

**Remarks of Robert Rose  
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US Fuel Cell Council  
And  
Breakthrough Technologies Institute**

**Upon Receiving the 2004 Fuel Cell Seminar Award  
2004 Fuel Cell Seminar  
San Antonio, TX  
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I want to thank the Seminar organizers for this extraordinary recognition. My gratitude is beyond words – almost. The theologian and social activist Reinhold Niehbur reminds us that “Nothing worth doing is completed in our lifetime. Nothing we do, however virtuous, can be accomplished alone.” I can assure you I have been only a tiny part of the work you cited.

I am glad you spoke of mobilization. Within the US Fuel Cell Council and among our counterpart organizations around the world, we have begun to mobilize as an industry. That is good. Success will require more, from all of us. The opportunity is enormous, but the challenges are great.

Together we can forge a new partnership. This new partnership will embody a genuine international commitment to the transition to fuel cells and hydrogen. A commitment backed up by government purchasing power and a dedicated revenue stream. A commitment for the long haul, informed by an understanding that this is the work not of you and me, but of our generation and the next.

Let me emphasize at the beginning that the opinions I express today are my own, and have not been approved or endorsed by the US Fuel Cell Council, or the board of the Breakthrough Technologies Institute.

It is time for plain talk and bold action. Our industry faces opposition not just from entrenched interests but from many who should be our allies. Our nation faces determined and clever enemies who see our energy dependence as a fundamental vulnerability. The community of nations faces a world shaped by the geopolitics of oil and the consequences of carbon based fuels.

The world economy is addicted to oil. World oil demand exceeded 82 million barrels a day this summer, in the face of rising crude prices. The US Energy Information Agency projects demand will reach 121 million barrels a day by 2025, worth more than \$2 trillion at \$50 per barrel. Most of this new demand will come from countries that have largely missed out on the benefits of the oil century. They want and deserve their share of human comfort and affluence. What might happen if the supply runs short or price competition becomes too aggressive? We are also developing an addiction to electrons. Consumers increasingly are intolerant of interruptions in service, as they have become more dependent. In the US, one home in five has an electric . . . toothbrush. Think of it.

What all this means to our world can be read each day in any newspaper in the world.

What it means to the fuel cell industry can be summed up in a single word – opportunity. If we can get products to market that will address these addictions, we can make some money. And in the process, of course, do the world a world of good.

I am an optimist. I believe fuel cells can ease the pressures of addiction by helping assure supply. Fuel cells will gain a significant share of multiple markets in my lifetime.

In some markets, fuel cells will compete from the beginning because they offer consumer advantages. Ultimately, this will and must be the case in all markets. But we can't get there without help. In markets where good technology is already entrenched – where our addiction is strongest – market forces will need some turbo charging from governments.

This is not as radical as it may sound. Governments influence markets all the time.

Here's where leadership comes in. Government programs are not shaped in a vacuum. Government does best when it responds to clear messages from the governed. Therefore, *we* must be the leaders. That may sound strange, since we plead for leadership from government all the time. But governments, with some exceptions, are cautious by nature. Democracies and most authoritarian governments alike are accountable to someone else, whether the will of the majority or the needs of certain private interests. So we must mobilize to help government help *us*.

In 2002, more than 40 organizations endorsed *Fuel Cells and Hydrogen: the Path Forward*, which outlined a comprehensive \$5.5 billion program for the United States. There were two reactions: you'll never get it; and, it's not enough. The critics were half right. The US has come pretty close to our recommended budget so far. But it's not enough. If we are going break our energy addiction, we will need ten times that amount – \$50 to \$60 billion in the US and three to four times that worldwide – over the next 15 years. This is consistent with emerging international expectations. And it is time to talk openly about it.

History is on our side. As human societies grow and become more affluent their impact on the natural environment and their interest in minimizing that impact both increase.

The carrying capacity of the environment – its ability to absorb waste, is limited. The resource capacity of the earth – its ability to fuel human endeavor – is also limited, with a couple of major exceptions. Exceeding those limits would be very painful. These realities will help define the markets of the 21st century.

The auto industry is coming to the view that the motor vehicle, as currently configured, has a limited upside. That is very reassuring.

In his award speech to the 2003 Seminar, Hiroyuki Watanabe of Toyota said his company hopes there will be 3.4 *billion* vehicles on the roads by 2050, a four- or five-fold increase, though the human population is expected to grow only by 50 percent. Restraining this market growth are smog, global warming and fuel supply concerns. Toyota's analysis is that hybrids and improved conventional engines will buy time, but only fuel cells will power the low-impact products that enable this market expansion.

