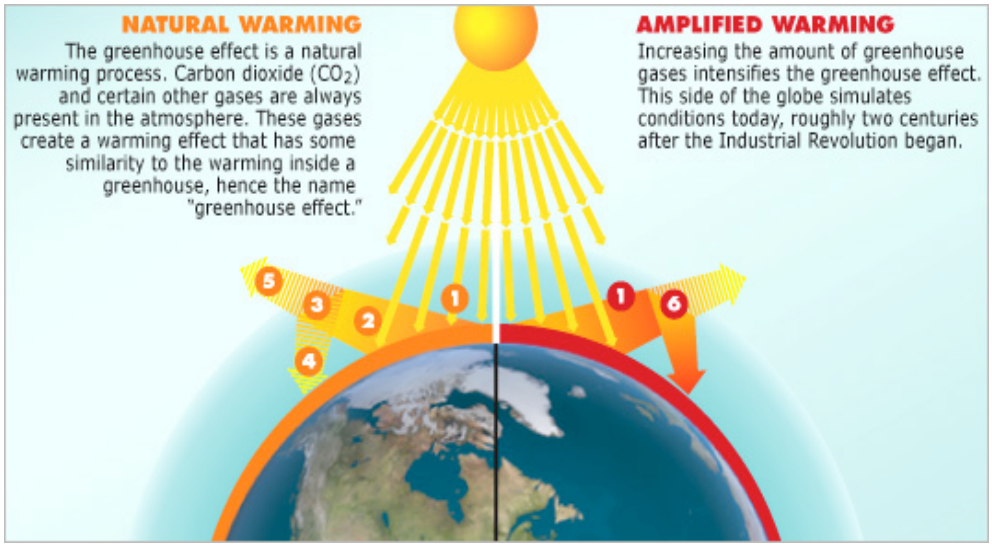
GREENHOUSE EFFECT DEMONSTRATION

This demonstration is meant to show the effect of a higher concentration of greenhouses gases in the atmosphere with the consequent rise in the temperature and relative faster melting of glaciers. The greenhouse effect is a natural occurrence that maintains Earth's average temperature at approximately 60 degrees Fahrenheit. Under normal conditions some of the sun's heat is radiated back into space. The 'Greenhouse Effect' occurs when heat is trapped in the atmosphere by gases. The greenhouse effect is a necessary phenomenon that keeps all Earth's heat from escaping to the outer atmosphere. Temperatures on Earth would be much lower than they are now, and the existence of life on this planet would not be possible. The global average temperature would drop precipitously 33 degrees from its current 15° to -18°C. The Earth would become an ice planet. However, too many greenhouse gases in Earth's atmosphere could increase the greenhouse effect. This could result in an increase in mean global temperatures as well as changes in precipitation patterns. Carbon dioxide and water vapor are the most important gases in creating the insulating or "greenhouse effect" of the atmosphere.



