

October 24, 2012

MEMORANDUM FOR: John Conti  
Assistant Administrator for Energy Analysis

Alan Beamon  
Office Director  
Office of Electricity, Coal, Nuclear, and Renewables Analysis

Paul Holtberg  
Team Leader  
Analysis Integration Team

FROM: Electricity Analysis Team

SUBJECT: Summary of the 2<sup>nd</sup> AEO2013 Electricity Working Group Meeting, held on October 11, 2012

ATTENDEES: Michelle Adams (EIA OEA)  
Alan Beamon (EIA OEA)  
\*Aaron Bergman (DOE: PI)  
Bill Booth (EIA OES)  
\*Erin Boyd (DOE: PI)  
Gwen Bredehoeft (EIA OEA)  
\*Thomas Cochran (NRDC)  
\*Jarad Daniels (DOE: FE)  
Jim Diefenderfer (EIA OEA)  
Vlad Dorjets (EIA OES)  
Bob Eynon (EIA OEA)  
Tyler Hodge (EIA OEA)  
\*David Hunter (EPRI)  
Ayaka Jones (EIA OEA)  
Jeffrey Jones (EIA OEA)  
Diane Kearney (EIA OEA)  
\*Sikander Khan (DOE: FE)  
\*Jordan Kislear (DOE: FE)  
Mike Leff (EIA OEA)  
\*Jennifer Li (DOE: PI)  
Laura Martin (EIA OEA)  
Carrie Milton (EIA OEA)  
Chris Namovicz (EIA OEA)  
Sam Napolitano (EIA OEA)  
\*Chris Nichols (NETL)

Marie Rinkoski Spangler (EIA OEA)  
\*David Shoerberlein (DOE: PI)

## WEBEX

### ATTENDEES:

\*Justin Adder (DOE: NETL)  
\*John Brewer (DOE: NETL)  
\*Dan Chartier (EEI)  
\*Kyler Gates (Westinghouse)  
\* Gürcan Gülen (University of Texas)  
\*Eric Holdsworth (EEI)  
\*Jennifer Macedonia (BPC)  
\*David Schmalzer (Argonne)  
\*Sharon Showalter (OnLocation)  
\*Bill Stevens (EPA)  
\*Glenn Stoner (City of CO Springs Dept. of Utilities/ NCTA)  
\*Frances Wood (OnLocation)  
\*Evelyn Wright (DecisionWare)  
\*David Young (EPRI)

### \*Non-EIA Attendees

Presenter: Carrie Milton

*Topics covered included key changes in AEO2013 compared to the AEO2012 reference case, including coal plant retirements, planned capacity additions for all technology types, generation shares by fuel types, fuel prices, and electricity demand growth. The key modeling assumptions for AEO2013 were addressed, including (1) full replacement of CSAPR with CAIR and the corresponding impacts on the coal fleet and natural gas generation, (2) extending the projection through 2040, (3) incorporation of updated capital costs for new technologies in the model and the resulting impact on endogenous capacity additions, (4) nuclear uprates and retirements assumed in addition to reported uprates and retirements, (5) and reported nuclear planned additions included in the forecast. Carrie Milton presented the preliminary results via PowerPoint to those in attendance and via WebEx.*

### Specific discussion relevant to electricity markets:

1. Carrie Milton explained the main assumptions in place for the AEO 2013 that have the biggest impact on the forecast as compared to the AEO 2012 reference case. These included the implementation of MATS in 2016 and updated capital costs for new technologies. Capital costs for generating technologies decreased by more than 10% for wind, solar photovoltaic, and natural gas combined cycle and increased more than 10% for IGCC and IGCC with carbon capture and sequestration.
2. After viewing the AEO 2013 total electricity demand compared to the AEO 2012 electricity demand, a participant asked, "Do you have confidence limits around your input assumptions? Why do you present no confidence limits or uncertainties around your projections?" Alan Beamon responded that this is something that EIA considers, and is why

EIA analyzes side cases. Side cases are developed to effectively describe such uncertainties. The AEO Early Release, published later this year, will include the Reference case, while the full AEO will be released in the spring, with all of the side cases.

