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Rethinking PNGV

Hearing on "Partnership for a New Generation of Vehicles:" Assessment of Program Goals, Activities, and Priorities

Testimony to US House of Representatives, House Science Committee, Subcommittee on Ener and Environment

by

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Good afternoon. My name is Daniel Sperling I am Professor of Transportation Engineering and Environmental Studies, and founding Director of the Institute of Transportation Studies at the University of California, Davis. This Institute administers over $7 million in research contracts ar grants, and is staffed by about 100 research faculty, post-doctoral scholars, and student research assistants. I oversee major research programs in electric, hybrid, and fuel cell vehicle technology have been deeply involved in the study of advanced propulsion technologies and alternative fuels since the late 1970s. I am founding chair of the Alternative Fuel Committee for the Transportatio Research Board of the National Research Council, have participated in several National Research Council committees on energy and environmental aspects of motor vehicles, and have authored o co-authored 5 books and over 100 papers and reports on the topic.

Let me begin by saying that I strongly endorse the goals of PNGV and the need for strong government support of advanced vehicle R&D. It is clear that the automotive industry is on the threshold of a technological revolution. Technology is near at hand to achieve huge and rapid improvements in energy use and pollution reduction But industry has little incentive to pursue many of these advanced technologies because their major benefits -- reduction of oil imports, greenhouse gases, and air pollution -- do not have value in the marketplace. And so there is a clear role for government, as a regulator and supporter of advanced technology R&D

There is another important reason for government to support these advanced automotive technologies: global competitiveness, to assure that the United States retains international leadership. Other countries seem more determined than us to develop these new technologies and advanced vehicles, for reasons I will indicate below If we sit passively by, the nation risks losing millions of jobs and billions of dollars in economic growth

PNGV has made some positive and important contributions it has helped focus DOE R&D programs, eased somewhat the adversarial relationship between automakers and regulators

through increased communication and coordination, helped the Big 3 close a gap with European companies in advanced diesel technology, and stimulated advances in fuel cell technologies. Thes are important achievements. But that's the past

PNGV is at a critical juncture. Unless it is reorganized and refocussed, it will no longer serve this country well. My concern is that PNGV, as presently constituted, will not provide the leadership this country needs. In fact, it may be counterproductive.

PNGV has two fundamental problems. The first is its procedural requirement that technology to be used in the 2004 production prototypes must be selected by the end of 1997. At first glance this requirement seems reasonable: it assures that industry will stay on track to meet milestones and the 2004 deadline. The actual effect will be perverse. Because 1997 is rapidly approaching and only one technology will be picked (by each of the 3 companies), risk-averse PNGV managers in the Big 3 and in the federal government are expected to favor incrementalism over leapfrogging. That is, organizational and political realities push them toward selecting modest enhancements of conventional technologies, and away from more advanced technologies, such as fuel cells, that are riskier but potentially far more promising.

It appears that the three automotive companies, with government concurrence, will select a direct-injected diesel engine combined with an electric driveline and a small battery pack. This choice is disconcerting for several reasons: 1) Diesel engines have inherently high NOx and particulate emissions; 2) industry is already well along in developing these advanced diesel engines for the European market; and 3) other potentially more promising technologies would be pushed aside.

Based on conversations with federal officials and corporate executives, I suspect that the willingness to embrace diesel technology is premised on a perception that America's air quality problem is mostly solved. While it is true that pollution has subsided in most American cities, the Detroit-Washington belief that pollution will not be a factor in defining the next generation vehicle could be tragically mistaken. Coming from California, I may be more sensitive to the fact that demand for cleaner air is not a California-specific phenomena. Indeed, not only do many US cities continue to experience unhealthy air and many Americans continue to demand clean air, but in European and Asian cities the demand for cleaner air is becoming ever stronger. Pressure on the world's auto industry to build still cleaner vehicles is likely to intensify. That is why diesel technology is unlikely to power the next generation vehicle, even in a hybrid configuration. California is not an outlier in terms of pollution and the desire for pollution-free vehicles.

