

April 8, 2016

MEMORANDUM FOR: JOHN CONTI
ASSISTANT ADMINISTRATOR FOR ENERGY ANALYSIS

FROM: MINDI FARBER-DEANDA
ACTING TEAM LEAD
NATURAL GAS MARKETS TEAM

JOHN STAUB
TEAM LEAD
EXPLORATION AND PRODUCTION ANALYSIS TEAM

EXPLORATION AND PRODUCTION and NATURAL GAS
MARKETS TEAMS

SUBJECT: Second AEO2016 Oil and Gas Working Group Meeting Summary
(presented on February 29, 2016)

Attendees:

- Joseph Benneche (EIA)
- Katie Dyl (EIA)
- Terry Yen (EIA)
- Danya Murali (EIA)
- Laura Singer (EIA)
- Faouzi Aloulou (EIA)
- Dana Van Wagener (EIA)*
- Troy Cook (EIA)*
- Mindi Farber-DeAnda (EIA)
- John Staub (EIA)
- Barbara Mariner-Volpe (EIA)
- Kevin Easley (DOE)*
- Taylor Malone (ARI)
- Brett Murray (ARI)
- Keith King (Moyes & Co)*
- Doug Tierney (Encana)*
- Gurcan Gulen (UT-Austin, BEG)*
- Ben Schlesinger (BSA)*
- Ken Ditzel (FTI Consulting)*
- Richard Nehring*
- Mike Lynch (SEER)*
- Geoffrey Brand (API)*
- Anas Alhajji (NGPTRS)*

Beth Lau (CAPP)*
Katrina McLaughlin (RFF)*
Kara Callahan (OnLocation)*
Harry Vidas (ICF)*
Bob Hugman (ICF)*
Jack Weixel (PointLogic)*
Dave Schmalzer*
Jairam Gopal (Deloitte)*
Anthony Yuen (Citi Research)*
Kevin Massy (StatOil)*
Melissa Whitten (DayMark)*
Robert J Smith (DOE)*
Marshall Carolus (INTEK)*
Stuart Mueller*

*Attendance via WebEX

Presenters: Katie Dyl (NGTDM)
Dana Van Wagener (OGSM)

Presentation:

The Annual Energy Outlook 2016 (*AEO2016*) schedule started later and will result in a later publication than most years, target of June. The *AEO2016* will have standard cases – Reference case, High/Low Oil Price cases, High/Low Macroeconomic Growth cases, and the High/Low Oil and Gas Resource/Technology cases – and a variety of other cases.

The presentation provided preliminary oil and natural gas production and price results for the *AEO2016* in the Oil and Gas Supply Module (OGSM) and the Natural Gas Transmission and Distribution Module (NGTDM), highlighting major changes compared to the *AEO2015* Reference case.

For natural gas market modeling, the following were presented:

- Natural gas supply and delivered prices
- Natural gas consumption
- Pipeline imports/exports
- LNG exports

For oil and gas supply modeling, the following were presented:

- New approach to representing changes in Resources and Technology improvements
- Production of oil and natural gas across several scenarios by resource type, tight oil and shale gas plays
- Oil and natural gas price trends
- Liquids imports

Questions and answers regarding the NGTDM:

- 1) What causes the dip in natural gas consumption in the electricity generation sector around 2022? (slide 7)

EIA RESPONSE: Mainly renewables capacity growth. Natural gas prices are also rising in this time period.

- 2) Why don't renewables appear to extend growth past 2022?

EIA RESPONSE: The tax credits are phased out or expire after this time period. So renewables continue to grow, just at a slower rate. Natural gas is also replacing coal after this time period, leading to its increase.

- 3) Pipeline exports to Mexico being to decline around 2020. Is that because their production is increasing? (slide 9)

EIA RESPONSE: Yes. After 2020, U.S. exports to Mexico remain flat for several years, then begin to slowly decline due to new production in Mexico.

- 4) If shale gas resources are larger, will LNG capacity increase?

EIA RESPONSE: Potentially. When we have run our high oil and gas resource case previously we have seen more U.S. LNG liquefaction capacity built. LNG capacity increases are in response to the global natural gas price/world oil price relative to the price in the United States, which can be expected to be lower with more resources.

Questions and answers regarding the OGSM:

- 1) Does the future see rapid improvements in costs, EURs? Is it likely to have to rapid innovation near term, then slower further out?

EIA RESPONSE: Timing of new technologies is difficult. We just want a simple assumption that will capture both the slow incremental improvement in industry practices and the rapid employment of future as yet unidentified technologies.

- 2) Applying an S-curve to technology improvement would be more reasonable than linear improvement over time.

EIA RESPONSE: How should we choose the timing of the inflection point and slowdown in technology improvement? What about new future technologies that are not on the radar now? Technology advancement is expected to continue throughout the projection period without specifying the timing and contribution of specific technologies.

- 3) What vintage EUR's are the basis for AEO2016?

EIA RESPONSE: We are using wells drilled in 2013, 2014 and 2015.

- 4) STAKEHOLDER COMMENT: Onshore and offshore costs are different.

- 5) The good wells in the Middle Bakken probably have 3x the reasonable resource than the Three Forks. Are your projections too optimistic?
EIA RESPONSE: We have fit decline curves to all wells drilled in the Three Forks and use the mean EUR for each county. The Three Forks covers over 25 million acres and much of the area has little to no drilling. The EURs in undeveloped areas are based on the EURs of nearest developing counties but discounted as the distance from these counties increases.
- 6) Why is the Eagle Ford decreasing? Exhaustion of resources?
EIA RESPONSE: Only a few counties have productive wells. Drilling in the Eagle Ford is competing with drilling in other more production tight oil plays in Texas.
- 7) Have you reviewed/revised your resource assumptions for the Woodford?
EIA RESPONSE: We did update the Woodford resources. It's difficult to judge where wells are going to go with the low prices- it's hard to get drilling schedules consistent with the real world in the low price environment.
- 8) Operator cash flow is a constraint on how much production can increase.
EIA RESPONSE: In general, cash flow impacts production and limits development in early years. We assume greater cash flow in later years.
- 9) Costs and facilities are important constraints.
EIA RESPONSE: Agreed. We represent development of resources as a function of the net present value of drilling in a play.
- 10) STAKEHOLDER COMMENT: Four years ago we wouldn't have anticipated the amount of growth that could be sustained.
- 11) Is shale gas different from tight gas?
EIA REPNONSE: Tight gas comes from tight sandstone carbonate plays.
- 12) Tight sandstone gas peaked in 2008. Pinedale is backing out. Cotton Valley has 160 acre spacing and can be drilled more closely.
EIA REPNONSE: We assume that improvements in technology and industry practices in shale gas and tight oil formations will also be applied to tight gas resources.
- 13) Can you check the cumulative integral production from 2015-2040 to see how much resource is produced by 2040? Cannot produce at maximum rate beyond 70% of total recoverable resource.
EIA REPNONSE: We have looked at the cumulative production through 2040 and have not exceeded a reasonable recovery rate where we have an estimate for oil or natural gas in-place.
- 14) Fluid physics interfering with recovery over time. For example in North Dakota the gas-to-oil ratio (GOR) has increased from 1,000 mcf/barrel to 1,400 mcf/barrel in recent years.

EIA REPOSENSE: We assume flat gas-to-oil ratio over time.

15) How much larger is the Utica this AEO?

EIA REPOSENSE: We added roughly 100 Tcf additional resources to the Utica.