

October 3, 2017

MEMORANDUM FOR: Ian Mead
Assistant Administrator for Energy Analysis

FROM: Jim Turnure
Director, Office of Energy Consumption and Efficiency Analysis

SUBJECT: Summary of AEO2018 Transportation Working Group held on Thursday, September 28, 2017

The second Transportation Working Group presented a discussion of completed data and modeling updates for the AEO2018 Reference case, ongoing updates for both the Reference case, proposed side case scenarios, and preliminary results from changes completed to date. The presentation materials are provided in a separate document.

Model updates and preliminary results

Completed model updates included the following changes:

- *Historical data*—update mid-year model year (MY) vehicle sales with final MY 2015 light-duty vehicle (LDV) sales and attributes, update freight parameters to align with U.S. Department of Transportation’s latest Freight Analysis Framework release, and update regional freight travel demands,
- *Model*—expansion of macroeconomic drivers that realigns industrial and service projections used to project freight travel demands; update of the Zero Emission Vehicle (ZEV) sub-module to include credit banking for light-duty vehicles and new post-2017 ZEV credit multipliers by regulated vehicle type; inclusion of a 300-mile range electric vehicle category; and, addition of logit fuel selection factors for international marine mode.

EIA staff provided an update on the status of planned AEO2018 model updates, including the addition of autonomous vehicles, ridesharing, and car sharing for the Reference case and side cases. EIA staff also provided preliminary AEO2018 results including historical data and model updates completed to date.

Discussion

During the discussion, participants asked several questions related to modeling updates, pending regulations, and preliminary draft AEO2018 results.

Completed model updates

Most of the participant’s questions centered on model updates, particularly EIA’s inclusion of credit banking and spending for the ZEV mandate. Participants asked for further clarification and explanation of the ZEV regulatory requirements and mechanisms and how EIA modeled them. Regarding the mandate itself, questions can be grouped into four subjects. What defines a credit and how are they

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modeled? How and what data does EIA have on current credit banks? How does the credit travel provision work and who determines what credits will travel? At what level does EIA model the mandate?

Regarding credit definitions and how they are generated, participants asked about what kind of credits there are, how a regulated vehicle sale creates credits, and which types of credits are earned towards ZEV compliance. EIA responded that different vehicles receive different credit values depending on their powertrain type and attributes. Further EIA staff clarified how certain credit types are phased out and converted in 2018 to only ZEV credits and Transitional Zero Emission Vehicle (TZEV) credits.

Regarding historical data, EIA staff clarified that historic credit bank values were determined at the OEM level with 2015 being the most recent year with data. Participants asked for details of how many credits currently exist. Based on reports for California and the nine additional states that have adopted the mandate, as of 2015, EIA staff answered that there were approximately 800,000 ZEV credits nationwide with about 370,000 in Census Division 9, of which the majority represents the state of California. In addition, there were about 200,000 TZEV credits, as well as several hundred thousand other credits that are assumed to be transformed into TZEV credits in 2018 at a heavily discounted rate.

There were multiple questions regarding the explanation of the allowed credit travel provisions. Participants asked if ZEV credits travel due to the actual vehicle changing location or the credit moving to another region. EIA staff responded that the vehicles do not move but ZEV credits can “travel” and count towards compliance in multiple states until 2018. However, in 2018 and beyond, this provision applies only to hydrogen fuel cell vehicles.

Follow-up questions asked if EIA was double counting credits, to which staff replied that credits for the sale of a regulated vehicle can count more than once allowing the earned credits to count towards compliance in multiple states, but degradation factors help determine the relative total sales ratios between the regions. Another participant asked if traveling meant that manufacturers do not actually need to sell applicable vehicles in certain states. EIA responded that after 2018 the traveling provisions becomes much reduced, allowing only hydrogen fuel cell vehicle credits to travel.

There were questions about how EIA models the mandate and what assumptions are made. A participant asked if the mandate is modeled at the OEM or regional level. EIA explained the mandate is at the OEM level but is aggregated to and modeled at the Census Division level. Finally, participants asked who determines if a credit will travel. EIA responded that this decision is made by OEMs, but due to banked credit amounts it is assumed to originate only from Census Division 2 in the AEO2018.

Beyond the ZEV mandate, participants asked questions regarding how the AEO2018 captures other important policies and associated uncertainties. Attendees asked if uncertainty of the future of both light- and heavy-duty vehicle fuel economy and greenhouse gas emissions standards are taken into account in the AEO2018. Staff reiterated that EIA models current laws and regulations in the AEO. Participants asked if the ZEV mandate continues past 2025, to which EIA answered that the ZEV mandate after 2025 is held constant, as is the case with other laws and regulations. A question arose regarding discussion by cities of banning internal combustion vehicles. EIA responded that no bans are currently in law, and further that many cities would need to do so for it to significantly affect national sales.