3. Carrie Milton demonstrated how the fuel price changes for natural gas (lower throughout the AEO 2013 forecast) and coal (higher throughout the AEO 2013 forecast) for the electric power sector led to lower coal generation and higher gas generation, in general, throughout the AEO 2013 forecast. This led to a larger discussion on the gas prices, which came up repeatedly throughout the presentation. A participant argued that gas prices should not be increasing at the rate seen in the forecast, and that if one hundred years of historical price information were evaluated we would see that fuel prices in general remain constant in real terms. Chris Namovicz pointed out that if we were to look at the past twelve years, there has been a tremendous drop in gas prices, but the same participant replied that twelve years is not long enough to develop a trend in prices. The participant again suggested that EIA should use 100 year averages for fossil fuel commodities. Alan Beamon responded that EIA would take that into consideration.
4. Two participants questioned what the main drivers were for the higher gas prices throughout the forecast and Alan Beamon replied that over time current gas plays become less productive and that plays available in the future may be more expensive to develop. He mentioned that there is a lot of uncertainty in this area, and that EIA will be running several sensitivity cases with gas prices for the full AEO 2013 report. Alan Beamon mentioned that prices in 2012 were at record low levels. One of those participants did not have a problem with upward price projections, given that the current low prices were not sustainable from a producer's perspective. Alan Beamon recommended that the natural gas team could provide more insight, since the electricity team receives the gas prices from their model. Mike Leff added that EIA sees increased demand from the electric power and industrial sectors which contributes to the upward push on prices.
5. Carrie Milton explained how removing CSAPR from the assumptions led to a shift in the timing of coal plant retirements between AEO2012 and AEO2013. She illustrated that in the reference case for the AEO 2012, a large amount of coal capacity was retired in 2013, when CSAPR was assumed to go into effect. In the AEO 2013, in general, the same amount of coal capacity is retired throughout the forecast, but 2016 is the year that most retirements occur, coincident with the assumed implementation year for MATS. Carrie pointed out that a combination of factors led to the coal plant retirement decisions, including the lower gas prices, higher coal prices, and reduced demand, in addition to the environmental regulations. Alan Beamon emphasized that EIA is not claiming that CSAPR was specifically responsible for the coal plant retirements, but rather it influenced the timing of owners' decisions concerning whether to continue to operate or retire the plants. Alan Beamon pointed out that switching from CSAPR to CAIR did not result in more or less actual retirements, but pushed back retirements to the MATS compliance deadline. Since CSAPR was more costly to comply with in the short term, Alan postulated that including CSAPR in the assumptions for the AEO2012 resulted in some instances of plants retiring earlier, prior to making investments to comply with MATS in the future.
6. A participant asked, "When looking at coal retirements, do you consider equipment at individual plants?" Jim Diefenderfer affirmed that EIA does look at each individual unit and its corresponding environmental controls. He explained that EIA attaches individual types of equipment to the generators to obtain a very precise unit-level equipment configuration

for each individual generator. The same participant pointed out that a recent Brattle Group assessment projects higher coal retirements—59 GW by 2020 and wanted to know how that compared to EIA’s model. Mike Leff answered that EIA has seen the Brattle study and that EIA analysts are currently working to compare the results and assumptions of the study with those of the AEO 2013 reference case. In broad strokes, it appears that EIA’s assumptions match Brattle Group’s “low” case. Alan Beamon mentioned that EIA often compares its results with other studies; however that exercise can be frustrating because the level of detail supporting the underlying study assumptions that EIA would like to evaluate is typically not available.

7. A participant asked how EIA models reliability requirements and reserve margin targets. Jeff Jones answered that reserve margins—the percentage of capacity required in excess of peak demand needed for unforeseeable outages—are determined within the model through an iterative approach that compares the marginal cost of capacity and the cost of unserved energy. The target reserve margin is adjusted in each model cycle until the two costs converge.
8. In response to a slide indicating the compliance actions taken in the MATS year in the AEO 2012 as compared to the AEO 2013, a question was asked why there are fewer DSI and FGD installations in the AEO 2013 as compared to the AEO 2012. Carrie Milton had pointed out earlier that in the AEO 2012, there were fewer retirements in the MATS implementation year (2015), because more plants had retired in an earlier year, due to the assumed implementation of CSAPR in 2013. Alan Beamon noted that in the AEO 2012, which included CSAPR, retirement decisions were being made in an earlier year with MATS in mind, although retirement decisions are based on several factors, only one of which is environmental regulations. Since more retirements are occurring in the MATS implementation year for AEO 2013, fewer scrubbers and DSI retrofits are needed to bring the approximately 90 GW of unscrubbed capacity into compliance.
9. A participant asked, “What are the new assumptions around possible MATS compliance actions?” Jeff Jones mentioned that they are the same as last year, and that a fabric filter is still required in tandem with DSI to comply with the rule. Mike Leff added that if a plant has no scrubber, it can either retire, install an FGD, or install DSI. A follow-up question was asked as to whether EIA allows wet and dry scrubbers or only dry scrubbers. Mike Leff replied that for compliance EIA only allows for wet scrubbers. Jim Diefenderfer mentioned that there is also a difference in how EIA treats MATS compliance actions for petroleum-fired generating units for AEO2013. Some petroleum-fired units will be installing electrostatic precipitators (ESP) while others will switch from burning residual fuel oil to distillate fuel oil. Carrie Milton further added that for AEO2013 petroleum coke plants also need to install a dry scrubber in order to comply with MATS.
10. A participant questioned whether there are any changes in the DSI cost assumptions, to which Mike Leff replied that EIA is using the same cost assumptions as for the AEO 2012. One attendee inquired whether coal plants could comply without installing a DSI or scrubber, for instance by burning coal with a lower chlorine content. Jeff Jones indicated that while EIA does not currently consider this in the model, it is certainly something that EIA could consider for AEO 2014. Another attendee wondered whether EIA requires fabric filters with DSI. Jeff Jones replied that, “Yes, we require fabric filters to be added with the DSI compliance option. Activated carbon injection can be used to reduce mercury without a

