Alternative Natural Gas Price Forecasts

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Why Forecast Natural Gas Prices?

- Directed by statutes in state law:

  "At least every two years, the commission shall conduct assessments and forecasts of all aspects of energy industry supply, production, transportation, delivery and distribution, demand, and prices." {PRC § 25301 (a)}

- Natural gas price forecasts are used internally as inputs for electricity demand, transportation fuels forecasts, design building standards and others.
- Other state agencies and the public

2005 IEPR on Natural Gas Price Forecasts

- Although the Commission in the 2005 IEPR adopted a natural gas price forecast, it directed staff to:

"*…further investigate alternative forecasting methods in the 2007 Energy Report cycle to better assess future gas prices*."
(2005 IEPR, page 129)

2007 IEPR on Natural Gas Price Forecasts

- During the 2007 IEPR cycle staff tried to better portray uncertainties surrounding the forecast and conducted four sensitivities. Commissioners again directed staff to:

  "Conduct a rigorous verification of the models used to forecast natural gas supply and price by evaluating the reasonableness and economic and physical likelihood of model results." (2007 IEPR, page 187)

2009 IEPR on Natural Gas Price Forecasts

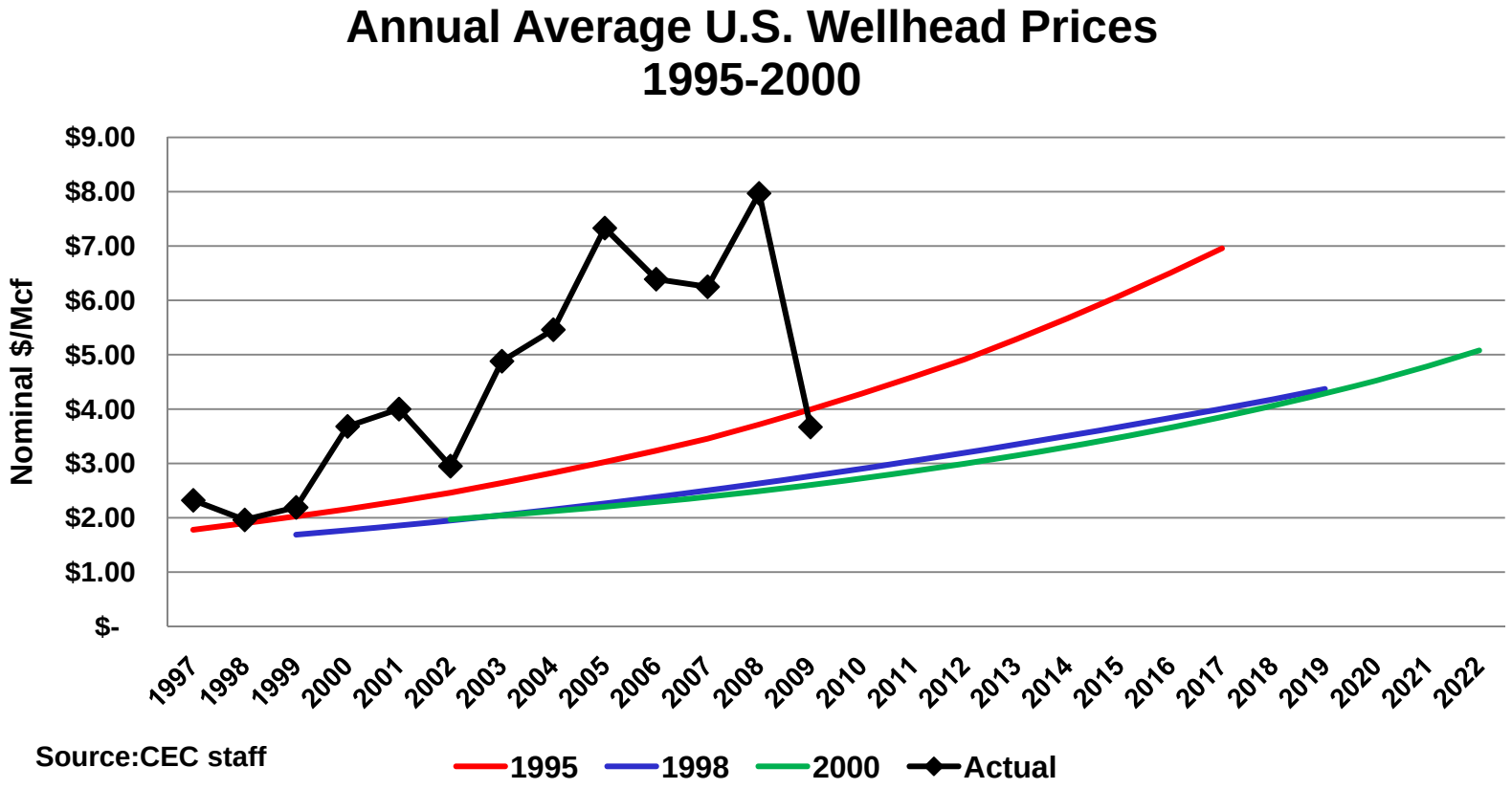
- During the 2009 IEPR cycle staff did not generate a price forecast.
- Commissioners questioned the need for a single point price forecast:

