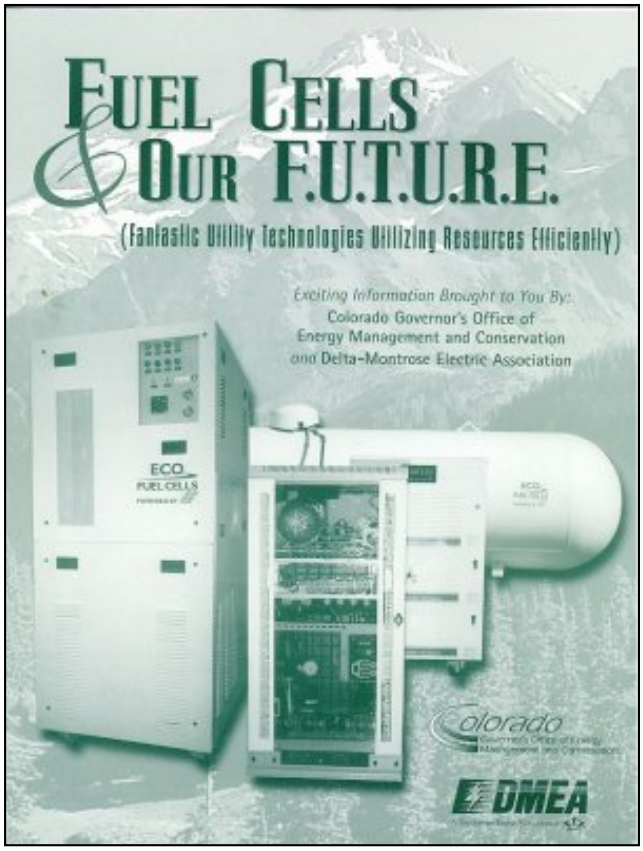
Fuel Cells & Our Future

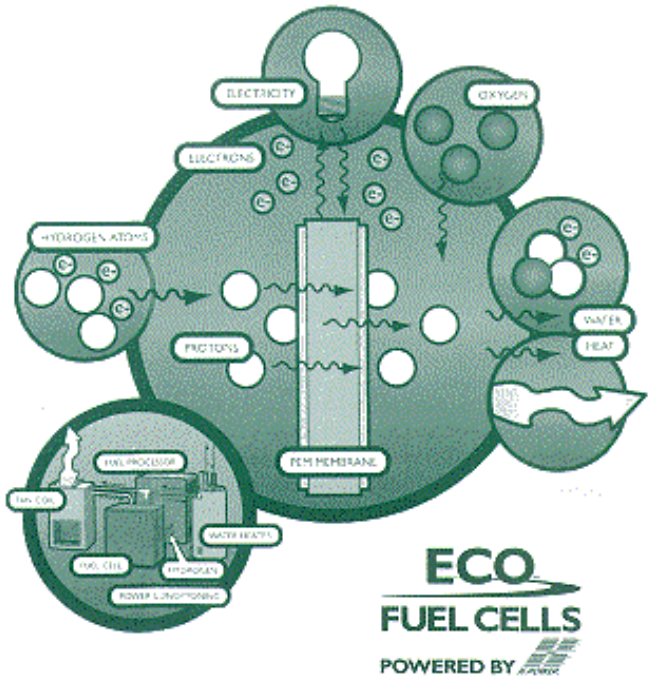
Fantastic Utility Technologies Utilizing Resources Efficiently



FUEL CELLS: An Emerging Technology Offering Clean Power For Our Environment, Economy and Future

According to the U.S. Department of Energy, "Fuel cells have emerged in the last decade as one of the most promising new technologies for meeting the nation's energy needs well into the 21st century."

How Does a Fuel Cell Work?



As described by THE NEXT WAVE, "A fuel cell is a device that directly converts the chemical energy contained in a fuel to electrical power. The cell is supplied with oxygen and a fuel containing hydrogen. The reaction of these two elements produces water and electricity. Using hydrogen fuel, there are no polluting emissions, and the amount of power that can be generated is significant."

Why Aren't We Using Fuel Cells Now?

Fuel cells have been around a long time. In fact, it was 1839 when a Welsh judge, Sir William Grove, first demonstrated the fuel cell principle. However, as Fuel Cell World, a non-profit organization working to commercialize fuel cells (www.fuelcellworld.org), says, "Until recently their use was confined to the laboratory and to exotic applications -- such as space travel -- where they provide electricity, heat, and water, and have done so since the 1960s when they were chosen over riskier, less reliable options. But the technology was immature and far too expensive for terrestrial applications."

Technological Breakthroughs Lead to Emerging Opportunities!

An exciting "space age" technology has landed on earth in Colorado in the service territory of Delta Montrose Electric Association (DMEA), a member-owned electric cooperative. On April 3, 2000, DMEA employees, staff of ECO*, and technicians from H Power corporation (www.hpower.com), made history with the start up of a 10 kW propane-powered fuel cell system at DMEA's headquarters in Montrose. This prototype was the first in the nation outside a laboratory setting to run on propane, a fuel readily available in areas served by rural electric cooperatives.