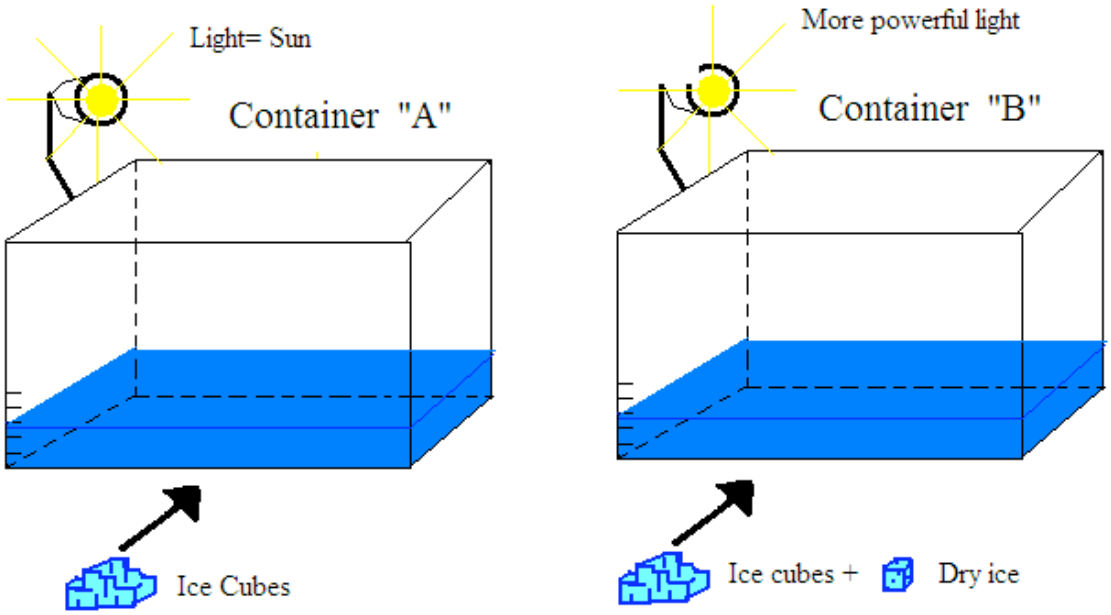
Glaciers along the southeastern coast of Greenland are thinning by more than 3 feet a year, possibly because of global warming, according to a new study by NASA scientists. Sea level has already risen due to warming and is projected to rise much more. Many people are under the mistaken impression that only if the polar ice caps melt will sea level rise. In fact, average sea level around the world has already risen 4 to 8 inches in the past 100 years due to global warming and is expected to rise another 4 to 35 inches (with a best guess of around 19 inches) by 2100. The primary reason for this rise is that water expands as it warms. The second reason is that **glaciers** all over the world are melting, and when land-based ice melts, the water runs to the sea and increases its level. Thousands of small islands are threatened by the projected sea-level rise for the 21st century, as are low-lying coastal areas such as southern Florida. Of course, if there is any significant melting of the polar ice sheets, the additional rise in sea level would be enormous (measured in feet not inches). This is projected to occur on a time scale of millennia rather than centuries.

Description of the Project

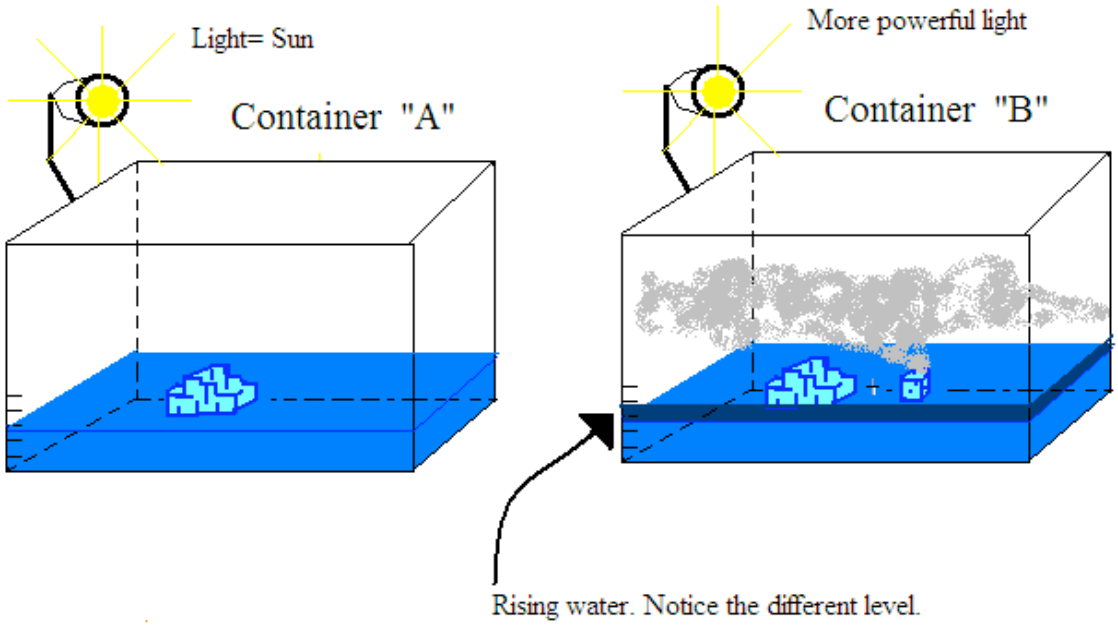
Two transparent plastic containers, A & B, graduated on a side, which represent the Earth's atmosphere. Both containers are filled at the same level with some water. Two lamps, representing the Sun will be attached to the containers (one of the two bulbs should to be more powerful of the other, so that it will warm up faster the water). I will need some ice's cubes that will be introduced in container A & B. In addition to ice cubes in container B also a piece of dry ice (frozen carbon dioxide) will be introduced, so that it will sublimate turning directly in carbon dioxide gas resulting in the formation of fog. Since the ice should be melting faster in container B than in container A, after two or three minutes it should be possible to observe a higher level of water in container B. The two containers will be compared showing what happens in the one, which represent a

