APPENDIX 7-B. IMPACTS OF STANDARDS ON NATURAL GAS PRICES

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7-B.1 INTRODUCTION

The NIA described in Chapter 7 identifies examines the potential impacts of new standards on the nation using EIA projections for future natural gas and oil prices. For the analysis of the final rule for commercial boilers, DOE undertook a review of the potential impact of commercial packaged boiler energy efficiency standards on natural gas prices.

7-B.2 NATIONAL ENERGY SAVINGS AND NATIONAL NET PRESENT VALUE RESULTS CALCULATED FROM THE MARKET BASELINE

A review of the economic literature indicates that there is support for the idea that an impact on natural gas prices will occur with a reduction in overall natural gas energy consumption and that the price impact would result in a reduction in overall natural gas prices. DOE examined two earlier analyses of the effect that a reduction in natural gas usage due to efficiency standards would have on natural gas prices. These were analyses and results published in the 2007 Furnace and Boiler final rule (72 FR 65136, 65152-54 (Nov. 19, 2007))[1] and in analysis prepared for the preliminary TSD for standards for residential water heaters for 2009[a]. The natural gas price analysis for the furnaces and boilers rulemaking was conducted using a version of the 2007 NEMS-BT that was modified to account for energy savings associated with possible standards for residential gas furnaces, and for the residential water heaters standards rulemaking that used the 2008 NEMS-BT.

The preliminary analyses in both studies above estimated that gas demand reductions resulting from more stringent minimum energy conservation standards would reduce the U.S. average wellhead natural gas price. An inverse elasticity was calculated in both studies, relating a percentage reduction in the average wellhead natural gas price to a percentage reduction in total annual natural gas consumption. In the furnace and boiler rule, DOE estimated that this inverse elasticity was approximately 0.9. In the residential water heater preliminary analysis, DOE estimated an inverse elasticity of approximately 0.8. An elasticity of 0.9 means that for a 1 percent change in energy consumption, the nation experiences a 0.9% reduction in fuel price. Given the closeness of these inverse elasticity figures for furnaces and water heaters, and given the expected similarity in energy end-use profile expected for space heating equipment, DOE chose to estimate the impact for commercial packaged boilers based on the elasticity estimated for residential furnaces, or 0.9 percent.

DOE then proceeded to estimate the likely maximum impact on fuel prices resulting from new boiler standard. DOE's analysis was based on the impact calculated from adopting the highest efficiency level analyzed for the class of small gas-fired hot water boilers.

[a] Data and preliminary results from analysis of residential water heaters provided by LBNL in June, 2009 indicated an inverse price elasticity of between 0.79 and 0.81 for natural gas water heaters. Exchange of Email between David Winiarski, PNNL and Alex Lekov, LBNL, June 2009.

The condensing efficiency level for small gas-fired hot water boilers showed an estimated savings of 0.223 quads over the period from 2012-2042. DOE estimated the impact that the stream of energy savings would have on natural gas prices over the same period. It did this by calculating in each year in the analysis period the percentage reduction in overall natural gas energy use for the nation. This was done by dividing the quad savings projected from small gas-fired hot water boilers at the condensing efficiency level from the NES analysis by the total U.S. natural gas consumption from NEMS-BT for that year. DOE used the EIA 2009 April 2009 reference case forecast[2] as providing the base national consumption. The result is a fractional change (reduction) in natural gas fuel use for each year, varying from -0.00011% in 2012 to -0.064% in 2042. (See Figure 7-B.1)

DOE then applied the inverse elasticity by multiplying the 0.9 value by the fractional change in fuel consumption calculated in each year and then by the well head natural gas price at the well head, as predicted by EIA. For well head prices between 2031 and 2042, DOE used the average escalation rate for the 10 year period from 2021 to 2030 to escalate the 2030 price and develop estimates for wellhead prices in 2031-2042.