"…past efforts to forecast natural gas prices have been highly inaccurate compared to actual prices, even when price volatility was largely dominated by traditional, physical market factors. Additionally, as the United States continues moving toward a carbon-constrained existence, future greenhouse gas policies will further complicate these efforts, likely rendering future natural gas prices forecasts even less accurate and more uncertain. The uncertainty associated with predicting major input variables and the resulting natural gas price forecasts brings into question the value of producing date-specific, single-point natural gas price forecasts." (2009 IEPR, page 13)

CEC staff Assumptions and inputs in the 1990s

- Anadarko and Permian Basins will continue to grow and Rocky mountain gas will play a big role for gas in the West
- Canadian Exports will continue to grow
- Natural gas will be plentiful in the next 50 years mainly from Canada and the Rockies

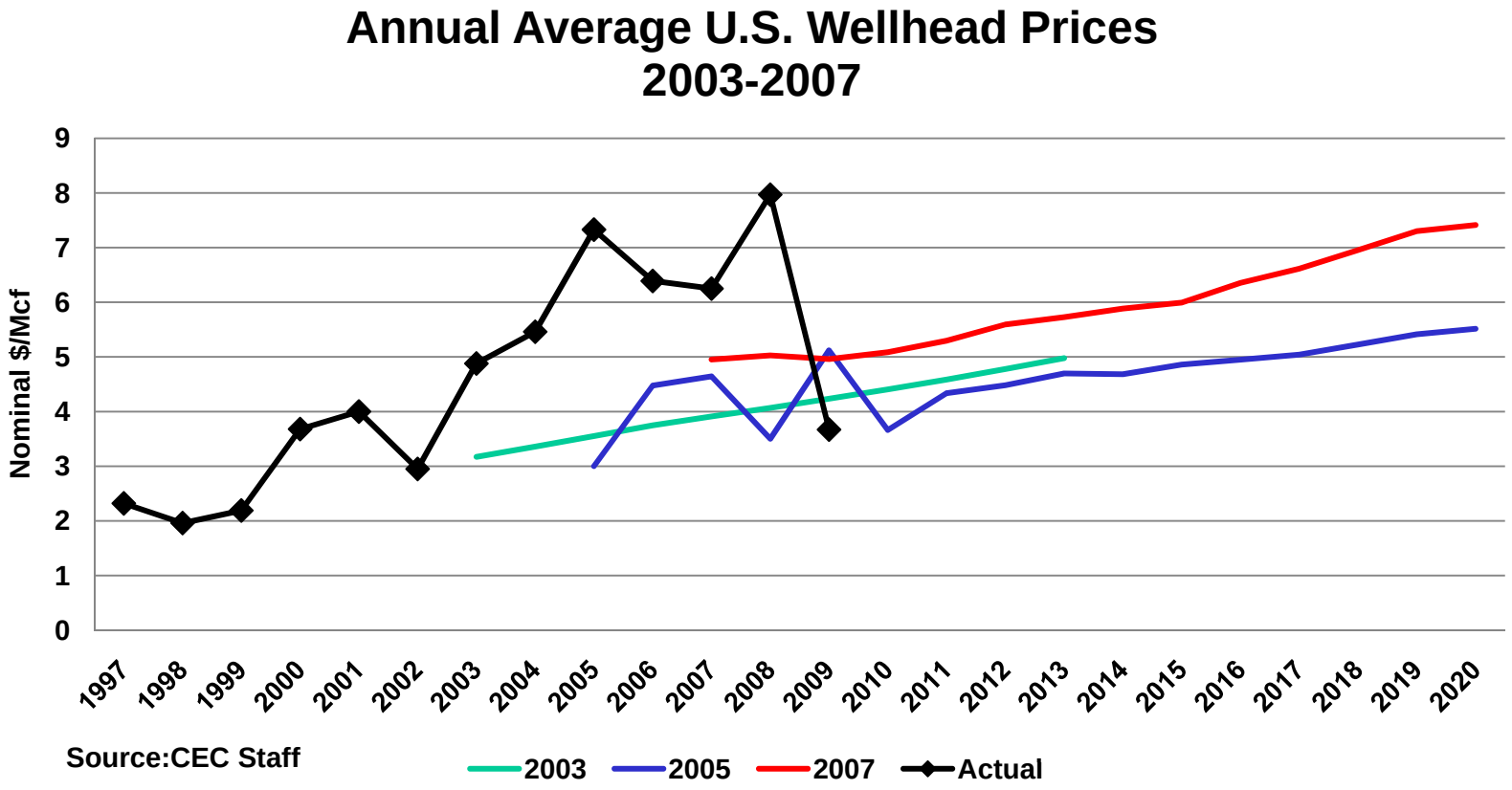
Staff's Natural Gas Price Forecast Vs Actual



