

TEACHERS TRAIL GUIDES

Trail Guide Renewable City: 9.1 Energy Transformations

Visit the **Energy City Gallery**

Renewable City

What forms of sustainable energy does the city use?

Which form of sustainable energy is most frequently used in the city?

Why are fossil fuels not considered sustainable?

Can the city survive on sustainable energy alone?

Teacher notes:

A sustainable environment should be able to continue without intervention. Would the Smart City be sustainable? If not, what forms of materials and energy would be needed to keep it going? Do you think the output (manufacture of food, water, and air) would produce more energy than the energy required to keep the city running? Note the Law of Conservation of Energy: Energy in a system may take on various forms (e.g. kinetic, potential, heat, light). The law of conservation of energy states that energy may neither be created nor destroyed. Therefore the sum of all the energies in the system is a constant.

Trail Guide Resources Required: 9.1 Energy Transformations

Visit the **Energy City Gallery**

Resources Required

Look at some of the products on display in the house.

Which products have the most energy transformations involved in their production?

Which products have the fewest energy transformations involved in their production?

How do these processes affect the planet?

Teachers Notes

Students may be surprised at the number of energy transformations involved in some of the products, such as the t-shirt and soda can. They should notice that the apple grown in Connecticut has significantly fewer energy transformations than the one grown in Washington State. The more energy transformations are involved the less efficient the process is, and the more risk there is for pollution.

Trail Guide A Year's Worth Of Weather: 9.1 Energy Transformations

Visit the **Exploring Space Gallery**

A Year's Worth of Weather

Look specifically at the footage of Hurricane Katrina and the Twin Typhoons in the Pacific Ocean

Do you see evidence of wind in the weather events in this display?
Where and how do you know there is wind?

List the energy transformations as a hurricane or tropical storm develops, paying particular attention to the Category Level of the storm. The "Category" of a storm increases as the storm gets stronger.

What happens after the storm comes to land?

Where do you think the energy in the storm goes?

Teacher notes:

Wind is evidenced in many ways, including the swirls of clouds and movement/ progression/growth of storms. Students might also indicate evidence from temperature bands in oceans

Trail Guide Goldberg's Machines: 9.1 Energy Transformations

Visit the **Invention Dimension Gallery**

Goldberg's Machines

List the energy conversions in each of the three Goldberg Machines.

Where does the energy come from that starts the machine?

Which machine shows the most energy conversions?

What could you add to one machine for it to have more energy conversions?

Teacher Notes:

All machines utilize the transformation of energy to do work. Forms of energy to look for include:

Potential Energy Forms	Kinetic Energy Forms
<i>Chemical Energy</i>	<i>Electrical Energy</i>
<i>Stored Mechanical Energy</i>	<i>Radiant Energy (light and solar)</i>
<i>Nuclear Energy</i>	<i>Thermal Energy</i>
<i>Gravitational Energy</i>	<i>Motion Energy</i>
	<i>Sound Energy</i>

Trail Guide Circuit Hacks: 9.1 Energy Transformations

Visit the **Invention Dimension Gallery**

Circuit Hack

List the energy conversions in each of the circuit stations.

Where does the energy come from that starts the circuits?

Which circuit shows the most energy conversions?

What could you add to one circuit for it to have more energy conversions?

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