The second fundamental problem with PNGV is that the apparent policy of directing most PNGV-related government funds to the Big 3 and their suppliers is not the most effective means of accelerating the development and commercialization of advanced technologies. It represents a poor investment of government funds, for the following reasons:

- The Big 3 and their principal suppliers will continue to develop and commercialize incremental-type technologies, regardless of government funding -- and even many truly advanced technologies -- for a variety of reasons, not the least of which is California's zero emission mandate. Indeed, virtually all the technical accomplishments of PNGV listed in their

glossy brochure published this month (July 1996) appear to be the results of ongoing efforts by the Big 3 and their suppliers.

- Because fuel prices are low and CAFE standards frozen, the Big 3 have little incentive to aggressively pursue the tripled fuel economy goal. This is the real-world political and economic context for PNGV; no carrots, no sticks. The result is that Big 3 management places little value on government support for longer term, riskier PNGV technologies.
- The $60 million dollars or so in advanced vehicle R&D sent annually to the auto industry by DOE has little influence on Big 3 priorities and R&D activities, partly for the above reasons, and partly because the amount is tiny relative to the many billions in R&D they already spend annually.
- The highly competitive automotive companies are understandably reluctant to share information on technological breakthroughs. As a result, the three automotive companies have reportedly erected a firewall between their in-house PNGV managers and their other R&D managers. For example, GM has reportedly created a proprietary in-house shadow fuel cell program that is completely independent and parallel to their government-funded PNGV fuel cell program. By implication, whenever GM (or any automaker) is serious about a technology, it will channel its development efforts away from PNGV to assure complete confidentiality. That GM behaves this way even with fuel cells, the most far-off of the major PNGV technologies, is further evidence that government funds are not valued highly.

The inescapable conclusion is that government-funded R&D plays a small role in automaker development and commercialization efforts and that government awards to the Big 3 and their suppliers are not generating as much technological development as might be expected.

PNGV is not directing funds toward the right technologies nor the right organizations. As a result, our country is foregoing important economic and environmental benefits and risks losing leadership to the Europeans and Japanese. The unveiling of a fuel cell car by Mercedes-Benz on May 14, and their announcement that they may be ready to sell fuel cell cars by 2010 is an indication of global demand for energy efficient and environmentally benign vehicles, and the intention of foreign companies to supply that technology.

I have three recommendations for more effectively leveraging government R&D funds and assuring that PNGV continues to accelerate the development and commercialization of advanced automotive technologies.

1. Renew emphasis on cleaner and more promising long term technologies.

Remove the requirement that a single technology be "down-selected" in 1997. Instead, require that each of the Big 3 pursue highly efficient and low-polluting options, such as fuel cells, Stirling engines, ultracapacitors, and flywheels. And require that the federal funds be matched at least 50/50 for these advanced technology efforts. The overall PNGV program now has a 50/50 match requirement, but it appears that most of the industry dollars are directed at PNGV goals 1 and 2 (improvements in near-term vehicle technology and manufacturing processes), which is money they would have spent anyway, and virtually all of the goal 3 activities (tripled fuel economy) are being paid for by government (though lax cost accounting procedures make it impossible to confirm).

2. Direct a significant share of funding toward independent research centers and technology companies.

Funding of independent skunkworks and research facilities, including universities, and unaffiliated technology companies would have several benefits: i) these other centers and companies would provide a benchmark with which to evaluate progress by the major automotive companies, for regulatory and future R&D funding decisions, ii) support of universities and other organizations would create a broader base of expertise outside the traditional auto industry; and iii) small entrepreneurial companies and technology companies unaffiliated with the automakers have a stronger and purer incentive to accelerate technology development and commercialization.

3. Reassign Government Management for Goal 3 to DOE

The March 1996 NRC review of PNGV stated that the "government lacks an effective program management organization, little or no ability to redeploy funds from less significant to more important technology developments in response to budget reductions or following technology selection" (p. 3). A central cause of this problem seems to be that DOE, which provides and controls over 95% of the funds for goal 3 (tripled fuel economy) and virtually all the technical expertise in this area, is inhibited and distracted by unneeded layers of policymaking and bureaucratic decisionmaking. My two preceding recommendations would have a much better chance of being implemented if control of goal 3 activities were shifted to DOE.

