

Appendix A. Fuel Price and Commodity Cost Assumptions

For our Reference case, we adopted (with some modifications) the Energy Information Administration's (EIA's) assumptions from the High Energy Project Cost and High Energy Price cases in its Annual Energy Outlook (AEO) 2008 report (see EIA 2008) to project oil, natural gas, and coal prices. These changes were made to account for recent cost increases and for expectations of higher prices compared with the AEO 2008 Reference case forecast. However, we assumed that construction cost escalation and pipeline cost escalation only continues until 2014, while the EIA assumed the construction cost and pipeline cost escalation continues until 2030.

The AEO 2008 Reference case included updated assumptions with higher costs than previous AEO's for new power plants, drilling and pipeline construction in the oil and natural gas industry, refinery costs, and capital costs in the liquefied natural gas (LNG) supply chain. However, this case assumed no real escalation in energy project costs over the near or long term.

The EIA's AEO 2009 report also included an updated Reference case to reflect the provisions of the American Recovery and Reinvestment Act of 2009 and to reflect recent changes in the economic outlook (EIA 2009). Initial capital costs for new generating power plants were updated on the basis of costs reported in late 2007 and early 2008. AEO 2009's updated assumptions reflect an increase of roughly 30 percent relative to the cost assumptions used in AEO 2008.

Due to a strong correlation between rising power plant construction costs and rising commodity prices, the new construction costs in AEO 2009 were tied to a producer price index for metals and metal products. The nominal index was converted to a real annual cost factor, using 2009 as the base year. The resulting new AEO 2009 cost factor remains nearly flat for the next few years, then declines by a total of roughly 15 percent to the end of the projection in 2030. As a result, the future capital costs are lower even before technology learning adjustments are applied. The same cost factor is applied to all technology types.

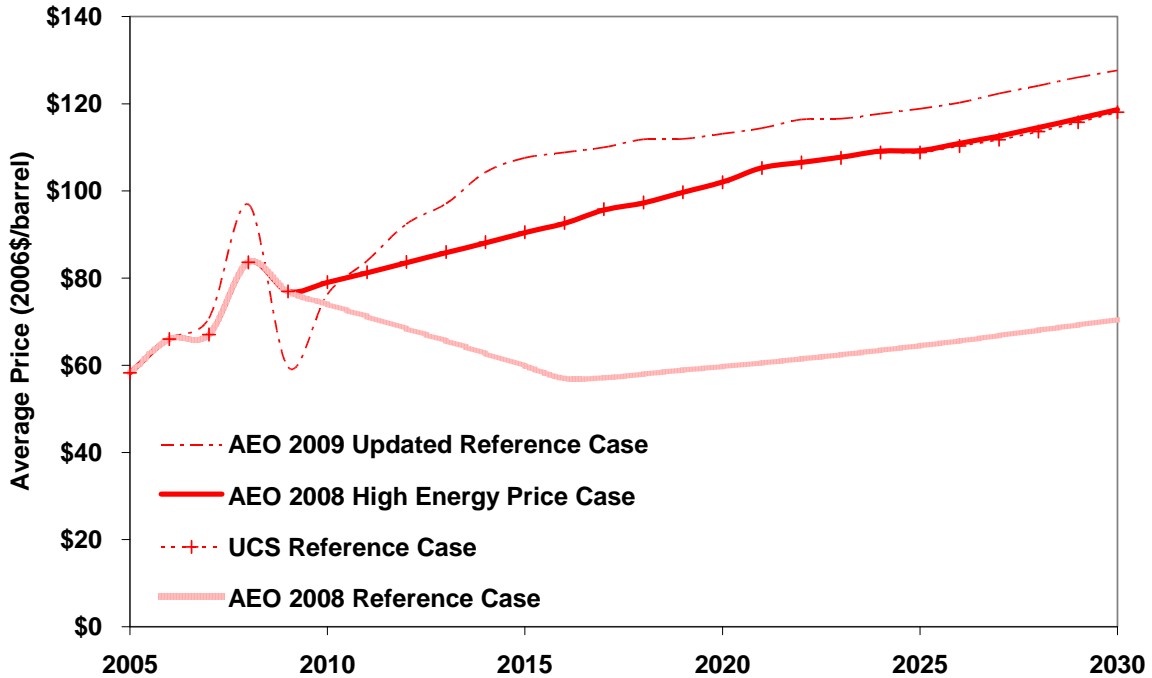
A.1 Oil Prices

Our Reference case oil price projections are consistent with those in the AEO 2008 High Energy Price case, but well below the AEO 2009 Reference case forecast (see Figure A.1).

In the AEO 2008 Reference case, the EIA calculated regional drilling costs from historical data from the American Petroleum Institute's *Joint Association Survey of Drilling Costs* (JAS). The EIA applied a cost escalation factor which is held constant until 2030, but its effect is partially offset by an annual technology improvement factor that reflects learning and increased efficiency. Pipeline construction costs are based on average construction cost data filed between 1992 and 2008, and the EIA assumed these

costs would remain constant through 2030. The Reference case also assumed that the costs for an Alaska pipeline and a pipeline from the Mackenzie Delta remain constant through 2030. The EIA assumed construction costs for refineries to remain constant at 2006 levels through 2030, based on the Nelson-Farrar index.