“normal” atmosphere, and the one which represent an atmosphere with a higher concentration of greenhouses gases.

BEFORE



AFTER



Audience, Standards and Museum

This demonstration can interest grades from K to 12. It covers “Unifying Concepts and Processes” (grades K to 12): "Models are tentative schemes or structures that correspond to real objects, events, or classes of events and that have explanatory power. Explain interaction of energy with matter including changes of state and conservation of mass and energy. Describe and explain the properties of solids, liquids and gases. Analyze reactions in natural and man-made energy systems. "It covers “Physical Science, Transfer of Energy” (grades 5 to 8): "Heat moves in predictable ways flowing from warmer objects to cooler ones, until both reach the same temperature." It covers **“**Earth, Environmental and Space Science, Grades 9 to 12: "Analyze the processes involved in naturally occurring short-term and long-term Earth events (e.g., floods, ice

ages, temperatures, sea-levels fluctuation. Heating of earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents. Provoke awareness of global warming and its effects (positive and negative) on Earth."

This demonstration could work for both museums, on the floor for MSI, or as an increment of one of the demonstration session already existing at Scitech.

A museum in Washington DC, Marian Koshland 'Science Museum of the National Academy of Sciences' hosts a very nice permanent exhibit on Global Warming and Greenhouse effects where the visitor can experience, feel difference between natural and amplified warming. http://www.koshland-science-museum.org/index.jsp

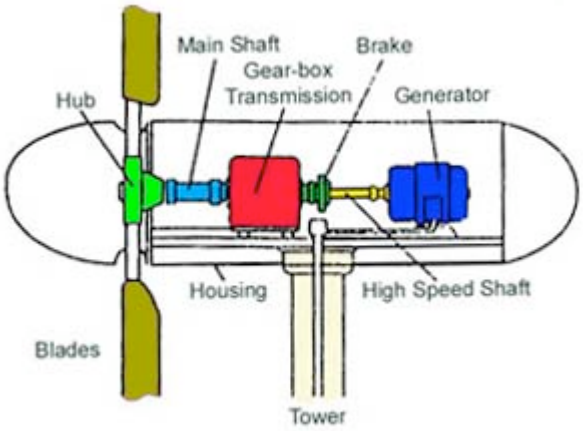
WIND POWER HANDS ON EXHIBIT

This hands-on exhibit is meant to show children how wind power, a renewable natural resource (*wind will blow as long as the sun shines*), is a valuable source of electricity. They would observe how wind can be used to do work. The kinetic energy of the wind can be changed into other forms of energy, either mechanical energy or electrical energy, in this particular case it will be showed the production of electrical energy.

What is wind: Wind is simple air in motion. It is caused by the uneven heating of the earth's surface by the sun. Since the earth's surface is made of very different types of land and water, it absorbs the sun's heat at different rates. During the day, the air above the land heats up more quickly than the air over water. The warm air over the land expands and rises, and the heavier, cooler air rushes in to take its place, creating winds.