Ron Fleshood, Energy Services Supervisor, is DMEA's lead person on fuel cell operations, research and monitoring. Ron tracks daily how DMEA's ECO/H Power alpha unit cell responds to varying load profiles and electric demands which are typical of residential electric use.

Data gathered from this monitoring and analysis is being used by H Power, a world leader in fuel cell research and commercial product development, to refine their products. H Power expects to commercially produce residential fuel cells as soon as the summer of 2001 !

**ECO is the acronym for Energy Co-Opportunity, a national cooperative created to assist electric distribution cooperatives diversify into new energy services.*

Environmental Benefits

DMEA cares deeply not only about the world in which we live, but also the one that we shall pass on to our children. Fuel cells offer tremendous hope for a cleaner environment in the future.

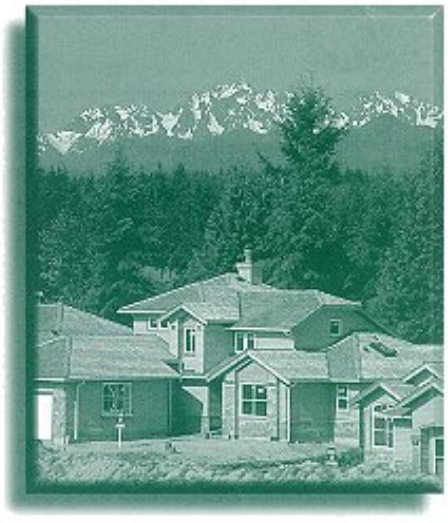
According to the U.S. Department of Energy, "Fuel cells emit almost none of the sulfur and nitrogen compounds released by conventional generating methods." Fuel cells have "dramatically fewer emissions, and their by-products, primarily water and carbon dioxide, are so environmentally friendly that natural gas fuel cell power plants have a blanket exemption from regulations in California's South Coast Air Quality Management District, possibly the strictest in the nation."

As biotech and agricultural technologies mature, new opportunities will arise for even more environmentally friendly fuel cells. We hope to help develop the vision in which the rural agricultural industry economically produces biofuels such as ethanol and methanol to run fuel cells. This would create a "closed-loop" $C0_2$ cycle, while providing significant economic benefits to rural America.

Development of stationary applications for fuel cells also enhances the research, development and economics of fuel cell technology for transportation purposes. Fuel cells also offer hope of replacing the internal combustion engine, responsible for much of the world's pollution and related problems. The economic and environmental potential of fuel cells is truly fantastic.

Fuel Cells and the Home of the Future: Sustainable Development

DMEA sees tremendous opportunities to integrate fuel cells with other advanced energy technologies into highly energy-efficient "Green" homes in the near future. For example, electricity generated by the fuel cell can drive the compressors and fans of GeoExchange home heating and cooling systems, already the most efficient home heating and cooling available.



Because GeoExchange systems TRANSFER renewable energy from the earth, rather than produce heat, efficiencies of up to 400% can be achieved. Electricity from a fuel cell could be leveraged to provide very affordable home heating and cooling ? naturally! Fuel cells also produce hot water as a by-product, which could meet all domestic hot water needs such as laundry, dish washing, and showers.

DMEA regularly sponsors forums, seminars and conferences which provide education and information on fuel

cells, GeoExchange systems, other emerging technologies, and Green Building. For the date of the next "Fantastic Utility Technologies Using Resources Efficiently" (F.U.T.U.R.E) event, contact Tom Polikalas, DMEA Communication. Director, at 970-240-1245 or tpolikalas@dmea.com, or look for "Upcoming Events" at www.dmea.com.

- ## Fuel Cell Will Soon Offer Remote Homeowners Affordable Power

  "There are many areas in rural America to which it is prohibitively expensive to run power lines. Fuel cells offer an economical opportunity to serve these areas with clean, reliable electricity," says Paul Bony, DMEA's manager of marketing and customer service, who also sites on ECO's fuel cell technical advisory committee. "Rural electric cooperatives represent an ideal market for the first wave of residential fuels cells, expected to ve available in the summer of 2001."

- ## Businesses Will Benefit from Fuel Cells

  The nation's demand for electricity is growing while the supply has not kept up, leading to tremendous upward price pressure in many parts of the country. The spot market for electricity is sometimes astronomically expensive. Fuel cells will soon offer businesses reliable, affordable back-up or permanent power.

- ## Fuel Cells: A Major Industry in the 21st Century

  The U.S. Department of Energy says, "Fuel cells are on the verge of revolutionizing the electric power industry by offering a better way to produce electricity and better ways to deliver it to the consumer."

  Analysts at the University of California, Irvine foresee a fuel cell industry with annual revenues exceeding $10 billion by the end of this decade.

The Governor's Office of Energy Management and Conservation (OEMC) is pleased to partner with DMEA to bring information about this emerging and exciting technology to people and businesses wanting clean and quiet electricity for: high quality distributed generation; cost-effective power for buildings and equipment in remote off-grid locations; and co-generation opportunities. OEMC invites you to visit our fuel cell demonstration, tentatively planned to start early next year and be sited in the Denver Fire Station at Washington Park. Please watch for details to be announced in Colorado newspapers.

Colorado
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