



# ENERGY NEWS

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## Nothing is 'too wonderful to be true'

by Robert Farmer, ©1997

I have an idea that if scientist Michael Faraday were alive today, he might repeat his famous remark upon reviewing the promise of fossil fuel cells.

I still think that we must start accessing the power of the sun sooner rather than later, but that's the subject for another day. The reality is that we live, today and for the foreseeable future, in a fossil fuel world and that's where the bulk of our energy efficiency and environmental R&D has to be done.

Demand-side management will continue to be crucial, and especially in the residential sector where significantly less progress has been made compared to the industrial/commercial market. The public isn't concerned yet — and it might be quite a while before they are. Where the really significant efficiency and emissions improvements are achievable, though, are in supply-side management or, put another way, in new power technologies, both for electricity and transportation.

Since Britain's industrial revolution, the heat engine has been the staple of power. Whether it's powering a central electric generator or an automobile, the engine of today is cleaner and more efficient than ever, and considerable R&D funds will continue to be invested in further improvements.

The fuel cell, on the other hand, is

new. It's an electrochemical "engine" that converts fossil fuel gas and oxygen via an electrolyte into electricity. It looks and acts much like a battery but, like a heat engine, produces power only for as long as the fuel and oxygen are delivered to it.

Being electrochemical, fuel cells offer the highest electrical efficiencies (45-70% LHV) and the highest cogeneration efficiencies (70-90% LHV) of any fossil fuel technology. Because they do not involve combustion, they are essentially pollution-free. Green House Gas (CO<sub>2</sub>) production is reduced and NO<sub>x</sub> emissions are almost undetectable. There are no wastewater discharges from fuel cell plants and there are no moving parts. They are therefore relatively quiet, and noise abatement is not a problem.

They are, in fossil fuel terms, almost "too wonderful to be true".

To get an idea of the importance placed on their development, DOE's Fossil Energy Program budget for natural gas fuel cells averages \$46-52 million a year. The U.S. private sector contributes the most, 60% of the total budget, in a government/private sector teaming and cost-sharing program.

Europe spends about the same, but Japan's budget has jumped to \$200-300 million a year as the parties position themselves for what is seen as a booming 21st century global marketplace for cleaner, more efficient electric power.

The Energy Information Administration (EIA) projects that outside the United States, the market for electric power systems could be as large as \$1 trillion in 2015. A country that captures only 20% of this market would sell more than 400,000 megawatts of power generating capacity and bring in revenues of nearly \$200 billion.

Fuel cells are not limited to natural gas. DOE expects that "As R&D advances, however, fuel cells could become part of an 'ultimate coal plant' — a plant with unprecedented levels of power generating efficiency and dramatically lower levels of CO<sub>2</sub> emissions."

On the transportation front, DOE's Energy Efficiency and Renewable Energy Programs feature fuel cell R&D prominently in their FY 1998 budget requests. Three programs — Advanced Automotive Technologies (\$129 million), Natural Gas (\$75.7 million) and Hydrogen (\$15 million) — all seek increased funding levels over 1997 appropriations with fuels cells playing a significant role in the R&D for transportation technologies, either as hybrids with or as replacements for the "traditional" combustion engine.

The only conclusion I draw is that the planet's governments are serious about the need for superior fossil fuel efficiencies and cleaner air as we head into the next century — and fuel cells offer the major path towards getting there. •



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His technical expertise includes large scale to small scale power generation, combined heat and power (CHP), marine and surface transportation, and alternative fuel applications.

A Florida resident since 1984, Robert was a member of the Energy Advisory Committee of Governor Chiles' Commission for a Sustainable South Florida.

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