Abstracts

Plenary Session – A View from the Bridge

U.S. ENVIRONMENTAL PROTECTION AGENCY HIGHWAY AND NON-ROAD DIESEL STANDARDS UPDATE

William Charmley

U.S. Environmental Protection Agency

ABSTRACT

This presentation will provide an overview of the U.S. Environmental Protection Agency (EPA) highway heavy-duty diesel 2007 program and an update on recent progress, including both light-duty and heavy-duty vehicles. The pre-sentation will also discuss EPA's recent proposal for a new standards that would dramatically re-duce the fuel sulfur levels in off-highway diesel fuel and at the same time require dramatic re-ductions in particulate matter and oxides of ni-trogen from non-road diesel engines used in farm, construction, and industrial equipment.

GLOBAL CLIMATE CHANGE AND THE TRANSPORTATION SECTOR: AN UPDATE ON ISSUES AND MITIGATION OPTIONS

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ABSTRACT

It is clear from numerous modeling exercises that addressing the challenges posed by global climate change will eventually require the active participation of all industrial sectors and consumers on the planet. Yet, these and similar modeling exercises indicate that it is the large stationary CO_2 point sources (e.g., refineries and fossil-fired electric powerplants) that are likely to be the first targets for serious CO_2 emissions mitigation. While focusing on large stationary point sources might be a useful starting point, these efforts ultimately must be expanded to include all other sectors of the global economy. Because of its operating characteristics, price structure, dependence on virtually one energy source (oil), and enormous installed infrastructure, the transportation sector will likely represent a particularly difficult challenge for CO_2 emissions mitigation. Our research shows that climate change induced price signals (i.e., putting a price on carbon that is emitted to the atmosphere) are unlikely to result in fundamental shifts in demand for energy services or to transform the way these services are provided in the transportation sector. We believe that a technological revolution will be necessary to accomplish the significant reduction of greenhouse gas emissions from the transportation sector. This talk will present an update of ongoing research into a variety of technological options that exist for decarbonizing the transportation sector and the various tradeoffs among them.

GLOBAL CLIMATE AND ENERGY PROJECT

Chris F. Edwards

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ABSTRACT

Energy is the lifeblood of modern societies. Within 20 years, 7.5 billion humans will occupy this planet, about 25 percent more than do so now. They will want to heat and light their homes, power electrical devices, move from place to place, grow food, and drink clean water. Supplying the energy required to do all this is, by itself, a significant challenge. But that is only part of the challenge. It is now apparent that humans are interacting with the chemistry of the planet on a global scale. The concentration of CO_2 in the atmosphere has increased by a third from its pre-industrial levels. There has been an easily detectable change in the pH of the upper ocean as the CO_2 from the atmosphere dissolves. And, while there is a lively ongoing debate about the magnitude of a global warming response to the presence of greenhouse gases (GHG's) in the atmosphere, there is no question that changes are occurring on a global scale, and there is a significant possibility that the world will need an energy system that adds *much* lower GHG's to the atmosphere in the future. This project aims to make that future possible.

Imagine a global energy system that adds *very* low GHG's to the atmosphere. What would be possible primary sources of energy supply in such a system? How would energy end-users make use of that supply? What technologies and systems would be used in the developing countries in addition to North America and Europe? Would we use wind, solar, nuclear power, hydrogen, fossil fuels, and in what combinations? How would such an energy systems be created? What barriers prevent implementation of such systems today (barriers might include safety, adverse environmental effects, market acceptance, legal and social environments, and cost, for example)? What technologies will have to be developed to eliminate those barriers? How can the creative talents of the world's great universities be harnessed to invent such a future? Who will train the next generation of scientists and engineers who will make all this possible? Those questions are the reasons for this project.

With the support of visionary, international companies, Stanford University will develop and manage a portfolio of pre-commercial research to provide the basis for the low GHG-emission energy technologies of the future. It is unlikely that any one energy source will be able to meet the full range of future energy needs, and hence it is essential that the exploration of energy futures examines the technology development needed across the full spectrum of energy sources and uses. Guesses made now about which energy technologies will dominate in the future are unlikely to foresee accurately how these complex systems will evolve and how markets will respond to them, and hence investigation of a diversified portfolio of research topics is critical to project success. Research conducted as part of the project will be performed at Stanford and at other universities worldwide. Stanford will draw widely from energy expertise around the world to build the portfolio. Results of the research will be openly available, and any technology patents will be widely licensable. A key objective of this initiative is to encourage future commercial application of the technologies that flow from the research results.