It is with some reluctance that I criticize PNGV, for I am firmly convinced that advanced vehicle technologies can and will play a leading role in preserving the environment. But if PNGV cannot be reformed to support more advanced and clean technologies and to fund independent companies and universities, then it should be allowed to die a peaceful death. On the other hand, if changes are made, then the argument for substantial increases in PNGV funding becomes more compelling.

Mr. EHLERS. Finally, we will turn to Professor Daniel Sperling.

I will interject that I have received word that we will have votes on the floor very soon. It appears there will be two votes, and for those of you who are not familiar with the Congress, when the bells ring we have 15 minutes to be get there, and there will probably be a 15-minute vote followed by a five-minute vote. So that's likely to take at least 20 to 25 minutes out of our hearing.

Professor Sperling.

STATEMENT OF PROFESSOR DANIEL SPERLING, DIRECTOR, INSTITUTE OF TRANSPORTATION STUDIES, UNIVERSITY OF CALIFORNIA, DAVIS

Professor SPERLING. Thank you. I will be brief.

My name is Dan Sperling, and I'm Professor of Transportation Engineering and Environmental Studies and founding Director of the Institute of Transportation Studies at the University of California at Davis. The Institute that I direct administers over $7 million in research contracts and grants, the majority of which involve advanced vehicle technologies and fuels.

I've chaired or been a member of several National Research Council committees on vehicle technologies and fuels, though not this one that is represented at the table next to me, and I have authored or co-authored five books and over a hundred papers and reports on these topics. And I also regularly consult with and advise many major energy and automotive companies and government agencies in the U.S. and abroad.

What I'll do here is just briefly summarize my written testimony.

Mr. EHLERS. Please don't rush. We will have a few minutes after the bells ring to get to the votes. So feel free to take your allotted time.

Professor SPERLING. Thank you.

Well let me begin by saying that I do endorse the goals of PNGV. Technology is near at hand to achieve huge and rapid reductions in energy use and pollution, and government must play an instrumental role if those technologies are to be developed and commercialized.

I also believe PNGV has been a step in the right direction. It has already made positive and important contributions. It has helped focus the DOE R&D programs, it has eased somewhat the adversarial relationship between automakers and regulators, it has helped the Big Three automakers close the gaps with European companies in advanced diesel technology, and it has also stimulated advances in fuel cell technologies, and these are important achievements.

But that's the past. PNGV is now at a critical juncture. Unless PNGV is reorganized and refocused I believe it will no longer serve the country well. My concern is that PNGV as presently constituted will not provide the leadership this country needs. In fact, it may be counterproductive.

PNGV has two fundamental problems. The first is the procedural requirement that technology to be used in the 2004 production prototypes must be selected by end of 1997, what we've heard referred to as down selection. At first glance this requirement seems reasonable. It assures that industry will stay on track to meet the 2004

deadline. The actual effect will be perverse. The problem is that 1997 is rapidly approaching and only one technology will be picked by each of the three companies. What will it be?

Given the risk adverse nature of the PNGV managers in both industry and government, all indications are that it will be a direct-injected diesel engine combined with an electric driveline and a small battery pack. This choice is disappointing for several reasons: (1) Diesel engines inherently emit large amounts of nitrogen oxide emissions and particulate matter, the two most severe air pollution threats facing the country; (2) The industry is already well along in developing advanced diesel engines for the European market; and (3) It ignores other potentially more promising technologies, such as fuel cells, and relegates them to the back burner.

The choice of diesel hybrids could also be an economically disastrous mistake. It ignores the worldwide trend and desire for increasingly cleaner vehicles. Pressure on the world's automakers to build cleaner vehicles is likely to intensify and not diminish. That's why diesel technology is not likely to power the next generation vehicle even in a hybrid configuration.

The second problem with PNGV is that too much of the government funds go to the Big Three automakers and their suppliers. They receive, as best as I can tell, over half the funds devoted to Goal 3, the tripled fuel economy goal. This is not the most effective means of accelerating the development and commercialization of these advanced technologies.

