Fuel Cells: Environmental Performance

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Abstract

The Department of Energy's (DOE's) National Energy Technology Laboratory (NETL) is developing fuel cells for various applications in partnership with the private sector. These technologies are expected to operate on natural gas and renewable fuels. Fuel cell technologies - solid oxide fuel cells, molten carbonate fuel cells, and polymer electrolyte fuel cells – are being developed for the distributed generation market shortly after 2003. Some of the evolving fuel cell systems are incorporating gas turbines in hybrid configurations. The combination of the gas turbine with the fuel cell promises to lower system costs and increase efficiency to enhance market penetration. Hybrid efforts are underway at Honeywell, Fuel Cell Energy and Siemens Westinghouse. In the long-term, solid state fuel cell technology with stack costs under $100/kilowatt (kW) promises deeper and wider market penetration in a range of applications including a residential, auxillary power, and the mature distributed generation markets. The Solid State Energy Conversion Alliance (SECA) with its vision for fuel cells in 2010 was recently formed to commercialize solid state fuel cells and realize the full potential of the fuel cell technology. Ultimately, the SECA concept could lead to megawatt-size fuel-cell systems for commercial and industrial applications and Vision 21 fuel cell turbine hybrid energy plants in 2015. The environmental performance of the fuel cell technology is well-known. Some states exempt then from air permitting due to their ultra-low or zero Nox, CO and hydrocarbon emissions. All DOE fuel cell projects have required only a categorical exclusion under NEPA. Little life-cycle cost information is available. However, high-temperature fuel cells are expected to require minimum processes of solid state materials and do not involve petroleum-based materials. Any life-cycle cost assessment conducted by the EPA should include a comparison with other technologies, include recycle of components and reflect ultimate fuel cell manufacturing processes.