Participants also asked several questions regarding EIA's modeling of electric and plug-in hybrid electric vehicles. Attendees asked if there any changes in the vehicle ownership structure as people buy electric vehicles, to which EIA responded that this is not currently taken into account. Attendees asked if EIA models the split between gasoline and electric energy use for plug-in hybrid electric vehicles. EIA responded that both fuels are taken into account based on the vehicle's battery size. Participants asked if EIA produces model output in miles by powertrain, to which EIA confirmed. Attendees asked if EIA is following research programs aimed at rapid charging electric vehicles, and if such advancements would have a large impact on sales. EIA answered that they are following this development closely but there currently are no timelines or expectations as to when this technology will be commercially available.

Beyond electric vehicles, attendees asked if the degradation factor for on-road vehicle fuel economy compared to tested values has changed. EIA answered that this has not changed for AEO2018, but is subject to with ongoing model updates. Discussants asked for clarification on limits and definitions of the final model year (MY) 2015 light-duty vehicle sales data from the Environmental Protection Agency. EIA staff explained sales are for MY and are assumed to represent model year for the purposes of projecting vehicle sales. A participant asked whether MY 2015 is still the most recent data available. EIA staff responded that they are the most recent data, as later MY data are only estimated by the Environmental Protection Agency (EPA) and the National Highway Traffic Safety Administration (NHTSA). Participants asked about the use of methanol in bunkering marine vessels. EIA answered that there are a few countries that use methanol in marine but not in the US and currently is not in the AEO.

Preliminary results

Attendees asked several questions regarding draft AEO2018 preliminary results. Several questions focused on light-duty vehicle sales projections. Participants asked if additional factors beyond the ZEV mandate updates impact electric vehicle sales. EIA explained that overall light-duty vehicle sales are lower in the AEO2018 than AEO2017 from a macroeconomic update and that the addition of 300-mile range electric vehicles adds a higher earning credit vehicle. Further, electrified vehicles, such as battery electric, plug-in hybrid electric, and traditional hybrid vehicle consumer coefficients have not yet been re-calibrated for the most recent historical years, including for the 300-mile range electric vehicle. Participants asked if the projected increase in passenger car sales compared to light-trucks through 2030 is due to CAFE standards. EIA staff explained this is partially true but feedbacks of projected vehicle price, gasoline price, and vehicle attributes are also considered in the model.

Participants asked questions related to the effect of macroeconomic and fuel price updates on the preliminary transportation results. Attendees asked which macroeconomic data updates have lowered projected sales and why. EIA staff responded that motor vehicle gasoline prices are projected to be \$0.10-0.15 per gallon higher than in AEO2017 at the end of the projection period, but these values are still subject to change. Further, the gasoline price increase was the result of a study on international refineries and updates to state taxes and distribution costs, as opposed to increased crude oil price projections.

Participants asked if macroeconomic activity used in the September 2017 Short-term Energy Outlook (STEO) is reflected in the AEO2018. EIA responded that the AEO and STEO use the same economic model but may operate on different assumptions for economic activity, as the STEO requires monthly macro projections and AEO requires annual projections for a much longer projection time period than the

STEO. Further, EIA staff related that changes in macroeconomic activity affect all modes of transportation through changes in income and industrial output.

Ongoing model updates

Finally, participants asked several questions regarding EIA's plan to model the energy effects of automated and completely autonomous vehicles. EIA explained they would be in the model, but at limited scope in the Reference case, and in two assumption driven side cases, but that the complete build out of the model will be a multi-year process. Attendees asked if EIA would like feedback on either modeling or assumptions used in this development. EIA answered that for now feedback on assumptions is more valuable.

Attendees

Guests (in person)

Alicia Birky	Energetics
Kelly Fleming	DOE
Sarah Garman	DOE
David Gohlke	DOE
Marc Goodman	ERG
Jennifer Li	DOE
Saddiq Kahn	ACEEE
Cecilia Moura	Union of Concerned Scientist
Rachael Nealer	DOE
Kara Podkaminer	DOE
Tom White	DOE
Frances Wood	On Location

Guests (WebEx/phone)

Ken Katz	DOT
Jim Kliesch	Honda
Ria Kontou	NREL
Steve Plotkin	ANL
Tom Stephens	ANL
Lin Zhenhong	ORNL
Staff	EPA

EIA attendees (in person)

Nick Chase
David Daniels
Angelina LaRose
Perry Lindstrom
Melissa Lynes
Arup Malik
John Maples
Shirley Neff

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James Preciado
Mark Schipper
David Stone

EIA attendees (WebEx/phone)
Mike Stanley