August 13, 2014

MEMORANDUM FOR: John Conti
Assistant Administrator for Energy Analysis

Jim Diefenderfer
Office Director
Office of Electricity, Coal, Nuclear, and Renewables Analysis

Paul Holtberg
Team Leader
Analysis Integration Team

FROM: Renewable Electricity Analysis Team

SUBJECT: Summary of AEO2015 Renewable Electricity Working Group Meeting held on July 24, 2014

Presenters: Chris Namovicz, Gwen Bredehoeft

Topics included AEO2014 model and data updates, a summary of AEO2014 model results, and a brief overview of planned changes for the AEO2015. Data updates included revisions to existing and planned capacity based on new data from the Form EIA-860, PTC effective expiration dates, and initial capital cost updates from the SAIC capital cost report (used for AEO2013) based on EIA's learning model. The model enhancements discussion included the integration of POLYSYS with NEMS to create model-interactive supply curves for biomass, the handling of spinning reserves to better account for the impact of intermittent generators, and RPS updates. The presentation concluded with an announcement of changes in the AEO and IEO production cycles where full and reduced content reports will be produced in alternate years. Because of the shortened development cycle for AEO2015, EIA is planning minimal updates to the model this year. Those updates that are planned for AEO2015 include: capturing renewable capacity additions that have actually occurred or are under development; continuing work on POLYSYS integration; and reviewing trends in the installed cost of renewable projects to determine if changes are warranted in EIA cost assumptions.

Participants Present:

Aaron Bergman (DOE)
Austin Brown (NREL)
Ben Matek (Geothermal Energy Association)
Carrie Annand (Biomass Power Assoc.)
Christopher Namovicz (EIA)

Christopher Richard (DOE—contractor)
Danielle Lowenthal-Savy (EIA)
David Feldman (NREL)
Elyse Steiner (EPA-Clean Air Markets Division)
Emily Williams (AWEA)
Eric Lantz (DOE)
Erin Boedecker (EIA)
Erin Boyd (DOE)
Gwen Bredehoeft (EIA)
Jason Burwen (Bipartisan Policy Center)
Michael Goggin (AWEA)
Rich Tusing (DOE)
Tyler Hodge (EIA)

Participants Online:

April Lee (EIA)
Chad Augustine (NREL)
Frances Wood (OnLocation, Inc.)
Nate Blair (NREL)
Sharon Showalter (OnLocation, Inc.)
Tina Kaarsberg (DOE)

Issues Discussed

- **Learning rates**
  - A discussion of the methodology used to establish NEMS learning-by-doing parameters occurred. NEMS allows all generation technologies' capital costs to decline, based on technology-specific parameters, due to learning. However, for wind, NEMS also allows learning-based capacity factor improvements.
  - In NEMS, the learning algorithm is based on capacity growth in the United States and does not incorporate global capacity growth. In addition to capacity-driven learning for capital costs, NEMS also incorporates a minimum learning rate, which is technology-dependent and partially accounts for international learning.
  - Progress ratios systematically decrease with capacity. A participant asserted that there is no precedent for systematically decreasing progress ratios.
  - EIA plans to reevaluate the learning curve structure at some point in the future.

- **Capital Costs and PPA vs LCOE**
    - This discussion addressed issues of whether or not EIA's wind and solar PV capital cost estimates are too high, citing LBNL's studies such as the "Wind Technologies Report" and "Tracking the Sun". EIA and LBNL use somewhat different approaches, neither of which may fully capture all the nuance of project cost. EIA noted that it has consulted these reports, and reviewed the underlying data at a more granular level to allow for better comparison with the technology characterizations that are modeled in NEMS. In the past, EIA has judged that EIA assumptions are roughly consistent with the cost data in said LBNL reports, but is still in the process of reviewing cost assumptions for the AEO2015.
    - This discussion included clarification of the difference between power purchase agreements (PPAs) and levelized cost of energy (LCOE) estimates, including an explanation of why they are not comparable. The LCOE does not account for the variety of options available to actual PPA markets for financing, contract terms, local incentives, and multiple value streams. Although PPAs should not be compared to LCOE, if this comparison is made, it should at least focus on specific regions rather than national averages which obfuscate regional differences in cost and performance.
    - Does EIA use Bloomberg New Energy Finance as a source in its analysis of capital and levelized costs? Yes, EIA does review BNEF publications on LCOE, PPAs, and project costs. However, because methodologies differ substantially, it does not directly incorporate this information into its assumptions.
- **Cofiring**
    - Cofiring does not contribute to new capacity, and its projected increased use is driven in part by state renewable portfolio standards.
- **Geothermal terminology in EIA surveys**
    - The Geothermal Energy Association (GEA) requested clarification of capacity definitions in the survey EIA-860. EIA will put GEA in touch with the appropriate survey staff to address this matter.
- **Spinning reserves**
    - The topic of how the spinning reserve margins have changed since the AEO2013 was discussed. In general, the approach has a bigger impact on "stress" cases with higher wind or solar penetration than in the Reference case. Do the spinning reserve margins only account for impacts of intermittent generators on operating reserve requirements? No, each capacity type is evaluated within the algorithm with respect to its impact on both the need for operating reserves, as well as its ability to contribute to operating reserves.
    - More documentation on the spinning reserves should be available when the EMM documentation is released.
- **Net Metering**

- Distributed PV is modeled in the end-use (residential and commercial) modules of NEMS. While net metering is not explicitly modeled, residential installations are compensated for excess generation at the retail rate, so net metering is in effect captured.