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Building a Smart National U.S. Power Grid

One of President Obama's pre-election promises was to reduce our dependence on foreign oil by increasing our use of renewable energy to generate electricity. His goal is to increase wind, solar, and geothermal energy production from its current 1% level to 10% by the end of his first term in office.

Technologically speaking, there's no reason why renewable energy sources can't supply a significant percentage of the electricity we use. However, to fully embrace renewable energy our electric grid will need to go through a major metamorphosis.

The United States currently doesn't have a national electric power grid. We actually have three primary grids that serve specific areas of the country. The map below has been drawn to show just how physically separate these regions are. Today it is almost physically impossible to transfer electrical energy from one grid interconnect to another.

To allow for coast-to-coast electric power sharing, our electric grid

The new economic stimulus bill provides money "to build out our bulk transmission lines to get stranded renewable energy on line." (Here, the bill is referring to solar and wind renewable resources that will, for the most part, be generated in the West and the Great Plains—specific areas of the country that lack interconnectivity with the rest of the nation). "With this recognition the bill includes \$4.5 billion for smart-grid-related activities, including work to modernize the electric grid, enhance security and reliability, perform energy storage research. . . . A smart-grid will help create greater energy efficiency, reliability, and security." (Senate Stimulus Bill, page 10)

To understand why our electric grid needs a makeover, you first need to understand the delicate balance between electricity generation, electricity transmission, and electricity usage. The electricity that is generated and the electricity that is consumed are constantly kept in balance. If the balance collapses, a brownout or a blackout will occur. As we increase our dependence on renewable energy sources, we create some very significant problems that Congress and the president hope this funding will address.

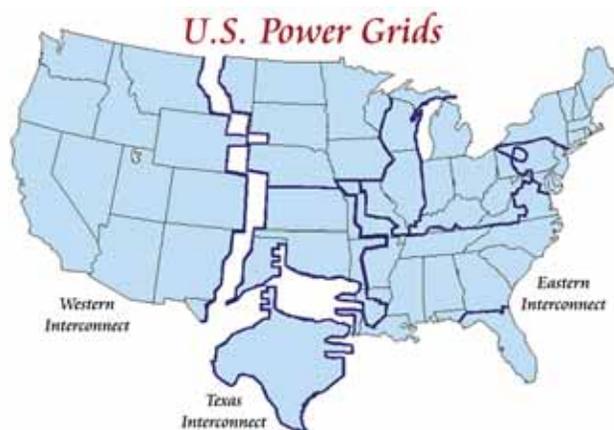
The problem with wind, solar, and wave-generated energy is their inter-

mittent nature. When the energy that they produce suddenly—expectedly or unexpectedly—drops off, another energy source must be ready to pick up the slack to keep energy demand and energy production in balance. A fully integrated national grid will help manage this problem since it will be able to constantly transfer energy from where it is abundant to where it is needed.



A robust national grid will only be part of the solution because high-demand periods will become harder to balance out as our use of renewable energy sources increases. When the wind stops blowing at the same time that the sun isn't shining, the energy output will still need to match the electricity that people are consuming.

To go renewable in a major way, we also need to create a smart grid that can lower demand. You will want to lower demand whenever demand can't be met before an energy imbalance causes a brownout or blackout. A smart electric grid will include two-way electric meters and special appliance switches that will allow people to save money by using high-demand appliances during low-demand times. To further decrease demand, people will be able to elect to receive even lower special electric rates in exchange for allowing high-demand appliances to be automatically switched down or off when electricity demand exceeds electric-



needs to change from a regional system into a robust, smart national system. This enhanced system must be capable of transmitting electricity from the location where it is generated to the location where it is needed.

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ity production. These smart meters could run backwards if your home, office building, or factory includes a system that generates electricity and is capable of sending this added power into the electric grid.

With all of these enhancements, you will still need to find a way to store electricity if you don't want our electric grid to become unreliable. A storage solution will allow us to store electricity when production exceeds demand and pump it back into the system when it is needed. Did you notice when you read the quotes from the new bill that Congress supplied money to address both of these issues?

Our current battery technology isn't up to the challenge of storing the volume of electricity that we need to pump back into the grid when demand exceeds production. The stimulus bill is supplying billions of dollars to fund battery research to create batteries that can supply massive electric storage for the grid and develop other batteries for future electric vehicles.

The current method to keep supply and demand in balance is to quickly bring on line fossil fuel plants when more electric energy is needed. The goal is to eventually decrease our need for plants that add to global pollution and warming.

When plug-in electric vehicles become a reality, the question becomes will they be a part of the problem or a part of the solution? If they are all plugged in for recharging during high-peak periods of use, they will be part of the problem. If they can be charged during low-demand periods and used as battery backup power for the grid, they could become a part of the solution. Imagine owning a car that earns you money by supplying energy to the electric grid while it is parked when you're at home or at work.

Recalling the Facts

1. What are the advantages and disadvantages of renewable sources of energy?
2. How could a smart grid decrease electricity demand? ☺

More than Fun Answers

Crypto List

TAP WRENCH
INTERNAL THREAD
CHAMFER
NATIONAL COARSE
ROOT DIAMETER
DIE STOCK
CUTTING THREAD
NATIONAL FINE

Scramble Word Challenge

ANGLE ENGINE
FLUID ANALOG

When unscrambled, the letters in the squares should read:

FUNGI and ALGAE

Though barred from attending college simply because she was a woman, Beatrix Potter nonetheless distinguished herself in the scientific community with her botanical studies of fungi and algae, including the discovery that lichens are a symbiosis between those two types of plant life.

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