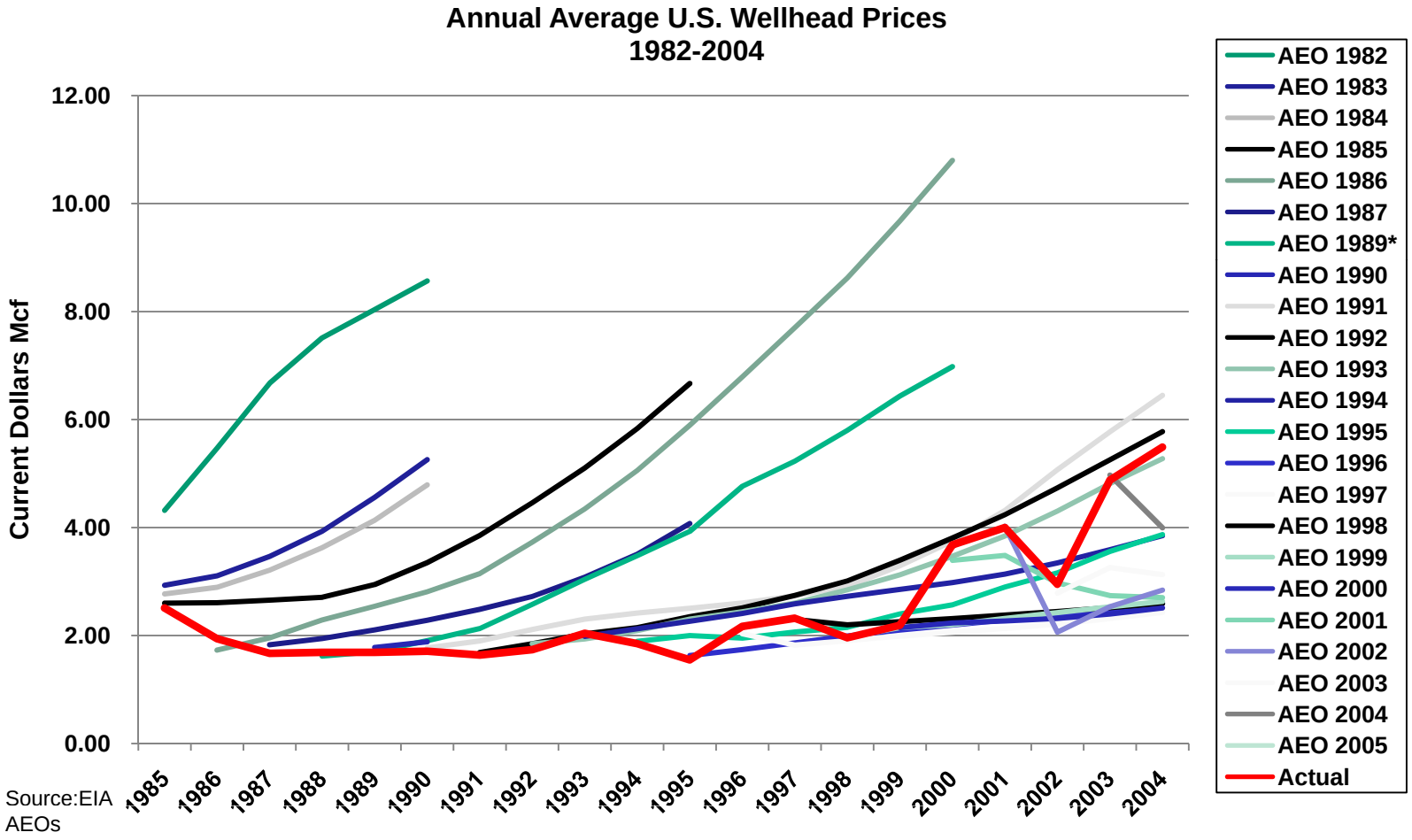
CEC staff Assumptions and Inputs in the 2000s

