Robert Rose

Executive Director

US Fuel Cell Council

Washington, DC

Testimony

Before the

Subcommittee on Energy and Mineral Resources

Committee on Resources

U.S. House of Representatives

Energy and Mineral Requirements for Renewable and Alternative Fuels Used for Transportation and Other Purposes

May 18, 2006

My name is Robert Rose. I am founding executive director of the US Fuel Cell Council, the 120-member trade association of the fuel cell industry. I began my work in fuel cells in 1991, and in 1993 established the nonprofit Fuel Cells 2000 education program at the Breakthrough Technologies Institute. The US Fuel Cell Council followed in 1998. Thank you for this opportunity to participate in the discussion of materials and fuel cells.

I must say at the outset that I am presenting my personal views today, although I am confident that nothing in my remarks runs counter to the Council's stated positions.

Fuel cells generate electricity *electrochemically*, without combustion. Fuel cells have inherent advantages over conventional energy production systems, including greater efficiency, lower environmental impact, and enhanced design flexibility. The only byproducts of using a fuel cell fueled by hydrogen generally are water and heat; both can serve useful purposes in particular fuel cell applications.

Fuel cells are being developed for virtually every power need, including remote sensors; consumer electronics; defense applications; emergency and backup power systems; heat and electricity for homes, businesses and factories; industrial equipment; locomotives and other off-road vehicles; trucks, buses and the family car.

The primary public excitement – and the largest potential market – lies in fuel cell passenger vehicles. Fuel cells offer the greatest potential to reduce and ultimately eliminate our reliance upon foreign oil, enhance our national security, and reduce the environmental impact of fossil fuel combustion. Fuel cells are fuel flexible. They use conventional fuels efficiently, and can bring solar, wind power and other forms of renewable energy to the transportation sector.

Fuel cell vehicles can even serve as electricity generators. It is literally possible for a fuel cell car parked in the driveway to generate enough power for the home, and to supply a significant amount of additional energy to the grid.

Charts 1 and 2 list fuel cell types and explain their operation.

The subcommittee is evaluating whether an adequate supply of raw materials will be available to produce fuel cells and hydrogen in a cost-effective manner. To answer that question we must look inside the box.

While some materials are common to virtually all fuel cells, there are significant differences. Some fuel cells, for example, use platinum group metals (PGM) to stimulate the electrochemical activity. Others use base metal catalysts. Still others rely primarily on heat. Other speakers will address the PGM. Chart 3 lists the key fuel cell materials *other than* platinum group metals. These materials often are used in combination. Thus molten carbonate fuel cells use lithiated aluminum oxide. Some solid oxide cells contain Yttria stabilized Zirconia; given my technical depth I just say, "ceramics and rare earths."

The fuel cell industry faces substantial materials challenges. But these challenges relate to characteristics such as expansion and contraction, heat resistance, their purity, their suitability for mass manufacture, the close tolerances to which they must be manufactured, their resistance to contamination and so on. The industry is working hard on these issues, and a wide variety of materials are under active review, ranging from metals to microbes.

All these issues occupy the attention of the fuel cell industry; to date, any concern over supply of the materials has focused on the Platinum Group Metals, even though the US relies on imports at present for most or all the supply of several materials on the list. There are a number of reasons for this confidence, I believe.

1. We will need a significant materials infrastructure eventually, but not right away and not all at once. Suppliers ought to have time to adjust to demand, assuming the resource markets are functioning normally. In the case of some materials there are plentiful supplies already.

1. Anticipated worldwide economic expansion will require additional materials of all kinds, and there is nothing exceptional about fuel cell materials that suggests they should be treated as a special case. The auto industry, for example, anticipates that the total number of vehicles on the road worldwide may reach 3.5 billion units by 2050 – compared to fewer than a billion today. That suggests expanding demand for *everything*.

1. Fuel cells are highly recyclable. Whether motivated by economics or sustainability principles, recycling will play an increasing role in the economy in general. Here, there may be a role for government in helping stimulate recycling; governments in Japan and Europe have implemented various recycling requirements and incentives. The US Fuel Cell Council has established a Sustainability Working Group, and recycling issues are high on its agenda. On the PGM front, the U.S. Geological Survey estimates that 70 tons of PGM is recycled annually in the US, primarily from auto catalysts.

1. Fuel cell developers and researchers all over the world are evaluating new materials, and searching for ways to use critical materials more efficiently; they are driven by cost reduction. Thus, the list we put together today may not be -- indeed, likely will not be -- the critical list in 20 or 30 years. It also means that today's catalyst formulations will certainly be replaced by supported catalysts and catalyst alloys that work better, *and* cheaper.

1. Research achievements to date have already allowed a substantial reduction in anticipated volume cost for fuel cells. And that translates into smaller, lighter, better systems and more efficient use of component materials.

The fuel cell industry is investing heavily in this research because, while fuel cells are meeting customer needs in some niche markets today, full commercialization depends on cost reduction. And thus, harvesting the benefits that fuel cells can bring to our energy and environmental priorities also depends on it.

Congress has already taken significant steps to assure a strong public-private partnership toward this end. The Energy Policy Act of 2005 commits us to a 15 year development effort that covers not only research, but also demonstration, technology validation, federal purchases and market entry support. Building on this beginning, I would suggest the following.

1. The Administration's budget request for 2007 does not fully reflect the Congressional will as expressed by the authorizations in EPACT. Fully funding EPACT, including the fuel cell purchase programs, will be a significant boost for the industry, although I should emphasize that even at these levels the industry's own investment is far larger than the federal share, as it should be.

1. Congress approved an installation tax credit for fuel cells, but with a two-year time line. We support legislation proposed in both House and Senate to extend the credit for an additional eight years.

1. This Subcommittee may also wish to examine the issues related to materials recycling, with particular emphasis on platinum group metals, to identify any areas where federal intervention might improve the process or stimulate additional recycling activity. An estimated 2000 tons are "on the road" worldwide, according to the International Platinum Association.

I want to thank the Subcommittee, and you, Mr. Chairman, for this opportunity to testify. I would be happy to answer any questions, to the best of my ability.

Slide 1

Slide 2

Slide 3

Slide 4

Slide 5