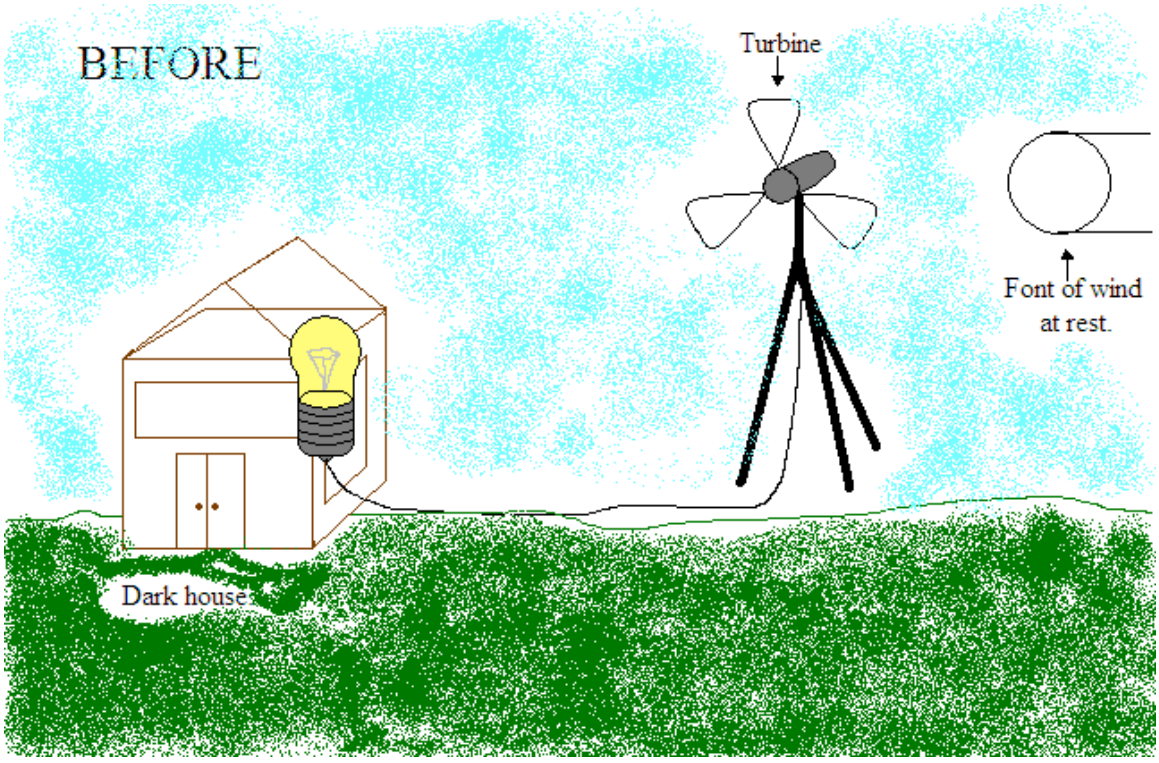
How a windmill/turbine works: Like old fashioned windmills, today's wind machines use blades to collect the wind's kinetic energy. Windmills work because they slow down the speed of the wind. The wind flows over the airfoil shaped blades causing lift, like the effect on airplane wings, causing them to turn. The blades are connected to a drive shaft that turns an electric generator to produce electricity. If the wind gets too high, the turbine has a brake that will keep the blades from turning too fast and being damaged. In order for a wind turbine to work efficiently, wind speeds usually must be above 12 to 14 miles per hour. Wind has to be this speed to turn the turbines fast enough to generate electricity. The turbines usually produce about 50 to 300 kilowatts of electricity each. A kilowatt is 1,000 watts (kilo means 1,000). It is possible to light ten 100 watt light bulbs with 1,000 watts. So, a 300 kilowatt (300,000 watts) wind turbine could light up 3,000 light bulbs that use 100 watts. Once electricity is made by the turbine, the electricity from the entire wind farm is collected together and sent through a transformer. There the voltage is increase to send it long distances over high power lines.

