"Big Issue" Policy Studies

TRB's Executive Committee identified the **long-term viability of existing transportation systems in an era of uncertain energy availability and cost** as a major issue. In addition to the ongoing study of fuel taxes (*Long-Term Viability of Fuel Taxes for Transportation Finance*) and the 1997 Special Report (*Toward a Sustainable Future: Addressing the Long-Term Effects of Motor Vehicle Transportation on Climate and Ecology*), the Executive Committee noted that within the National Academies, the Board on Energy and Environmental Systems usually takes the lead role on projects dealing with energy. Recent BES studies cited by the Committee include:

> *Effectiveness and Impact of Corporate Average Fuel Economy Standards* (NRC 2002).
>
> *Review of the Research Program of the Partnership for a New Generation of Vehicles*. Sixth Report (NRC 2000).

The Executive Committee failed to identify the recently initiated BES study *Alternatives for Future Hydrogen Production and Us*e which is assessing the feasibility and cost of alternative methods to produce hydrogen for primarily transportation applications. This study is of great interest to TRB's Energy and Alternative Fuels committees. In addition to this study, there are many issues associated with the technical status, economics, and market acceptance of hydrogen and fuel cells that are candidates for "big issue" policy studies. Two of these were proposed as 2002 environmental research needs by a joint panel of the Energy and Alternative Fuels Committees. These two, plus three others identified by that panel and a final more recent candidate, are discussed below.

1. **Pathways for the Transition to a Hydrogen Infrastructure.** The Bush administration has announced a major initiative to develop and deploy hydrogen utilization technologies, and to produce and deliver hydrogen energy in an affordable, safe, and convenient manner. Clearly, hydrogen has the potential to lessen dependence on foreign oil and reduce pollution and greenhouse gas emissions. However, developing and deploying hydrogen vehicles is a formidable undertaking. Coordinating infrastructure development with deployment will be even more challenging. At the policy level, what are government and industry roles in various pathways and what types of incentives and regulations might be used? How successful would they be, are they likely to be sustainable over the number of years they would be needed - weighed against societal and other benefits – and are there clear "no regrets" choices?

2. **Pathways to Fuel Cell Vehicles.**
   An ever growing interest in fuel cell vehicles has led to a variety of diverse efforts to accelerate their commercial introduction, and significant current and planned investments from the private sector and government. To maximize the return on these investments, a comprehensive assessment of pathways to

the successful mass market commercialization of fuel cell vehicles is essential. Again, what are government and industry roles, what types of incentives and regulations might be used, and how successful might they be?

3. **Alternatives to CAFE for Increasing Fleet Fuel Economy.** What are the alternatives (e.g., attribute-based standards, a market-based system like feebates, tradable credits, greenhouse gas standards, tax credits, congestion pricing, travel demand management, etc.), how might each work, and what is its impact on cost, manufacturer flexibility, fuel consumption reduction, safety, and inequities between manufacturers? How might each alternative affect the economic efficiency of the system, equity (or fairness), and what is its potential for gaming (loopholes)?

4. **Costs and Benefits of Transportation Strategies to Improve Energy Security.** Recent events have renewed attention to energy security as a component of national security, and have provided the motivation behind a variety of initiatives to develop new transportation technologies, systems or fuels. Clearly, market power is concentrated in the hands of a few major oil exporting countries many of which are in politically unstable parts of the world, and there is a risk of oil market shocks from revolutions, wars, embargoes, and accidents. Moreover, in the face of this unstable supply, demand for fuel is inflexible, especially in the short run and especially in the transportation sector. On the policy level, what are the expected costs and benefits of measures which reduce oil demand over the longer term and measures which increase the flexibility of fuel demand or transportation services demand to adjust to sudden energy emergencies in the short-run? In particular, what are the relative advantages and disadvantages of reducing long-run petroleum use through conservation (greater fuel efficiency) or substitution (of alternative fuels for petroleum fuels)?

5. **What are the Limits of Biofuels Supplies for Transportation?** Biofuels are becoming increasingly popular in response to mandates (e.g., for oxygen in gasoline) and as a means for promoting energy security, emissions reduction and low net greenhouse gas production. However, there may be practical limits to biofuels supply. These limits include the quantity of biomass resources available, competition with other uses for biomass, competition for arable land to produce biomass feedstock, production cost, limitations on blend percentages (e.g., vapor pressure limitations for ethanol in gasoline; cold-flow performance for some types of biodiesel), limitations on production incentives, and availability of vehicles that can use the fuel (e.g., flexible fuel vehicles that can use E85). Options for increasing biofuel supply include expanding the resource base, developing advanced production technologies, increasing imports from foreign countries, and promoting additional biomass pathways (e.g., methanol-to-biomass for fuel cell vehicles). Each of these options should be investigated, and its potential contribution quantified, under a range of potential incentives. .

6. **Have efforts to promote alternative fuel use in highway vehicles failed?** With the exception of a few market niches and sustained tax preferences for ethanol, efforts to promote alternative fuel use in vehicle fleets appear to have largely failed. However, before abandoning the effort, the record should be carefully examined and a determination should be made on which fuels under which circumstances appear to have gained market acceptance and what lessons may be learned from the experience.