Figure A.1. U.S. Crude Oil Price Projections
(UCS Reference case vs. various AEO cases)



In the AEO 2008 High Energy Project Cost case, the EIA assumed that the costs for drilling oil and gas wells and for construction materials would continue to rise beyond current levels. Oil and gas well drilling costs escalate from 2007 through 2010 to twice the Reference case level in 2010. After 2010, the EIA assumed oil and gas well drilling costs are held constant at twice the AEO 2008 Reference case level though 2030. This cost escalation is partly offset by an annual technology improvement factor. The EIA also increased pipeline construction costs by 1 percent per year over the AEO 2008 Reference case for both pipeline construction in the lower 48 states and for the Alaska and Mackenzie Delta pipelines. In the refining sector, construction costs are increased above the AEO 2008 Reference case level by a factor equal to the percentage difference between the 2004 and 2006 Nelson-Farrar index and held constant from 2008 through 2030.

In the AEO 2009 Reference case, oil prices begin to rise in 2010 as the EIA predicts that the U.S. economy will rebound and that global demand will grow. The AEO 2009 Reference case assumed that access limitations restrain the growth of non-OPEC conventional liquids production between 2007 and 2030. The AEO 2009 Reference case

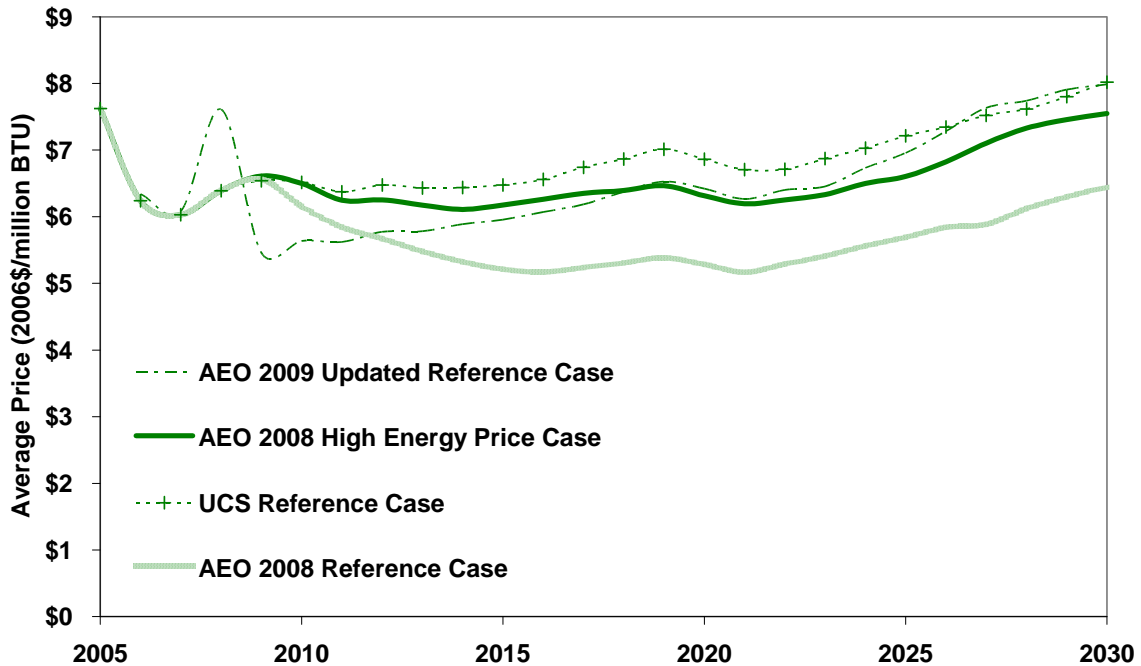
also included significant long-term potential for supply from non-OPEC producers. In several resource-rich regions, high oil prices, expanded infrastructure, and new exploration and drilling technologies all contribute to additional non-OPEC oil production.

Our Reference case adopted the assumptions of the AEO 2008 High Energy Project Cost case for oil and gas well drilling and pipeline construction costs, but limited pipeline cost escalation to 2014 to be consistent with construction assumptions in the electricity sector. The EIA also assumed pipeline cost escalation would continue to 2030 in the AEO 2008 High Energy Project Cost case.

A.2 Natural Gas Prices

The wellhead price of natural gas in 2030 is higher in the AEO 2009 Reference case than in the AEO 2008 Reference case. Wellhead prices in our Reference case are slightly higher than the AEO 2009 Reference case forecast until 2025, but slightly lower in the last five years of the forecast (see Figure A.2).

