Name: _____

Sources of Energy

SPH4C

Updating our power generators to meet future needs and to incorporate new renewable energy sources is an ongoing project. Go to:

http://ngm.nationalgeographic.com/2010/07/power-grid/grid-interactive

(yes, the map highlights projects in the U.S., but our utility systems are connected; you will note dots for Canadian projects are shown as well).

What areas on the map are shaded in red ("congested areas" in need of power relief)?

_____

_____

The yellow dots show planned wind power projects. In which areas are these found?

_____

Wind is one of our oldest sources of energy. Wind turbines (or windmills) were used to turn grain-grinding millstones and to pump water from wells long before they were ever used to turn electric generators.

Most horizontal-axis wind turbines in North America (such as those shown in the photo at right) generate approximately 1.5 MW (megawatts).

What areas on the map are shaded in blue or brown (suitable for large-scale wind projects)?

_____

Read the description to the right of the map to complete the following blanks:

_____ has more wind-generation capacity than the grid can handle. Proposed new transmission lines could help Texas deliver its wind energy to _____.

_____

To the right of the map, click on the red button to show the red dots, showing planned solar power projects. In which areas are these found?

_____

Electricity can be generated from solar energy by photovoltaic solar panels made of semi-conducting materials (which are the type seen on the rooftops of residential homes or commercial businesses). The largest photovoltaic plant in the world, with a capacity of 80 MW, is actually located in Sarnia, Ontario.

Also, reflective surfaces (called heliostats) can concentrate solar energy to a small enough area, as shown in the image at right, to produce heat to power a conventional steam turbine.

What areas on the map are shaded in light brown or darker brown (suitable for large-scale solar projects)?

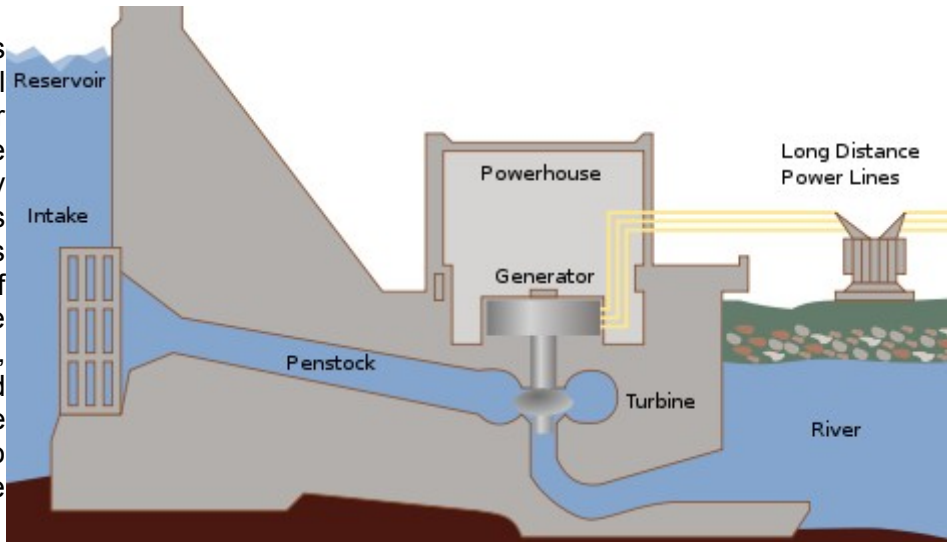
_____

The _____ is a solar-power hotbed. To supplement fossil fuel plants, long-distance transmission lines stretch from the _____ Desert, which has plenty of sun.

To the right of the map, click on the blue button to show the blue dots, showing planned hydro power projects. In which areas are these found?

_____

Hydroelectric power plants convert the gravitational potential energy of the water into electrical energy; the process does not emit any pollutants but large dams (such as the Three Gorges Dam in China, capable of generating 18.2 GW) can be environmentally destructive, producing flooding and sedimentation above the dam. Most new hydro projects are smaller scale and low-impact.

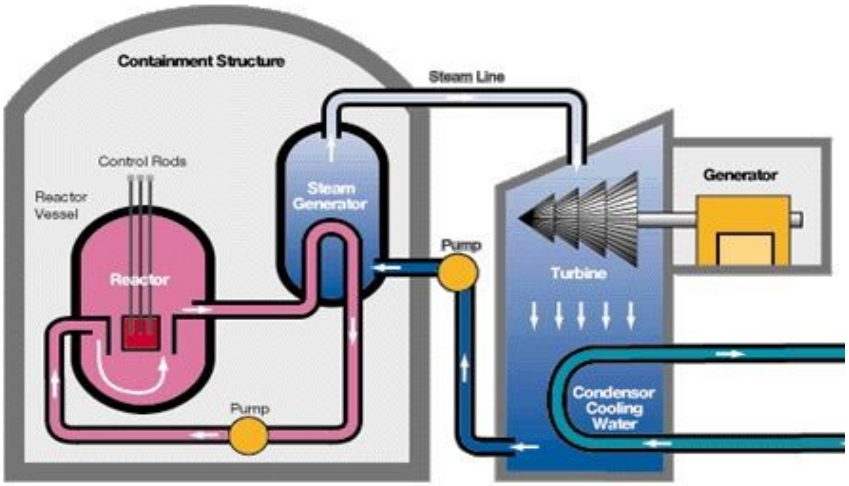


Turbines _____ along the _____-_____ and its tributaries have been proposed as a way to generate hydroelectricity without _____.

To the right of the map, click on the purple button to show the purple dots, showing planned nuclear power projects. In which areas are these found?

_____

Nuclear power plants are not that different from coal plants in that in both, the fuel is used to heat water to produce steam to turn a turbine. The large towers associated with nuclear power plants are just cooling towers: the clouds coming out the top are just that: clouds of steam.



To the right of the map, click on the black button to show the black dots, showing planned non-renewable power projects. In which areas are these found?

_____

Our electricity today is far from clean. Most of it comes from burning _____, about

half of that from _____.

_____, _____, and _____ are other nonrenewable

sources.

Why would North America be planning more of these plants if the resources will run out eventually (and they emit pollutants: not only greenhouse gases but also contaminants such as mercury)?

_____

What types of energy sources are represented by the green "Other"? Define each of these. *(You may need to look these up.)*

_____

_____

If you click on the brown lines to the right, the map will show you proposed transmission lines. Where are most of the lines coming from?

_____

Where are most of the lines going to?

_____

Some of the proposed transmission lines are DC (direct current). Given that traditional generators produce AC, why would we be planning DC lines? *(Hint: look at the areas the DC lines are coming from. What kind of power source may be found there?)*

_____