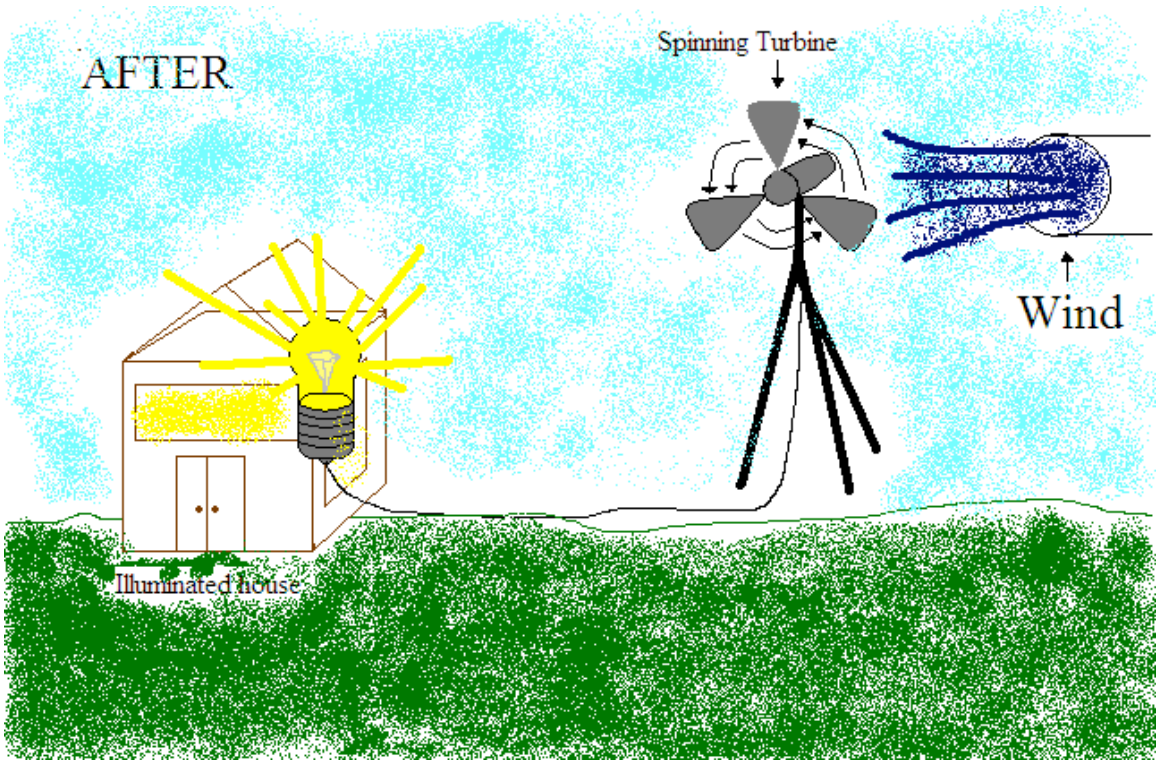
Photo credit:
Bergey Windpower Company



Description of the Project

A windmill (turbine) is connected to a house containing a light bulb. A fun or hairdryer which will be the font of wind which directed on the windmill will cause it to spin and light the bulb in the house.





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Conservation of Energy" (grades 5 to 8): "identify and compare sources of energy. Use Kinetic theory, wave theory, quantum theory and the laws of thermodynamics to explain energy transformations."

This exhibit could serve Scitech implementing the set of their existing environmental exhibits, but it could fit also MSI.

ENVIRONMENTAL DEMONSTRATION AT SCITECH

I am also working at Scitech under the supervision of Diane Gallentine, the director of education, on a project which is meant to create a set of activities for a demonstration program tied to the environmental exhibits already present at the Museum.

Alessandra Conversi