fabric filter, but is not as economic.” EIA requires the fabric filter to reduce other pollutants that are not explicitly modeled in NEMS, namely HCl and PM<sub>2.5</sub>.

11. Carrie Milton discussed how the renewable generation by specific technology type varied between the forecast in 2035 for the AEO 2012 and AEO 2013, as well as how it changed significantly between 2035 and 2040 in the current forecast. Chris Namovicz added that wind generation this year has been particularly sensitive to changes in gas prices and that NEMS runs completed since the 10/4 run ( presented for this meeting) have shown greater wind generation. A participant questioned whether the AEO 2012 also assumed the expiration of the renewable technology production and investment tax credits, to which Mike Leff responded that it did. Another participant asked whether there will be a side case on extended tax credits. Alan Beamon affirmed that there would be. A participant asked whether the solar in the chart represented both rooftop and utility-scale projects, to which Chris Namovicz replied that it did.
12. During the discussion on capacity additions in the AEO 2013 compared to the AEO 2012, Carrie Milton pointed out that during the last five years of the forecast EIA sees a lot of natural gas and renewable technology additions. Alan Beamon indicated that when gas prices hit about \$7/MMBtu, i.e. in the last 5-6 years of the projection period, other technologies become economic to build even without incentives. A participant asked whether the natural gas additions were mainly combined cycle. Alan Beamon replied that the natural gas additions are largely to support baseload, but there are also some peakers added as well. Natural gas capacity additions are split between combined cycle and combustion turbines, with the turbines mainly added for reserve purposes, and not to meet demand growth. A participant inquired as to how EIA models the interaction between natural gas prices and capacity additions, specifically in order to understand why the higher gas prices toward the end of the forecast did not stimulate more coal additions. Alan Beamon answered that gas plants are the most flexible source of new capacity in that they can meet intermediate and peak loads that might be needed, as well as baseload. Mike Leff added that the capital cost of a new coal plant is approximately \$2,900/kW while a natural gas combined cycle plant is approximately \$1,000/kW. Therefore, even with the higher fuel prices, gas still may be cheaper on a levelized basis. Alan Beamon indicated that the competition for capacity additions between coal and natural gas may become quite interesting in the 10-15 year range after the projection period.
13. Questions pertaining to the 111(b) regulation (New Source rule that would limit new coal builds to those with CCS) were brought up. A participant asked whether EIA assumes this in the reference case. Mike Leff and Jeff Jones explained that since the rule has not yet been finalized, it is not part of the reference case. The same participant followed up by asking whether it will be part of the AEO if the rule is finalized before the full release of the AEO 2013. Alan Beamon said that it likely would not, since only 1 GW of coal is being built in 2039.
14. A participant asked how EIA is handling the 316(b) rule. Mike Leff answered that EIA is not including it in the AEO 2013 reference case, and will likely not include it in any side cases.
15. The last discussion slide, which illustrated the CO<sub>2</sub> emissions over the forecast in AEO 2013 as compared to AEO 2012, opened a discussion as to what assumptions are made around the CO<sub>2</sub> regulations. Laura Martin indicated that EIA includes the Regional Greenhouse Gas Initiative (RGGI) and California Assembly Bill 32 (AB32), as well as a 3 percentage point

cost of capital added on new coal plants without sequestration. Because the New Source Rule is not finalized, it is not included.

16. A participant asked about some of the electricity demand drivers. Alan Beamon mentioned that efficiency gains in appliances and larger households play a role, and that the Residential-Commercial Demand team could answer in more detail. The same participant followed up with a question about EIA's assumptions regarding electric vehicles and demographic shifts, to which Alan Beamon responded that transportation and end-use demand are modeled outside of the electric power modules. Alan indicated that EIA models electric vehicles, but the uptake is small, and that EIA also models an increasing number of people per household over the forecast. The participant followed up with a question as to whether EIA's numbers for electric demand growth are national. Mike Leff and Jeff Jones explained that EIA models demand regionally, by census division.