

Building a SEED Park: Part II -- Energy

In Part I of this series a SEED Park, a Sustainable Environmental and Economic Development Park, was defined and building it was compared to building a shopping mall. The SEED Park will be centered around some major agricultural- or natural-resource-based industry. A SEED Park will require energy, but could also be a producer of energy. To understand the role of energy in a SEED Park, let's examine the sources of energy.

With the exception of nuclear, geothermal and tidal energy, all energy on earth is derived from the sun. We see energy from the sun as light and feel the warmth. Through photosynthesis, plants have been capturing solar energy and converting it to sugar since the earliest days of the earth. The plant cells have used the energy in the sugar to drive the cellular machinery to produce all other organic materials. Over geologic time, the deposition of plant material, primarily marine algae, produced coal, oil and gas. Today we extract these non-renewable fuels to provide the bulk of the energy upon which society depends.

"new clean energy technologies present the same kind of transformative opportunity in the 21st century as the digital revolution provided in the second half of the 20th..."

Sen. Ken Salazar and Timothy Wirth, Jan. 2006

We recognize wind, solar and biomass as renewable forms of energy, but all of these are forms of energy from the sun. Wind results from sunlight heating the oceans and the atmosphere. Hot air expands and rises; cold air contracts and falls. Movement of the air through this heating, cooling, expansion and contraction produces the wind. When turbines are used to capture the energy from the wind and to produce electricity, the turbines are actually capturing energy from the sun stored as heat in the oceans and the atmosphere.

Today, solar energy can be captured by photovoltaic cells and converted to electricity. This form of renewable energy is available only during the daylight hours. Solar energy is more readily available at high altitudes where the atmosphere is thinner, sunlight is stronger, and cloud cover is minimal. The San Luis Valley is an excellent location for capturing solar energy through photovoltaic cells.

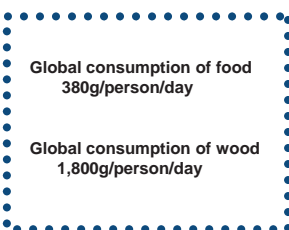
Biomass is the source of the third form of renewable energy. Plants capture and convert solar energy to organic materials including wood, straw, and other biomass products. Wood is used worldwide as a major source of energy for heating homes and for cooking. At the industrial level, wood, in the form of forestry residues, is used as a fuel to produce steam from water; the steam is then used to turn turbines for production of electricity. Agricultural residues including corn stalks, wheat straw and animal

Wood Chips – for heat –

\$31,000 worth of wood chips replaced heat provided by \$400,000 in electrical costs

**Annual Operation Savings of:
\$400,000 - \$31,000 = \$369,000**

Mount Wachusett Community College, MA



manure are used as forms of renewable energy. The offal and by-products from slaughter houses and animal processing plants include oils and fats, both of which are very high in energy. These have been combusted directly to extract energy, but today they are also being converted into biodiesel as fuel for transportation. Biodiesel is now being produced in many locations and could be one product of the SEED Park.

Nuclear energy is being used to propel submarines, power some satellites, and to produce electricity. Following the accidents at Three-Mile Island and at Chernobyl, the world is acutely aware of the risks posed by nuclear energy were an accident to occur. Of current national and international news is the global threat of terrorists to obtain weapon-grade plutonium. France is one country that has successfully embraced nuclear power to produce a major portion of its electrical energy. Other countries, including the US, are awaiting development of a new generation of safer, low risk nuclear power plants before developing nuclear energy as a major supplier of electricity.

Geothermal energy is readily available from geothermal wells in the San Luis Valley. This energy is being used to heat greenhouses and to provide the warm water necessary for tilapia and alligators. Geothermal energy can be tapped to provide household heating and, where temperatures are sufficiently high, to drive stream turbines to produce electricity. Geothermal energy could be a component of a SEED Park in the San Luis Valley.

Tidal energy is a renewable form of energy waiting to be tapped. The gravitational system of the sun, the moon and the earth produces the tides. Prototypes systems have been designed to capture the energy from the tides to produce electricity. The harsh environment of the ocean, and high capital costs, have limited interest in commercialization of tidal energy. Being miles from the coast, tidal energy will be unavailable within the San Luis Valley.

People power, manual labor and animal power are indirect forms of sun power. All people and animals require food as fuel, and their energy is derived from the food. Food is basically plants, or plants fed to animals to produce meat. The energy in food is ultimately derived from the sun and is a form of renewable energy. Manpower, people power, will be a key component of a SEED Park producing jobs in the San Luis Valley.



Fossil fuels are available in a limited supply and prices increase as supply declines. Ethanol is one form of renewable energy. Energy crops such as switch grass, or corn for the conversion into ethanol require considerable tracts of land and other resources to produce a significant amount of energy. These other resources include machinery, fuel, water, transportation, processing facilities, labor, and cooperative weather. Will crops be grown for food or for energy? Cattle feeders, swine producers, and poultry producers have seen the price of animal feeds increase as corn has been directed into the ethanol market. There is, however, another source of biomass that is growing annually in quantity and does not compete with the production of food.

The Mid-West has been described as the bread-basket of the world. Using today's technology and practices, every product (including wheat, corn, beef, dairy, and ethanol) requires both water and energy at unsustainable levels.

The quantities of municipal solid waste (MSW) and the sludge produced from the treatment of wastewater is growing annually. As the world population increases and becomes even more urbanized, MSW increases. MSW and other biomass must be recycled to capture energy and produce organic products. Also, opportunities to capture solar energy

will be required to move the world from fossil fuels to sustainable renewable energy. The San Luis Valley SEED Park can be a shining example demonstrating these processes.