I believe it represents a poor investment of government funds. After all, the three automakers have little incentive to aggressively pursue triple fuel economy. Gasoline prices are lower than ever, CAFE standards are frozen and PNGV offers no carrots nor sticks.

Moreover, the amount of government R&D funding is so small relative speaking that it has little influence. The automakers receive about $60 million per year for Goal 3 research. This amount is swamped by the many billions of dollars the industry already spends on R&D annually.

And perhaps most critically much of the information on advanced vehicle technology is not shared. The three automotive companies have reportedly erected a firewall between their in-house PNGV managers and their other R&D managers so as to restrict sharing of technological breakthroughs.

General Motors, for instance, has reportedly created a proprietary in-house fuel cell program that is completely independent and parallel to their government-funded PNGV fuel cell program. Where do you think GM's major effort is going to be, in the government-funded PNGV program or in their own proprietary program?

The inescapable conclusion is that government-funded R&D has little effect on automaker efforts to develop and commercialize advanced vehicle technology.

To be blunt, after all I'm an academic and less constrained than other folks, to be blunt PNGV is not directing funds toward the right technologies nor the right organizations. As a result, our country is foregoing important economic and environmental benefits and risks losing leadership to the Europeans and Japanese The unveiling of a fuel cell car by Mercedes-Benz on May 14th o this year and its announcement that it may be ready to sell fue

cell cars before 2010 is an indication of the global demand for efficient and clean vehicles and the intention of foreign companies to supply that technology.

I have four recommendations for restructuring PNGV.

The first one is to place renewed emphasis on cleaner and more promising long-term technologies. I would suggest removing the requirement that a single technology be down selected in 1997 and, instead, require that each of the Big Three must pursue highly efficient and low-polluting technology options, technologies that include not only fuel cells but also Stirling engines, ultracapacitors and flywheels.

The second recommendation: require that federal funds be matched at least 50/50 for these advanced technology efforts. The PNGV program now has a 50/50 overall match requirement, but it appears that most of the industry dollars are directed at PNGV Goals 1 and 2, the ones dealing with manufacturing and near-term vehicle technology. So most of the industry dollars are directed at PNGV Goals 1 and 2, which is money the Big Three and their suppliers would have spent anyway, and virtually none go to the Goal 3 activities, or at least as best we can tell based upon the information that is available.

Number three, direct a significant share of funding toward independent research centers and technology companies. Funds should be directed at independent skunkworks and research facilities, including universities and unaffiliated technology companies. This would have several benefits.

First, these other centers and companies would provide a benchmark with which to evaluate progress by the major automotive companies, and this is important for both regulatory and R&D funding purposes.

Also, support of universities and other organizations would create a broader base of expertise outside the traditional auto industry.

Also, supporting universities would assure that engineers and scientists are being trained for the automotive industry of tomorrow.

And, lastly, small entrepreneurial companies and technology companies unaffiliated with the automakers have a stronger and purer incentive to develop and commercialize environmental technology and, thus, the return on taxpayer money would be much higher.

My last recommendation is that government management for Goal 3, for the triple fuel economy, should be transferred from the Department of Commerce to the Department of Energy, and this echoes what we just heard a moment ago. The March '96 NRC review of PNGV that we just heard of criticized PNGV for lacking an effective program management organization and little or no ability to redeploy funds from less significant to more important technology developments in response to budget reductions or following technology selection.

A central cause of this ineffective management seems to be that DOE, which provides something like 95 percent of the funds for Goal 3 and virtually all of the technical expertise in this area, is hackled by having to work through many extra bureaucratic lay-

ers of decision-making. My three preceding recommendations would have a much better chance of being implemented if control of Goal 3 activities were shifted to DOE.

In closing, it's with some reluctance that I criticize PNGV, for I am firmly convinced that advanced vehicle technologies can and will play a leading role in preserving the environment. But if PNGV cannot be reformed to support more advanced and cleaner technologies and to fund independent companies and universities at a much higher level, then perhaps it should be allowed to die a peaceful death. If, on the other hand, changes are made, then substantial increases in PNGV funding would probably be a good investment of public monies.

Thank you.

[The prepared statement of Professor Sperling follows:]