- Gas prices will continue to grow due to strong demand
- Conventional gas production will continue to decline
- McKenzie Delta and Alaskan pipelines feasible by 2015
- LNG prospects in the West Coast will increase
- More gas from Rockies to West with Ruby

Staff's Natural Gas Price Forecast Vs Actual



EIA AEO Natural Gas Price Forecast Vs Actual



Source:EIA AEOs

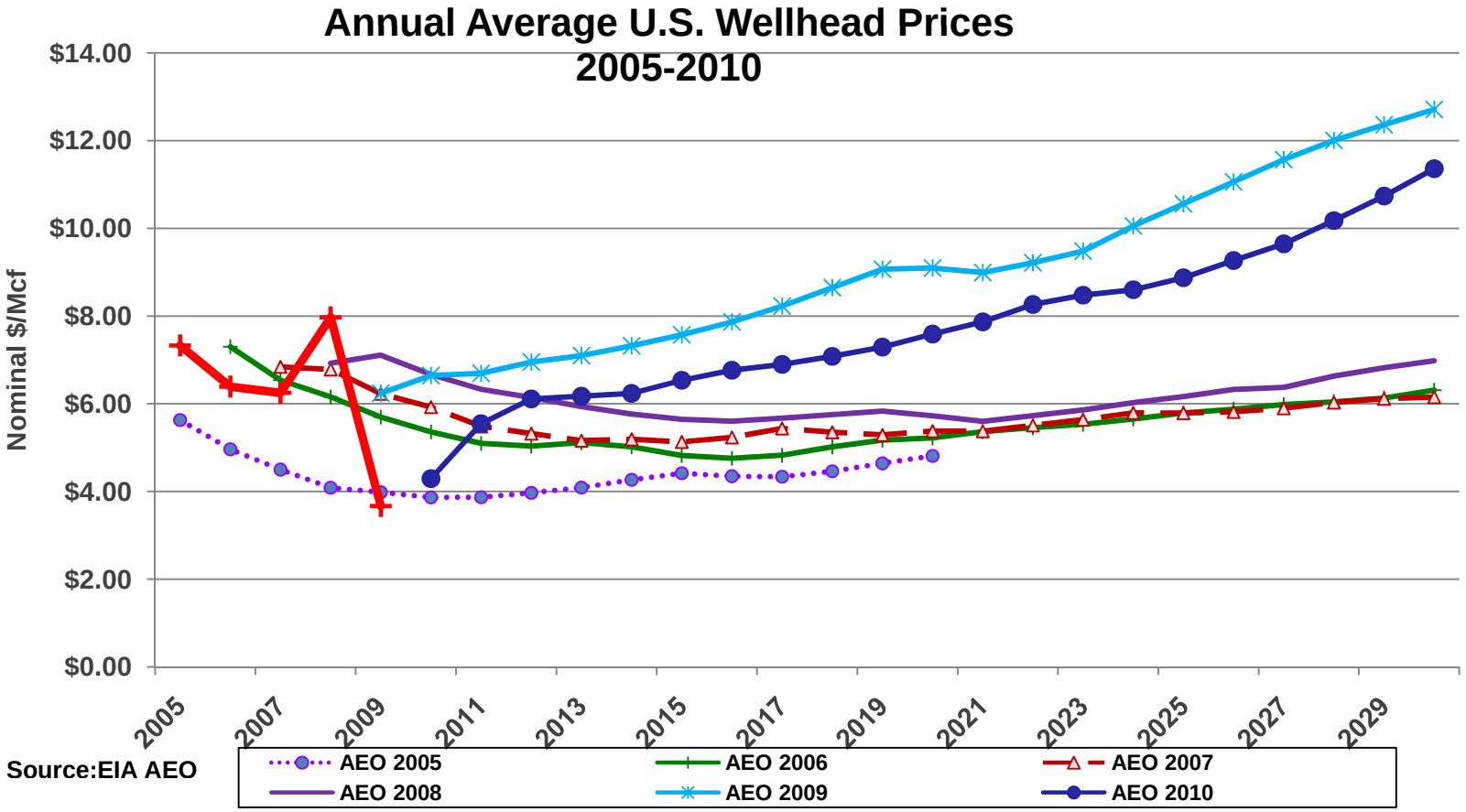
EIA Assumptions and Inputs AEO 2005

- Domestic production will decline in the next 20 years—30 percent net imports from Canada and LNG by 2025.
- Alaskan pipeline by 2016
- Strong demand for gas for power generation—31 percent of all gas consumed in the U.S. by 2025
- Rocky Mountain gas production (mainly unconventional) will reach 38 percent of Lower 48 production by 2025
- McKenzie Delta pipeline to open in 2010

EIA Assumptions and Inputs AEO 2008

- LNG imports will continue to increase
- Unconventional gas production from tight sandstones, coal bed methane and gas shales will increase from 8.5 tcf in 2006 to 9.5 tcf in 2030—the production from shale gas alone in 2010 reached 5.0 tcf
- Net imports from Canada will decline

EIA AEO Natural Gas Price Forecast Vs Actual



Source:EIA AEO

EIA Assumptions and Inputs AEO 2010

- Moderate growth in energy consumption
- Increase use of renewables
- Strong increase of shale gas production. It might grow up to 6.0 tcf by 2035
- No explicit regulations to limit GHG

