Extra Information Handout

Nuclear power

As of 2004, nuclear power provided 6.5% of the world's energy and 15.7% of the world's electricity, with the U.S., France, and Japan together accounting for 57% of nuclear generated electricity.[1] As of 2007, the IAEA reported there are 439 nuclear power reactors in operation in the world,[2] operating in 31 countries.[3]

The United States produces the most nuclear energy, with nuclear power providing 20% of the electricity it consumes, while France produces the highest percentage of its electrical energy from nuclear reactors—80% as of 2006.[4][5] In the European Union as a whole, nuclear energy provides 30% of the electricity.[6] Nuclear energy policy differs between European Union countries, and some, such as Austria and Ireland, have no active nuclear power stations. In comparison, France has a large number of these plants, with 16 multi-unit stations in current use.

International research is continuing into safety improvements such as passively safe plants,[8] the use of nuclear fusion, and additional uses of process heat such as the hydrogen production (in support of a hydrogen economy), for desalinating sea water, and for use in district heating systems.

Radiant-Floor Heating for Energy Savings

Radiant-floor heating has been around since the days of Ancient Rome where fires were built beneath the floors of villas. Early Korean homes routed flue gases beneath the flooring before venting them out through chimneys. Nowadays, most radiant-floor heating follows the Frank Lloyd Wright method of routing hot water through pipes in the flooring to add heat during the cold months of winter, although some homes use electricity to heat the floors as well in an effort to their homes.

Proponents of radiant-floor heating systems point out that there is a potential for lower electric bills that stem from lower thermostat settings. They point out that a home with radiant-floor heating set at 68 degrees feels like the thermostat is set at 72 degrees.

Another potential for savings comes from the ability to combine solar heating with radiant-floor heating.

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Taking The Heat Off Inefficient Engines

by Kate Melville

An incredible 60 percent of the energy that goes into an automotive combustion cycle is lost, primarily to waste heat through the exhaust and radiator system. It's no surprise then that physicists are looking at how to harness this wasted thermal energy and convert it into electricity via thermoelectric devices.

Speaking at the NanoTX '07 conference, Clemson University physicist Terry Tritt told attendees that even at the current efficiencies of thermoelectric devices (7 to 8 percent), more than 1.5 billion gallons of diesel could be saved each year in the U.S. if thermoelectric generators were used on the exhausts of heavy trucks.

"Thermoelectric generators are currently used in NASA's deep-space probes to convert the heat of radioactive elements to electrical energy, powering these systems for over 30 years," Tritt said. "Thermoelectric energy conversion is a solid-state technology that is environmentally friendly. One of the more promising 'down-to-earth' applications lies in waste-heat recovery in cars."

Tritt said that researchers at Clemson were focusing on developing higher-efficiency thermoelectric materials that could increase savings significantly. This research on the electrical and thermal properties of new materials could reduce the world's reliance on fossil fuels and has shown promise with two classes of materials: low-dimensional systems for enhanced electrical properties and increased phonon scattering that leads to inherently low thermal conductivity.

Tritt heads up the Department of Energy's Center of Excellence in Thermoelectric Materials Research at Clemson. The center focuses on the next generation of thermoelectric materials for power conversion and refrigeration. Researchers in physics, materials science and chemistry screen promising new classes of materials in order to achieve higher-performance thermoelectric materials. DOE recently renewed the program with more than $1 million a year in research funding for the next three years.