Methodology for the Assessment of the Macroeconomic Impacts of Stricter CAFÉ Standards

This assessment of the economic impacts of CAFÉ standards marks the first time EIA has used the new direct linkage of the DRI-WEFA Macroeconomic Model to NEMS in a policy setting. This methodology assures an internally consistent solution between the energy market concepts forecast by NEMS and the aggregate economy as forecast by the DRI-WEFA Macroeconomic Model of the U.S. Economy. While we refer to DRI-WEFA model as a macro model, the full DRI-WEFA model forecasts more than 1600 detailed concepts covering final demands, aggregate supply, prices, industrial detail, interest rates and financial flows. It incorporates both short-run dynamics and long-run growth properties. The changes for the energy variables coming from NEMS influence these detailed components of the macro model, building to an aggregate forecast of economic activity. All of the energy prices and quantities forecast by NEMS are directly linked to energy concepts identified in the DRI-WEFA model. In essence, the energy block of equations in the DRI-WEFA model has been replaced by the corresponding NEMS concepts.[1]

NEMS determines the response of the energy market to changes in events or policies. These energy impacts (prices, quantities and energy-related expenditures) are then passed to the macro model and the economy reacts in an internally consistent fashion, producing an altered set of macroeconomic responses (variables). These altered variables are then passed back to NEMS for the next solution cycle, until system convergence is attained.

For the current assessment of CAFÉ standards, we identified four sources of impact:

1. the higher cost of vehicles to attain the standards;
2. the lower fuel use arising from the imposition of the standards;
3. a lower world oil price as the demand for motor fuels declines; and
4. any potential impact on domestic oil production.

The energy price, quantity and expenditure effects coming from NEMS are critical to capturing the macroeconomic effects of these sources. In the assessment of CAFÉ standards, a critical piece of information not contained in the typical set of energy variables passed to macro relates to the incremental cost of new vehicles to attain the new standard. This new calculation was developed by the Transportation Submodule of NEMS and specifies the incremental cost of both new cars and light duty trucks.

The incremental cost was implemented as a change in the cost factor feeding into the producer price index for automobiles. The econometrically estimated behavioral equations in the model, affect the chained price index for new light duty vehicles which results in a decrease in real consumption and investment expenditures (as defined in the

[1] For a full documentation of the macroeconomic linkage refer to "Model Documentation Report: Macroeconomic Activity Module (MAM) of the National Energy Modeling System," January 2002 found on the EIA web site at http://tonto.eia.doe.gov/FTPROOT/modeldoc/m065(2002).pdf

National Income and Product Accounts) on new light vehicles and consequently reduced vehicle sales. The exact change in vehicle sales due to an increase in vehicle prices are the result of solving the DRI-WEFA macro model with NEMS, over the forecast period, based on the increased cost and other assumptions identified in the report. From the vehicle perspective, this represents the cost side.

There is a benefit side as well. While first purchase costs are important to the decision to purchase, the benefits of lower fuel consumption are explicitly accounted for over the entire life of the vehicle. Since the Transportation Submodule tracks energy consumption for the entire fleet for the entire life of the respective vehicles, this positive effect is fully captured through the linkage of NEMS to the macro model. Lower gasoline consumption, and lower fuel prices, as the world oil price declines, increase real disposable income for the family and lower business costs for vehicles in industry and commerce.[2]

The four sources of impact – incremental vehicle costs, declining fuel consumption, a decline in the world oil price, and impacts on domestic oil production – each have a different time profile. The linkage of NEMS and the DRI-WEFA model allows EIA to capture the aggregate effects of these different elements in an internally consistent accounting framework. It is important to note this linked framework captures the adjustment mechanism of both the energy market and the aggregate economy as the system moves out in time. The results indicate that while the aggregate economy may experience a lower level of output in the near term as the adjustment takes place, there is a strong tendency to rebound over time toward a new equilibrium which is near the original baseline path.

The NEMS-DRI-WEFA system has the property of tracking the energy and economic variables over time as they adjust to changes in initial conditions. Other modeling frameworks, such as computable general equilibrium models, may focus on the energy/economy system from the perspective of maintaining a full employment equilibrium at all points in time.[3] Such full-employment systems are aimed at answering questions about the long-run horizon outcome, but cannot shed light on the adjustment path incorporating the transition costs to that long-run equilibrium.

[2] Implicit in this is the economic calculus that consumers and businesses go through in deciding whether to purchase or not.

[3] Example of such models are the Framework for Economic Impact Analysis and Industry Growth Assessment (AMIGA System) and A Model for Evaluating the Regional and Global Effects of GHG Reduction Policies (MERGE).