.

- What is the limit of this car's ability to go over small obstacles or inclines?
- What are some advantages of this car compared to the ZeCar? What are some of the disadvantages?
- Is the speed of the car the same from the time of release until you stop it? Why or why not?
- What happens when the battery is depleted? What is another natural resource that you can use to power this car?
- **Extension:** Try connecting your small solar panel (from Topic 1: Natural Resources for Energy) to see if you can power your car with solar energy!



MATERIALS FROM KIT:

- Zecar
- Electric Car

MATERIALS FROM CLASSROOM

- Measuring tape
- Different surfaces for the cars
- Stop watch



CONSIDER ...

Think about how the WindCharger uses extra wind power to charge large storage batteries. What other natural resources could benefit from energy storage?

CONNECT ...

Any time we can save energy by storing it as another form, we are conserving natural resources and reducing our greenhouse gas emissions. The City of Edmonton has added many electric buses to their transit fleet. Have you ever seen an electric car or bus in your community?

LEARN MORE ...

There are other ways to store energy, including batteries, flywheels, supercapacitors, and pumped hydro-power. Learn about pumped hydro by checking out the Canyon Creek Project near Hinton

> <https://turningpointgeneration.ca/the-canyon-creek-project>

We will also see energy storage come to our homes. Learn about home-based battery storage as one way to save extra solar energy produced during the day to use at night.

> www.tesla.com/powerwall