Figure A.2. U.S. Wellhead Natural Gas Price Projections
(UCS Reference case vs. various AEO cases)



The AEO 2008 Reference case construction costs for new natural gas liquefaction facilities match the EIA's 2006 cost estimate for facilities scheduled for completion between 2008 and 2011. The construction costs are assumed to remain constant at that level through 2015, then decline to only 15 percent above their pre-2006 levels in 2018,

after which the costs are assumed to remain constant at the 2018 level through 2030. The EIA assumed LNG shipping costs and construction costs for regasification facilities are 15 percent and 7 percent higher, respectively, than their 2006 levels.

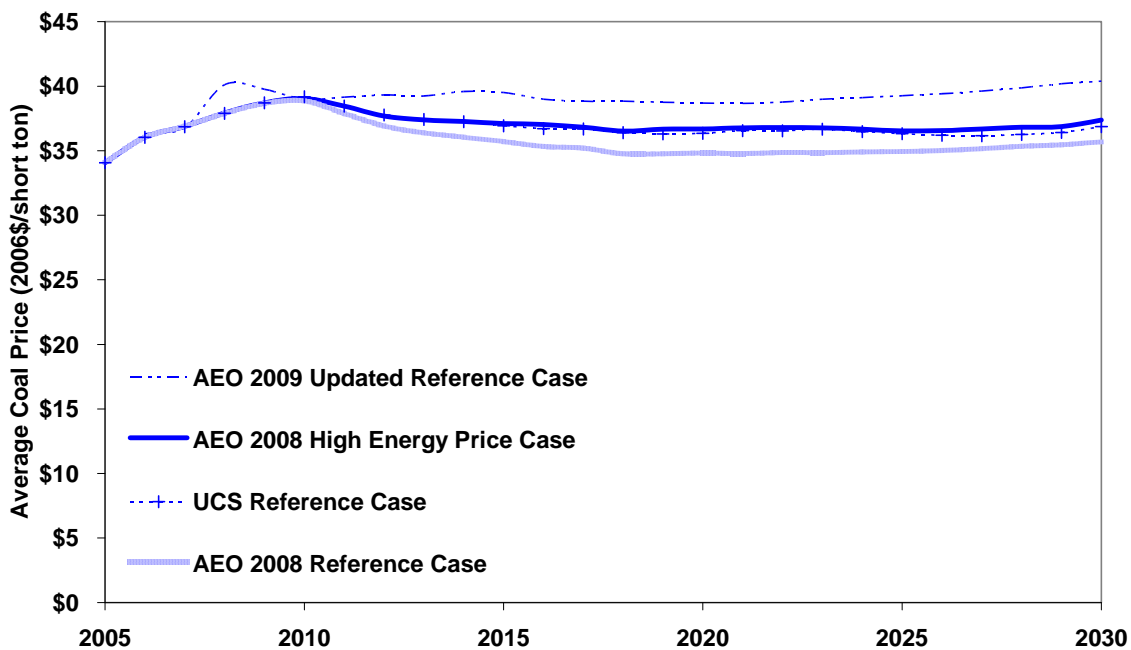
In the AEO 2008 High Energy Project Cost case, LNG liquefaction costs match the AEO 2008 Reference case through 2008, increase by 20 percent in 2009, and then remain constant through 2030. In this case, the EIA also increased construction costs for LNG regasification facilities by 15 percent above the AEO 2008 Reference case in 2008, and then held them constant through 2030. LNG shipping costs are 7 percent higher than the AEO 2008 Reference case through 2008 and then held constant through 2030.

In the AEO 2009 Reference case, natural gas prices decline at the end of 2008, stabilize through 2011, and then steadily increase through 2030. The price of natural gas is higher in the AEO 2009 Reference case than in the AEO 2008 Reference case due to higher exploration and development costs and a requirement for increased natural gas production (to meet increased consumption while imports are decreasing), particularly between 2020 and 2030. Total natural gas consumption is higher in 2030 as a result of an increase in natural gas use for power generation, and net imports are much lower.

A.3 Coal Prices

Our Reference case’s coal price projections are consistent with the AEO 2008 High Energy Price case, and only slightly higher than the AEO 2008 Reference case, but below the AEO 2009 Reference case forecast (see Figure A.3).

Figure A.3. U.S. Coal Price Projections
(UCS Reference case vs. various AEO cases)



The AEO 2008 Reference case assumed that investment costs will remain constant throughout the forecast. The base costs for all technologies in the Reference case were increased by 15 percent relative to AEO 2007 Reference case to reflect past cost increases.

The AEO 2008 High Energy Project Cost case assumed that costs continue to rise, leading to increasing investment costs. The EIA assumed that the base costs of new construction increase by 2.5 percent per year from 2007 through 2030, a rate based on the construction cost growth from 2003 to 2008. Although changes in learning rates can also affect the cost projections, in general, costs for most technologies in 2030 are about 75 percent higher in the High Energy Project Cost case than in the Reference case.

Our Reference case adopted the assumptions of the AEO 2008 High Energy Project Cost case for construction costs, but limited cost escalation only to 2010.

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References

Energy Information Administration (EIA). 2009. *An updated annual energy outlook 2009 reference case reflecting provisions of the American Recovery and Reinvestment Act and recent changes in the economic outlook*. SR/OIAF/2009-03. Washington, DC: U.S. Department of Energy.

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