ENERGY INDEPENDENCE FOR NORTH AMERICA: TRANSITION TO THE HYDROGEN ECONOMY

James J. Eberhardt

U.S. Department of Energy

ABSTRACT

A strategy will be presented for achieving energy independence for the United States and North America through a pathway that could ultimately transition the United States and the transportation sector into a hydrogen economy. The U.S. transportation sector, because of the unique mobility requirements of cars and trucks, is almost totally dependent on liquid carbon-based fuels, primarily conventional petroleum-based gasoline and diesel fuel. This has resulted in continued reliance on imported oil, mostly from less politically stable countries. Energy security concerns have therefore motivated this focus on the hydrogen economy to replace the oil economy. The *National Energy Policy* has included recommendations for the energy independence, not only of the United States, but for the North American continent as well. The President, in his State of the Union address this year, announced the FreedomCAR and Fuel Initiative for achieving energy independence, which would transition the United States and the transportation sector into a hydrogen economy.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT CLEAN TRANSPORTATION PROGRAMS

Mike Bogdanoff

South Coast Air Quality Management District

ABSTRACT

The South Coast Air Quality Management District (SCAQMD) has a number of programs to facilitate the development and deployment of clean transportation. These program elements arise from the SCAQMD's Air-Quality Manage-ment Plan. This plan contains the activities that will be taken by the SCAQMD, the California Air Resources Board, and the U.S. Environ-mental Protection Agency within their respective jurisdictions to achieve ambient air-quality standards in the South Coast Air Basin.

The SCAQMD has seven fleet rules that require the purchase of low-emission and alternative fuel vehicles. These include govern-ment fleets, transit agencies, school districts, and refuse haulers, all with fleets of more than 15 vehicles. State legislation has also enabled the SCAQMD to provide funding to defray the extra cost of the purchase of low-emission and alter-native-fuel vehicles and engines for these and other fleets. Over $57 million was disbursed in 2002. There are seven such programs in the basin.

Finally under the SCAQMD's Clean Fuels Program, new alternative-fuel and low-emission technology is being developed and demonstrated. With an annual budget of about $10 million, there are over 80 contracts in progress at any one time. Currently, the SCAQMD is interested in supporting technologies involving heavy-duty natural gas vehicles, gas-to-liquid fuels, heavy-duty hybrid vehicles, fuel cell technology, and hydrogen production and infrastructure.

GALE BANKS ENGINEERING

M. Ruth, R. Smith, L. Kocher, K. King, M. Meek, W. Harvey, G. Franks, J. Mackey, and J. Stang

Cummins, Inc.

G. Banks, J. Espino, S. Tackett, A. Johnston
Gale Banks Engineering

ABSTRACT

Cummins, Inc., and Gale Banks Engineering have teamed up to build a diesel-powered world record setting vehicle. The objective of the project was to provide a positive showcase to display the virtues of diesel power in a market area where diesel power is not currently available: sport vehicles, mainly trucks. Over a 2-year period, engineers at Gale Banks Engineering, Cummins, Holset, and Robert Bosch worked together to build this showcase. After several hardware exchanges, countless phone calls, and many, many late night thrash sessions, Project Sidewinder hit the road – not the track!

In an unprecedented fashion, the Cummins'-powered, Gale Banks Engineering-built Dodge Dakota made its way to the Bonneville Salt Flats not on a trailer or transporter, but under its own power, pulling a race supply trailer. This amazing vehicle went to the flats in full street-legal dress and capable of achieving over 21 mpg, with only a tire change. It broke four standing records during the driver's qualifying passes at an average speed over 182 mph. That was just the first day.

For 3 days, like-minded racers watched in awe as a diesel-powered pickup truck that looked a lot like what you would see on the street (complete with trailer hitch, air-conditioning, power windows, and stereo) set record after record. Even more amazing, using diesel fuel that anyone could buy at a corner fuel station, this vehicle would set records at speeds in excess of 222 mph without the signature tunnel of black smoke that was typical of diesels on the Salt. Ultimately, this Gale Banks-engineered Dodge Dakota, powered by a Cummins 5.9L turbo-charged diesel engine, succeeded in setting nine records in only seven passes, including two driver licensing runs.