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## Memorandum

TO: ANNUAL ENERGY OUTLOOK STAKEHOLDERS  
FROM: DAVID WHITE, PHD AND PATRICK LUCKOW  
DATE: FEBRUARY 12, 2016  
RE: AEO RENEWABLE WORKING GROUP MEETING NOTES – FEBRUARY 9, 2016

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### AEO Renewable Working Group Meeting Notes – February 9, 2016

The second AEO Renewables Working Group meeting for AEO 2016, hosted by Chris Namovicz of EIA, was held on the morning of February 9, 2016. Below are some highlights from that meeting.

The purpose of this meeting was twofold: present the latest set of renewable assumptions for AEO 2016, and review preliminary results for the current Reference case. Some of the key items discussed were:

**Wind costs** – The initial wind costs from Leidos, as presented in December, were \$2,192/kW. EIA held a second meeting on January 7<sup>th</sup> to discuss these costs in detail. On February 9<sup>th</sup>, EIA presented revised wind costs with a regional capacity-weighted average of \$1,770/kW. EIA chose not to use Leidos regional cost multipliers based on labor costs, but instead used recent capital costs from installed projects. Costs range considerably: from \$1,654 in Texas to \$2,021 in California, and \$1,861 in the upper Midwest. This represents substantial progress from the initial December assumptions, and a willingness from EIA to incorporate stakeholder feedback. EIA has also adjusted capacity factor assumptions upwards by about 3 percent to better reflect recent turbine models.

**Solar costs** – Initial PV costs are 20 percent lower than in AEO 2015, and increased PV installations result in greater cost reductions over time, due to learning in the model. They have not found significant cost differences between utility-scale fixed and tracking PV systems and will be using fixed PV systems in the model. The issue of customer PV was raised and they will be working with the Buildings team to better represent this in the modeling.

**Clean Power Plan** – A previous analysis of the proposed Clean Power Plan was done on AEO 2015 and the general results were a decrease in coal generation along with an increase in generation from natural gas and renewables. As of this meeting, EIA had decided to model a mass-based approach with trading at the electricity market module (EMM) region level in the Reference case. State requirements will be mapped proportionally to the EMM regions used in the AEO modeling. Allowances will be allocated to load-serving entities to reduce rate impacts.

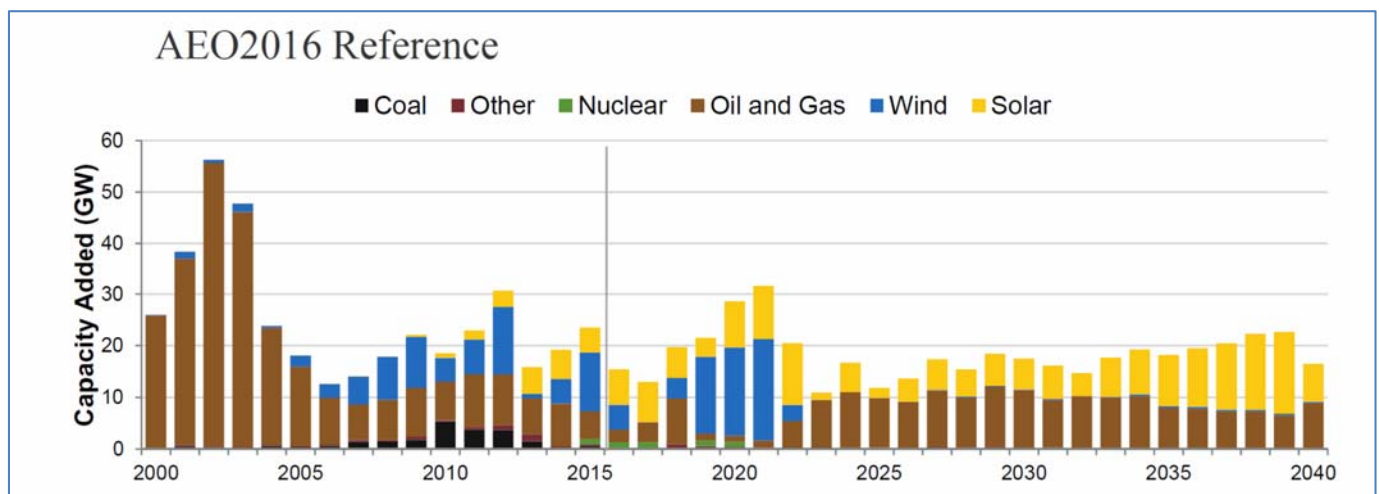
Subsequent to this meeting, the Supreme Court issued a stay on the Clean Power Plan. EIA is still deciding how to incorporate the policy in the final AEO 2016. Stakeholders suggested two reference cases, one with and one without the Clean Power Plan. While there is some reticence to have multiple reference cases, EIA will consider this, as well as alternate naming conventions to give the CPP and No-CPP cases similar weighting (whereas in general most users of AEO focus on the reference case and pay much less attention to the side cases). Typically, the side cases are variations from the Reference case, which makes the choice of the Reference case an important one.

**Federal Tax Credits** – AEO 2016 will incorporate the extension of the Production Tax Credit (PTC) and the Investment Tax Credit (ITC) in the reference case, assuming phase out of the ITC to 10 percent in 2022 and a complete PTC phase out by 2020. Initial results show these play a major role, and drive wind expansion in particular in the next five years. After that, little growth in wind is seen. The EIA modeling incorporates the construction time of PTC/ITC eligible technologies to appropriately incorporate the provisions of these policies that apply once a project has begun substantial construction.

**Model structure** – The NEMS model used in these forecasts incorporates hard caps on the level of variable generation in any particular EMM region. The model cannot build more than 40 percent variable generation in any EMM region. “Softer” constraints also apply—when the model hits 20 percent in a particular year, it must stop and wait until the next year to continue building.

**Preliminary Results** – With the tax credit extensions, the modeling shows significant wind additions through about 2021, which then decline drastically. Solar additions remain strong throughout the modeling period as do natural gas plants. The following figure from the Electricity Working Group presentation shows the current pattern of capacity additions which may change with further modeling.

**Preliminary Draft AEO 2016 Capacity Additions – 2/10/16. Do not quote or cite as results are subject to change.**



**We see the following as current priority issues:**

- **Model structure:** Preliminary results indicate a substantial expansion of renewable energy in AEO 2016, up from 13 percent of generation in 2014 to 22 percent in 2025 and 26 percent in 2040. Some regions are going to be substantially higher than this, and it is important for EIA to update the model to properly account for the operational implications of renewable energy. The hard constraints on variable renewable energy as a fraction of total generation are a blunt measure developed many years ago and should be updated to reflect real operational considerations including storage and load shifting.
- **Renewable cost assumptions:** The latest renewable cost assumptions appear much better in line with current data sources than the December presentation. However the disappearance of new wind after 2022 reflects modeling assumptions that should be reviewed.
- **Clean Power Plan implementation:** Given the Supreme Court stay, what EIA chooses to do with the Clean Power Plan will have a large impact on the final Reference case.

We plan to follow up on these issues with EIA. Please send us any questions, comments or suggestions you have at this stage of the AEO 2016 development process.

**David White & Patrick Luckow, Synapse Energy Economics, 2/12/16**

[dwhite@synapse-energy.com](mailto:dwhite@synapse-energy.com)

[pluckow@synapse-energy.com](mailto:pluckow@synapse-energy.com)