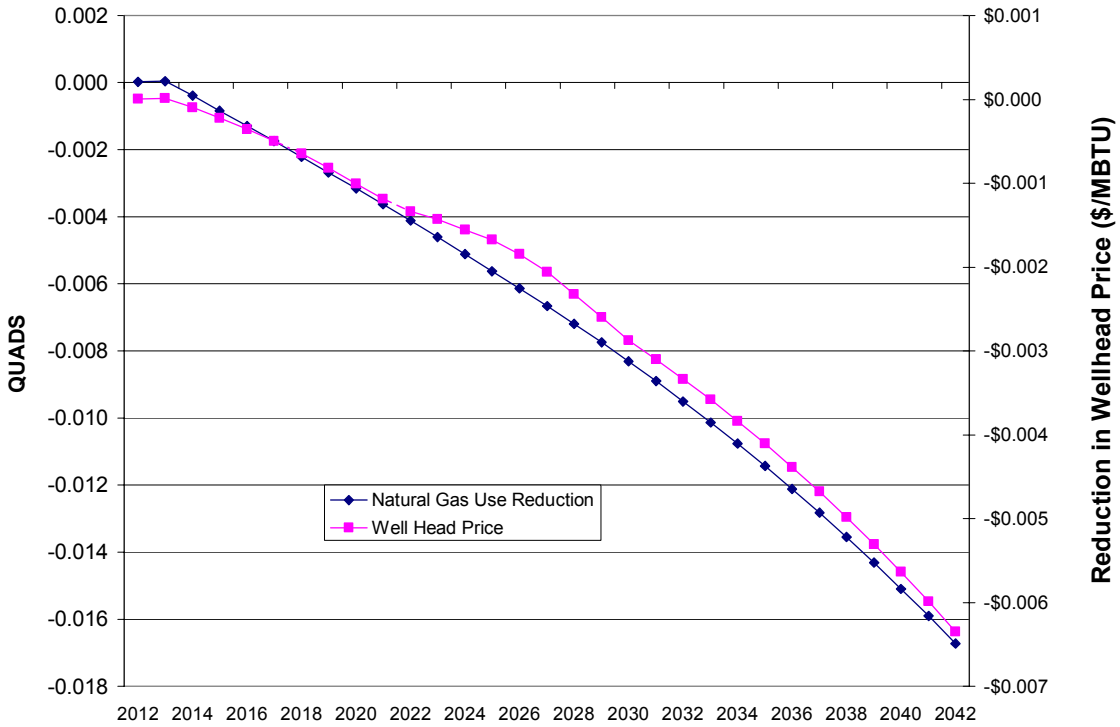

Figure 7-B. 1 Change in Natural Gas Usage and Price Due to Condensing Standards for Small, Gas-Fired, Hot water Boiler

For the 2012-2042 time period, DOE estimated that the average price changes amounted to a decrease in the wellhead price for natural gas of 0.25 cents per million Btu. Analysis done for the furnace and boiler rule showed that while changes in price were could be positive and negative depending on use sector, the effect on the wellhead price for natural gas was a decrease.

In previous studies, the projected change in the natural gas price varies among the end use sectors. For example, in the analysis for residential furnaces, DOE estimated that natural gas prices would decrease for the industrial and electric power sectors, and increase for residential consumers. The increase in the residential price is believed to occur because the fixed charges (e.g., transmission infrastructure costs) are spread over fewer million Btu of gas sales in the standards case, thus placing upward pressure on the average price per million Btu. A similar pattern could be expected to occur in the commercial sector with commercial boilers.

Although the estimated reduction in average natural gas prices is small, the estimated economy-wide savings in natural gas expenditures over the 2012-2042 forecast period have an estimated net present value of $0.29 billion at a seven-percent discount rate.

7-B.3 COMPONENTS OF THE BENEFIT

A decline in natural gas consumption may lower natural gas prices for two primary reasons. A decrease in consumption would lower the output of existing natural gas production capacity, leading to increased competition and downward pressure on prices. A second reason is that reduced consumption slows the depletion of low-cost gas reserves which lowers the future cost of finding and extracting natural gas resources.

When gas prices drop in response to a lower output of existing natural gas production capacity, consumers benefit, but producers suffer. In economic terms, the situation represents a benefits transfer to consumers (whose expenditures fall) from producers (whose revenue falls equally). When prices decrease because extraction costs decline, however, consumers and producers both benefit, and the change in natural gas prices represents a net gain to society. Consumers benefit from the lower prices, and producers, whose revenues and costs both fall, are made no worse off.

The short-term impact of lower consumption on natural gas price likely results from changes in the utilization of natural gas production and capacity. In the short run, DOE expects that consumer savings from lower natural gas prices would be offset by declines in gas producer revenue. In the long run, however, previous analyses for residential furnaces indicated that the reduction in natural gas prices mainly results from changes in gas extraction costs. Since there is only a limited supply of low-cost, conventional natural gas sources, natural gas extraction costs rise over time as these low-cost sources are depleted. Reduced gas demand puts downward pressure on extraction costs and prices by delaying the depletion of the low-cost reserves and the shift toward higher-cost sources. However, as changes in extraction costs are projected to occur in later years, the uncertainty of the actual savings that would be realized is increased.

Based on the discussed analysis, DOE recognizes that there is uncertainty about the magnitude, distribution, and timing of the costs, benefits, and net benefits within the economy. DOE's previous analyses indicated that the prices of natural gas to the end use consumers (residential) would increase slightly, due to fixed costs in the distribution of natural gas to the consumer becoming a higher fraction of the total cost. A similar effect is possible in the

commercial sector with commercial boilers. While DOE has not been able to estimate these potential effects, DOE anticipates the effect will be small since the magnitude of the gas price change is small (but likely to vary as the natural gas savings increases).

Similarly, DOE is uncertain of the effects of the drop in natural gas on producers and distributors of natural gas. While their revenues and costs are expected to drop, it is uncertain whether they will drop in proportion over time. The supply side will likely experience revenue loss due to both the price changes and the reduction in gas sales that they will experience.

REFERENCES

1 *DOE, 2007. Technical Support Document for Residential Furnaces and Boilers.* U.S. Department of Energy. Available at <http://www1.eere.energy.gov/buildings/appliance_standards/residential/furnace_boiler_fr.html>. Last accessed June 2009

2 American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE). 2008. *Energy Standard for Buildings Except Low-Rise Residential Buildings*. ANSI/ASHRAE 90.1-2007, ASHRAE, Atlanta, Georgia.