

Energy/Power Systems Generation

Technology findings in this category relate to alternative means of power creation or distribution.

Technology Scanning

One of PATH's major research support services is Technology Scanning. *Technology Scanning* tells us about technology developments in other industries, from other nations, from federal laboratories, and from other building sectors. PATH looks for breakthroughs in other industries that could be transferred and applied to housing. *Technology Scanning*-published by the U.S. Department of Housing and Urban Development/PATH and prepared by Newport Partners LLC-is updated as technology developments dictate.

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- Heating, Ventilating, and Air Conditioning
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- Indoor Environmental Quality

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MicroTurbines

Decentralized energy distribution is increasing as an alternative method of power generation. Several companies have introduced commercially-available microturbines, sometimes called mini-turbines. Currently, the smallest systems are about 30 kW in size, about three to six times as much electric energy capacity as is needed for a typical home. But the time may arrive when separate units will be available for an individual home.

Benefits include minimized need for connection to the grid, or elimination of this infrastructure altogether, typically a large cost in rural or isolated regions. The cost to produce electricity with a Microturbine can be half that of electricity purchased from the grid in many areas of the United States.

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The Capstone C30 MicroTurbine system is a compact, ultra-low emission generator providing up to 30 kW of power and 85 kW of heat for combined heat and power applications.



Courtesy: Capstone Turbine

Catalytic Converter Technology

Electric power plants face stringent federal limits on emissions of carbon monoxide (CO), unburned hydrocarbons (HC) and oxides of nitrogen (NOx), especially when they are located in clean air "non-attainment" areas. A new generation of sophisticated catalytic converter systems is now entering the market. At present the only use of catalytic converters in homes is in some wood stoves (where EPA has set emission standards since the early 1990's), although residential furnaces in some geographic areas with poor air quality have had to include technology for reducing NOx. Emission controls could become

Catalytic Converter Technology,
continued

a requirement for various types of fuel burning residential appliances, particularly furnaces, boilers and water heaters, and possibly even fireplaces, as well as for lawn mowers and other equipment driven by small gasoline engines.

A number of conventional (platinum/palladium) catalyst systems are presently on the market. These are designed to cut CO and HC, but are ineffective for NOx. The most advanced catalytic systems are "SCR" ("Selective Catalytic Reduction") systems, specifically designed to cut NOx emissions.

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Evacuated Heat Tube Solar Water Heater

This system by Thermomax uses heat pipes and a small amount of liquid that boils in sunlight (at low pressure). Heat flows up metal assemblies to the top of the tube where the metal pieces are ganged together and the heat is transferred to antifreeze or some other conducting fluid. A residential system sized for 60 gallons per day would cost about \$5,000.

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Nanotechnology Based Solar Cells

Researchers at the University of California, Berkeley have discovered a nanomaterial that will help harness solar energy in a way that promises to be more cost-effective than traditional technologies. The discovery, reported in the journal *Science* in March 2002, involves hybrid nanocomposites, incorporating inorganic nanorods into organic



Courtesy: J.J. Dittmer, Alivisatos Lab / UC Berkeley

A panel of eight plastic solar cells based on inorganic nanorods and semiconducting polymers. The shiny ovals are the aluminum black electrodes of the individual solar cells.

semiconductor films. The elements can be mass-produced without complicated or expensive steps. The report provides details on how to make quantum rods of this material in a reliable size and get them to pack together. The quantum rods can be used as active elements in solar cells. Nanosys, Inc. is developing the technology for commercial applications. Nanosys recently announced a collaborative agreement with Matsushita Electric Works to develop next generation solar cells for the building construction market in Asia.

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Skateboard Chassis for Utility Integration

A skateboard chassis concept could be applied to housing as a way of designing for maximum efficiency in utility installation. General Motors is pioneering such a chassis for future generation automobiles. The chassis contains all of the sedan's propulsion, transmission, steering and braking components within its 11-inch frame and provides a single electrical connection to the body. Standardizing the chassis will increase efficiency of production while enabling designers to tailor model designs to the interests and needs of the consumer. The prototype GM Hy-wire vehicle demonstrates this standardized chassis of the future. The concept of building a chassis upon which multiple designs could be placed may have application in the building industry, particularly in manufactured housing where chassis are built today to carry manufactured housing systems to the site for placement.

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