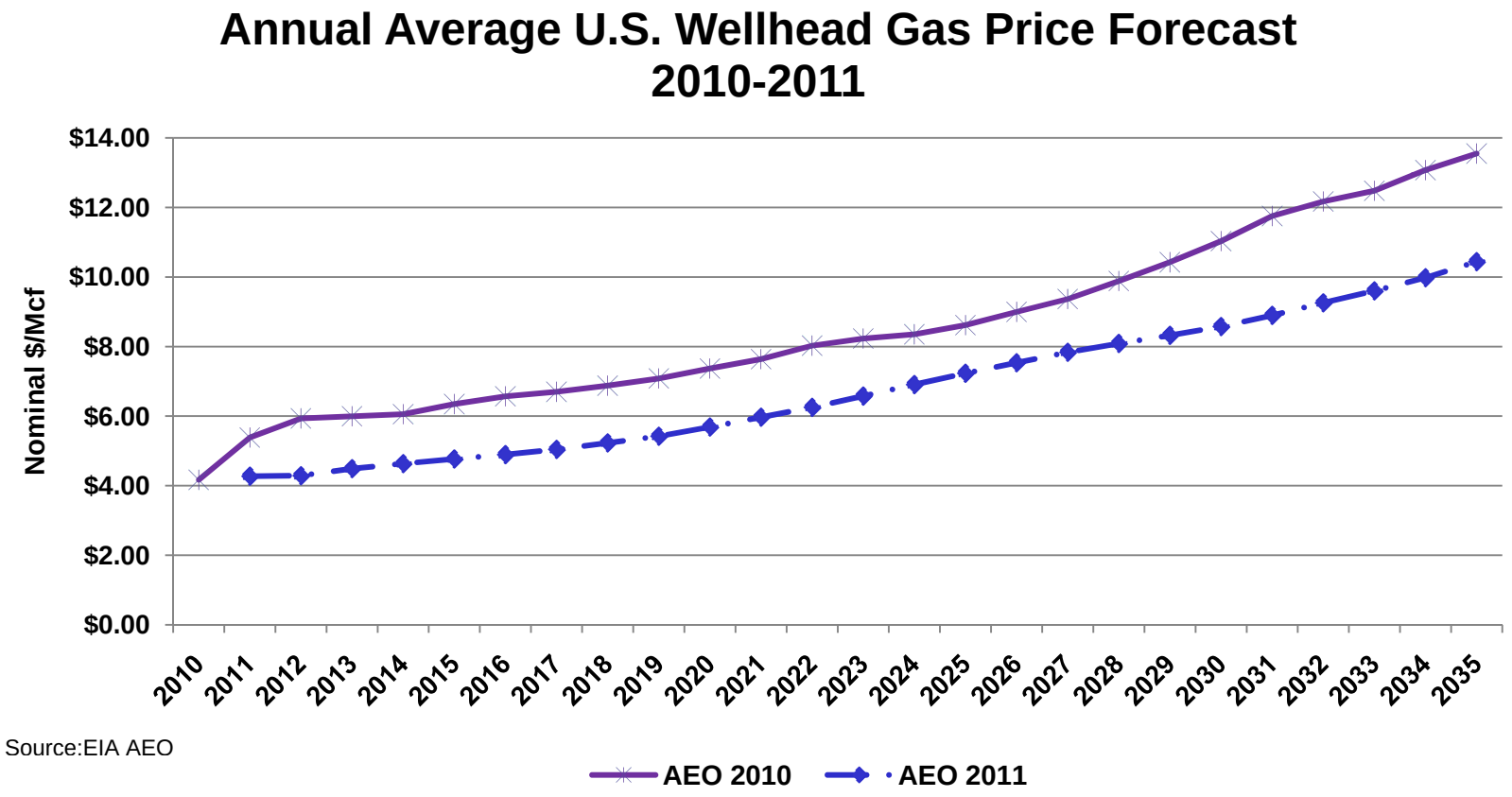
EIA's 2011 AEO Early Release

- Lower U.S. net imports of LNG
- Influence of oil prices on natural gas prices will decline
- Delays of projects as a result of offshore oil and gas drilling moratoria

EIA's 2011 AEO Early Release

- 2010 AEO assumed 347 trillion cubic feet (tcf) of technically recoverable shale gas
- 2011 AEO early released increase assumption of technically recoverable reserves to 827 (tcf)
- The Alaska pipeline is not constructed

EIA AEO Natural Gas Price Forecast Vs Actual



Source:EIA AEO

Bentek Assessment First Quarter 2011

- Gas production from shale formations increasing faster than expected
- Expected exploration and production industry consolidation in 2013
- Low Canadian gas imports

Bentek Assessment First Quarter 2011

- Imports of Canadian gas are very sensitive to prices. Canadian gas will continue to arrive to U.S.during high demand periods
- High overseas prices and low U.S. prices prevent LNG imports and will continue to decline for the next 4-5 years
- Gas prices in U.S. will be under $5.0/MMBtu for next five years

Navigant's Market Notes

- Strong gas production from shales in the next couple years
- High prices of associated gas liquids are also generating high production of gas
- Overseas investors in domestic operations are contributing to overproduction of gas in the short run

Moving Forward

- Staff, with help from consultants, has thoroughly reviewed the methodology and models used for forecasting natural gas parameters. The team concluded that:

1. MarketBuilder platform, used by staff in the past, was the appropriate tool.

2. Using a model of natural gas market developed by someone else, such as the one from the Energy Institute at Rice University was best way to proceed.

Moving Forward cont.

3. Staff must do a better job at portraying the outputs from the models as conditional results due to the numerous uncertainties in assumptions and inputs.

- Because of concerns by Commissioners and management on generating a single point price forecast, staff is proposing to develop cases, sensitivities and scenarios that will be helpful to decisionmakers