August 26, 2002

Diesel Use in California
Remarks by Commissioner James D. Boyd
California Energy Commission

I've been asked to comment on the potential benefits of diesel engine technologies for addressing California's energy and environmental challenges. Fortunately, my distinguished colleague Dr. Alan Lloyd, Chairman of the California Air Resources Board, has spoken on the views of the state's air regulators on diesel use. I'd like to comment on the potential energy benefits of diesel technology from the perspective of the California Energy Commission.

Petroleum Demand

Today, California is home to over 35 million people and is growing by about 1 million people every 2 years. Each year, Californians consume over 2.6 billion gallons of diesel fuel along with 14 billion gallons of gasoline for the movement of goods and people.

There are an estimated 380,000 heavy-duty, diesel vehicles that are operating on California's roads and highways. Heavy-duty vehicles comprise about 2 percent of California's (23 million) vehicle population, but carry 80 percent of the freight and use 17 percent of the transportation energy on a BTU basis.

Based on the Energy Commission's demand forecast published in December 2001, on-road diesel fuel use is expected to grow at a rate of about 2.4 percent per year over the next 20 years. If this trend continues, diesel demand will nearly double, rising from 2.6 billion to 4.8 billion gallons by the year 2030.

During the same period, the state's petroleum refining capacity is expected to remain relatively flat for both gasoline and diesel. Because no new refineries are planned, this will result in growing levels of imports.

Supply.
The Energy Commission continues to be concerned about California's ability to balance supply and demand for petroleum as a transportation fuel. With the existing demand for diesel fuel and gasoline, California refineries are at or near 100 percent production capacity. As we have experienced in recent years, disruptions in refinery operations cause significant gasoline and diesel price fluctuations. Our forecast for significant growth in diesel fuel demand will have to be met by an increased reliance on imports from other states or countries, efficiency gains, and fuel diversity.

Today's diesel fuel production is limited to the capacity of refiners to remove sulfur. Refinery plans to adjust their operations to produce low-sulfur diesel fuel (less than 15 parts per million sulfur content) may also reduce overall diesel fuel production.

Increasing our supply of diesel fuel will likely mean greater imports of refined diesel into California as well as relying on other supply options, such as Fischer-Tropsch diesel, for blending to make California-complying fuel.

Although diesel engines can run on synthetic diesels produced from natural gas, tar sands, biomass, methanol and coal, the infrastructure and production technologies are not yet established to produce large volumes of diesel fuel from these sources. These options will also add to the production cost of the fuel. As a result, oil refiners face major investment decisions for refinery processes to reduce sulfur and modify other fuel properties to supply fuel that will support the next generation of diesel engines.

Fuel Economy Benefits of Diesel.
Use of diesel in light-, medium- and heavy-duty vehicles provides energy efficiency benefits important to California. It's a known fact that diesel engines provide fuel economy benefits that exceed their gasoline

counterparts. Over time, advances in combustion, materials, and fuel/air management technology have produced fuel economy improvements.

Light duty-diesel vehicles have maintained a fuel economy advantage over comparable gasoline vehicles, ranging from 45 to 50 percent for the limited range of models being offered for sale in California. However, for a variety of reasons, light-duty diesel vehicles have experienced low sales in California, compared to gasoline vehicles. While California's light duty vehicle population approaches 23 million vehicles, only about 300,000 of these vehicles are fueled by diesel.

Historically, the fuel economy of heavy-duty diesel engines has also shown remarkable improvement. In Class 8, heavy-duty trucks, we've seen an improvement from 5.2 miles per gallon in 1982 to 6.5 miles per gallon in the year 2000. This translates into a fuel economy improvement of 25 percent over the last 20 years or 1.25 percent per year.

Energy Policy

As a matter of policy, the California Energy Commission is placing greater emphasis on ways to displace the use of petroleum-based fuels by encouraging technology advancement and increasing use of fuel-efficient vehicles. State legislation, Assembly Bill 2076, signed by Governor Davis in 2000, requires the Energy Commission and the California Air Resources Board to recommend a California Strategy to Reduce Petroleum Dependence. This California Strategy is intended to reduce our rate of growth in gasoline and diesel demand.

The potential for developing more efficient diesel technology in light, medium, and heavy-duty vehicles are strategies that are being examined by the Energy Commission and the California ARB for this report.

We believe that the future market for diesel technology in California, and perhaps nationwide, faces three challenges:

- First, California refiners need to provide an adequate supply of low sulfur diesel fuel in the face of growing demand reflecting local, state, and federal regulations
- Second, maintaining the fuel economy advantage of diesel engines, in light of more stringent emission standards remains a challenge, and may require significant breakthroughs in vehicle and engine technologies.
- Lastly, competition from alternative technology advancements, such as Liquefied Natural Gas engines, continues to put pressure on diesel manufacturers to keeps costs low.

Competition from Alternative Fuels

California energy and air quality agencies have encouraged the use of a portfolio of fuels, particularly natural gas in the heavy-duty sector. And we are beginning to see success in certain niche applications. But these fuels have not captured significant market share in the overall transportation market.

Given the challenges facing diesel technology, natural gas for heavy duty-vehicles may become even more competitive. We have begun to see a narrowing of the incremental prices of cleaner diesel technologies and natural gas vehicles.

For example, our latest natural gas school buses were priced at about $128,000. Comparable low emission diesel buses were priced at $105,000, a cost difference of about $13,000. Two years ago the differential was $35,000, an incremental price reduction of about 50 percent in two years.

If present trends continue, it is likely that natural gas engines for medium- and heavy-duty vehicles will achieve price parity in selected applications and may even enjoy a price advantage in some applications within the next ten years.

Needed for Sustained R&D

Maintaining the fuel economy and economic advantage of diesel technology will require a sustained research and development effort. Research and development efforts are concentrating on advanced emission control technologies needed to meet EPA's Tier II standards for light-duty vehicles.

At the national level, concerted efforts to improve the efficiency of heavy-duty diesel engines are underway. The 21st Century Truck Program has set some aggressive targets: doubling the fuel economy of a prototype Class 8 truck by 2010, and tripling the fuel economy of Class 2 through 6 medium duty vans, delivery trucks, and transit buses.

We believe that technology breakthroughs will be required to meet these fuel economy targets. From our perspective, there are a number of emerging technologies that can meet this challenge. These include:

- Vehicle weight reduction
- Aerodynamic styling
- Hybrid-electric propulsion technologies
- The use of auxiliary power units
- Improvements in combustion technology including new combustion chamber designs, higher-pressure ratios, and higher injection pressures.

These efficiency-related enhancements will not only reduce demand for fuel and reduce operating costs, but also have the potential to reduce carbon dioxide emissions, a green house gas.

Despite these trends, diesel fuel is likely to still be the primary fuel for heavy-duty vehicles. Our projections for the next 20 years show that diesel will continue to dominate heavy-duty vehicle markets, although they'll face increased competition from natural gas fueled vehicles in some applications.

We also believe that maintaining a greater competitive environment will not only benefit end users, but also advance diesel technology to help meet our state's energy and environmental goals.

CONCLUSION

In conclusion, California continues to rely on a portfolio of fuels and vehicle technologies to meet our transportation needs and fuel our state's economy. We believe diesel technologies will remain a key component of that portfolio by continuing to provide near-term energy benefits as well as helping to maintain our long-term energy and environmental goals.

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