Description of GPRA08 Scenarios

There is inherently considerable uncertainty in long term energy projections such as those underlying DOE benefits analysis. In fact, uncertainty about future energy demand, supplies and prices is one of the motivations for Federal investment in R&D, so that the nation might be better prepared in the face of potentially adverse world energy markets. The prospective benefits framework developed by the National Research Council (NRC)[1] recognizes this in their recommendation of assessing benefits for several "global scenarios."

DOE has developed alternative scenarios to capture two of the key uncertainties impacting future energy: energy prices and climate policy. A "business-as-usual" scenario based on the EIA Annual Energy Outlook 2006 is also used.

The High Fuel Price Scenario Definition

The High Fuel Price scenario is predicated on a future in which the supply of natural gas and oil, relative to demand, are more limited. As a result significantly higher fuel prices occur (see Figure 1 for comparison of oil and gas prices under the High Fuel Price and Business-As-Usual scenarios). The world oil price follows the trajectory of the AEO 2006 High World Oil Price case. Oil prices start off higher than the reference case in 2006 and rise to $90 per barrel by 2030 (real $2004). Natural gas supply in the High Fuel Price scenario is restricted in order to cause natural gas prices to rise to roughly $11 per thousand cubic feet by 2030. Restrictions on gas supply include limiting the ability of new LNG terminals to be constructed, delaying the Alaska gas pipeline until after 2030, and reducing assumed Canadian resources. Coal price assumptions were not explicitly changed, but mine mouth coal prices rise by up to 8 percent thru 2030 in NEMS-GPRA08 due to increases in oil and natural gas prices.

Carbon Constrained Scenario Definition

A second scenario was designed to examine the implications of a cap on energy-related carbon emissions. The carbon cap meets the Administration's "Global Climate Change Initiative" goal of an 18 percent reduction in national GHG intensity (below the 2002 level) by 2012, along with assumptions for continued emission reductions through 2050.[2] Figure 2 compares projected allowable emissions under this carbon cap scenario with "Business-as-Usual" baseline emissions of energy-related CO_2 emissions. Between 2012 and 2020, the U.S. carbon cap decreases at a constant rate, reaching 1,600 MMTCE per year in 2020—equivalent to a return to year 2000 carbon emission levels. Between 2020 and 2050, carbon emissions are constrained to decrease at a constant rate resulting in an ultimate emissions level of 1,200 MMTCE per year in 2050—equivalent to a return to mid 1970s and early 1980s carbon emission levels. An economy-wide trading system is assumed where the lowest cost reductions will occur first.

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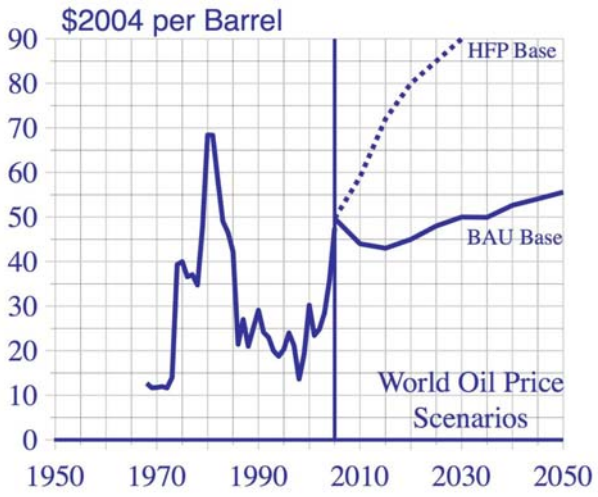
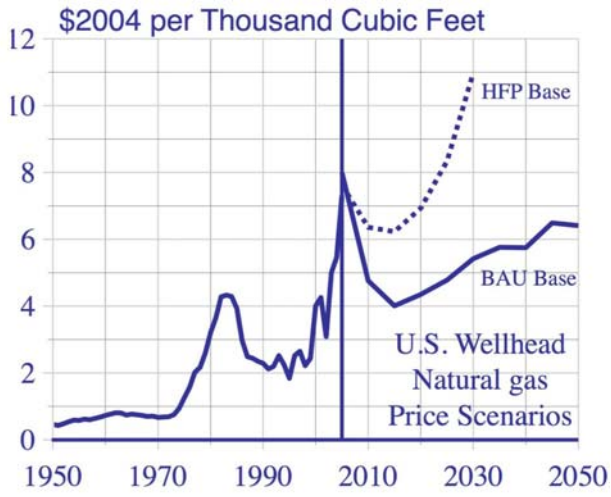
[1] National Research Council, Prospective Evaluation of Applied Energy Research and Development at DOE (Phase One), 2005