## **Technical progress**

Fuel cells will be up to the task. We are making impressive technical progress. Better stack and system life, new confidence on cost reduction, terrific performance for fuel cell vehicles in field tests. Fuel cell generators are in the field, meeting customer needs, today.

Our colleague Alan Lloyd said he was stunned recently to see the driver of a fuel cell vehicle pull up to a conference hall and simply hand the keys to the parking attendant. What better sign can there be that these vehicles can be “mainstreamed?”

## **What about hydrogen?**

Our technical progress has been matched by an increasing focus on the challenges of hydrogen fuel, including the cost of the fuel and infrastructure, safety and consumer acceptance. We have vocal and effective opponents. Their arguments are often wrong, usually inflammatory and too often badly motivated. In fact, much of this criticism is merely clever packaging, stimulated by defensive maneuvering by interests that would be displaced or that fear *their* corner of the advanced energy universe will be overlooked.

We *will* need a comprehensive hydrogen infrastructure. We will *not* need it all at once. When we do need it people will find a way to make money providing it, to do so safely and in a manner consistent with best environmental practice. It is fair to say that the challenges facing us are substantial, whether in the laboratory, the test station, the field or the marketplace. But *we* should be leading this discussion, not our opponents.

## **Government's role**

Here's where government can help. It *is* possible to expect too much of government. Government support can become an addiction in its own right, and deflect our creative energy away from marketplace considerations.

At their best, governments bring important benefits to the partnership. They bring credibility that is valuable in boardrooms and in the media. They are good at sharing the cost of high-risk research, and stimulating collaboration and research partnerships. They can support market introduction by subsidizing early purchases. They can use their purchasing power, matching our products' capabilities with real world needs.

How valuable, for example, would 100 fuel cell buses have been in the recent spate of hurricanes in the American Southeast, set up to provide both transport and electrical power, even a little emergency water? How valuable would 1,000 fuel cell generators have been to schools, hospitals and emergency service centers?

Many have called for a new Manhattan Project or a “man on the moon” style commitment. The US Interstate Highway System is another good model. But we face a bigger challenge, one that must be won consumer by consumer, community by community, country by country.

It will require aggressive international leadership, leadership that must come in the first instance from us, mobilized toward common ends.

## New partnership

I spoke earlier of a 15-year, \$50 to \$60 billion public-private partnership in the US with comparable efforts internationally. It sounds like a lot, but to put it in perspective,

- US tobacco companies have agreed to pay \$208 billion over 25 years to cover the health costs of addiction to that product.
- Annual highway spending is more than \$60 billion every year in the US alone.
- Tax subsidies that feed our oil addiction – subsidies for the extraction and sale of petroleum – cost the US treasury \$9.1 billion to \$17.8 billion annually. Funding for research, export financing, and pollution cleanup adds another \$2.5 billion.
- \$4 billion is also less than the US pays for imported oil in two weeks.

The International Energy Agency added up estimates of the global cost of a hydrogen transition over the next 30 years and came up with \$1 to \$5 trillion. While it sounds like a lot, it is only about one third of one percent of global national product. This is very modest compared to the cost of comparable transitions from canals to rail and rail to motor car, which IEA estimates cost five to 10 percent of global product.

Convincing governments in the US and internationally to support that investment is a substantial challenge. It will require us to use some tools we have been reluctant to use so far, and to be more unified, more committed, more resolute, better mobilized than we have been so far. There are encouraging signs that governments are beginning to listen. The longstanding leadership of Germany, Japan, and the United States has encouraged other nations to step forward, in Europe, Asia and South America. Efforts like the International Partnership for a Hydrogen Economy may develop into mechanisms for collaboration and perhaps become truly partnerships.

What would a \$60 billion program look like? Here are some specific suggestions. If they touch off a raging argument, so much the better. Because we can succeed only if we are united, and achieve only the goals that unite us.

First, we need targets. This is controversial, I know, but we need to make the program understandable to average citizens – after all, they are footing the bill. John Kennedy did not call on America's best efforts to develop technologies capable of putting a man on the moon. He was after those dusty footprints themselves.

The Japanese have set targets of 10 gigawatts of fuel cell power and 5 million vehicles by 2020. If we resolve that the US program will be only *half as ambitious* as theirs as a percentage of market penetration, we can derive targets for the US of

- 8 million fuel cell vehicles – three percent of the vehicle fleet, and
- 20 gigawatts of fuel cell power generation – two percent of installed capacity.
- Let's also aim at 20 percent of what I call personal power markets.