[2] Global Climate Change Policy Book. The White House, February 2002. http://www.whitehouse.gov/news/releases/2002/02/climatechange.html



Dashed line represents world oil price under "High Fuel Price" (HFP) scenario. Solid line represents world oil price under "Business-As-Usual" (BAU) or AEO 2006 reference oil price case. NEMS-GPRA08 2010 to 2030 MARKAL-GPRA08 2035 to 2050

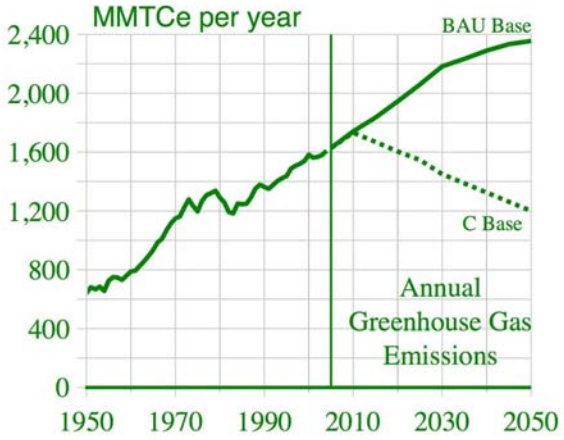
Historical data to 2005 from U.S. Department of Energy, Energy Information Administration. *Annual Energy Review 2005* DOE/EIA-0384 (2005) (Washington, D.C., July 2006) Table 5.21 Crude Oil Refiner Acquisition Costs, 1968-2005. (http://www.eia.doe.gov/emeu/aer/contents.html)



Dashed line represents natural gas price under "High Fuel Price" (HFP) scenario. Solid line represents natural gas price under "Business-As-Usual" (BAU) or AEO 2006 reference oil price case. NEMS-GPRA08 2010 to 2030 MARKAL-GPRA08 2035 to 2050

NEMS-GPRA08 2010 to 2030 MARKAL-GPRA08 2035 to 2050
Historical data to 2005 from U.S. Department of Energy, Energy Information Administration. *Annual Energy Review 2005* DOE/EIA-0384 (2005) (Washington, D.C., July 2006) Table 6.7 Natural Gas Wellhead, City Gate, and Imports Prices, 1949-2005. (http://www.eia.doe.gov/emeu/aer/contents.html)

FIgure 1. Oil and Gas Prices Under a High Fuel Price Scenario



Solid line represents energy-related CO2 emissions for the Business as Usual baseline (without EERE's portfolio). Dashed line represents allowed emissions of CO2 under a carbon cap policy. Note that EERE's portfolio has no effect on carbon emissions under a carbon cap since the allowable levels of CO2 are dictated by policy.

Historical data to 2004 from U.S. Department of Energy, Energy Information Administration. Emissions of Greenhouse Gas Emissions in the United States 2005. DOE/EIA-0573(2005) (Washington, D.C., July 2006) Table B3 Total Energy-Related Carbon Dioxide Emissions by End-Use Sector, and the Electric Power Sector, by Fuel Type, 1949-2004.Table available at http://www.eia.doe.gov/emeu/aer/contents.html)

FIgure 2. Carbon Emissions Under a Carbon Cap Scenario