If this sounds like a lot, remember, it isn't 2020 yet. These are goals, not predictions. But they will help us focus our efforts. My view is we should spend about half the \$60 billion on research, demonstration and infrastructure, and half on market stimulation through government purchases, purchase subsidies and tax incentives.

Here's a straw man proposal for the US.

- \$10 billion for coordinated research and demonstration programs through the Department of Energy.
- \$10 billion for university-led research. Maybe that will be enough to keep the universities from earmarking the hydrogen program budget.
- \$10 billion to help finance a national hydrogen infrastructure; GM estimates we can provide 70 percent of Americans access to hydrogen for about \$12 billion.
- \$10 billion for government purchases and purchase subsidies for fuel cell generators, with subsidies front loaded at 50 percent of cost or \$2000 a kilowatt in early years.
- \$16 billion for fuel cell vehicle purchases and tax credits, or \$2,000 per car on average, but heavily front loaded.
- \$4 billion for purchase of portable power units – not glorified doorstops, but units that meet users' expectations. That's less than 15 percent of the value of one year's battery sales.

If you like this outline, let's mobilize to develop a detailed and integrated proposal. We need to work out the transition from research to demonstration to performance based purchases. Each country is different and we will need to see if this outline is appropriate for other countries. The private sector will need some cost share. If you *don't* like it, put a counter proposal on the table. If you don't think our industry is ready yet, let's talk openly about that, too.

### **Dedicated revenue**

Where will we get the money? To make sure the commitment endures, it is essential to find a dedicated revenue stream. Just to make sure I offend every possible interest, I've put a list together. Each will raise about \$4 billion a year in the US and between \$12 and \$20 billion if applied worldwide

- A 3-cent increase in the gasoline tax; US prices can go up more in a week
- A 1.6 mill fee on utility generation – one sixth of one cent
- A 60 cent per barrel fee on oil
- A \$4 dollar per ton fee on coal sales
- A 60 cent per ton fee on greenhouse gas emissions
- A \$17 annual federal motor vehicle registration fee. Such a fee on vehicles worldwide would produce nearly \$13 billion a year.

I don't think this is far-fetched. Call it a "Freedom Fee." Republican leaders in the US Congress have already proposed a gas tax increase to cover broad transportation needs. In California there has been talk about a gas tax for hydrogen infrastructure.

### **Need for partnership**

We will need all the help we can get to achieve these ends. There is an impressive amount of leadership at the State level already; these leaders are particularly valuable because they speak to other policy makers as colleagues, not supplicants.

We should also join forces and share revenues with a broad coalition of advanced energy interests. An allied effort makes policy sense and political sense. It will take all our efforts and technology to achieve a truly sustainable result.

We also need to look at regulatory incentives. The US EPA has a Zero Emissions category for passenger vehicles, but fuel cells have no prominence in the overall air quality scheme. Regulatory incentives can help us put an economic value on the benefit fuel cells offer to society. This is a controversial area, but it needs to be on the table.

### **We must be the leaders**

Catalyzing all of this, of course, is leadership. We are lucky – in the US both major candidates for president support the goal of a hydrogen transition. But as we have seen, that by itself is no guarantee of success. We must mobilize to engage the policy community. I'll guarantee you, our opponents are.

Through the US Fuel Cell Council, we have begun the job. But each and every one of us has a role to play. We cannot leave this task to others. There is nobody else. As a start, we can meet with government officials, reach out to the media and potential allies, and speak to community leaders. Each of us can do these things, and more, and we must if we are to succeed.

And what a cause we have. We are talking about nothing less than overhauling the engine of the world's economy, making each nation safer, offering even those nations that have been left out of the oil century a chance for a better future. An end to smog. Breaking the curse of carbon emissions. Ending the pain of energy addiction.

Robert Kennedy said: "The future . . . will belong to those who can blend passion, reason and courage in a personal commitment to . . . great enterprises . . . . Few will have the greatness to bend history itself," he said, "but each of us can work to change a small portion of events, and in the total of all those acts will be written the history of this generation." That's true of *our* generation, too.

A 15 year program will begin the job. And begin we must, now while we can develop and implement a staged transition, or later when an oil supply, energy price or environmental catastrophe stimulates public rage and a panic response from government. It is our job – yours and mine. There is no better calling.