

October 4, 2016

MEMORANDUM FOR: Ian Mead
Assistant Administrator for Energy Analysis

James Turnure
Director, Office of Energy Consumption & Efficiency Analysis

Paul Holtberg
Team Leader, Analysis Integration Team

FROM: Industrial Energy Consumption & Efficiency Analysis Team

Subject: Second AEO2017 Industrial Working Group Meeting held on September 22, 2016

The Energy Consumption & Efficiency Analysis Team led a discussion of initial AEO2017 model results and projections. Topics covered included updates to the industrial model and the initial results from model runs. Additional questions were addressed at the end of the meeting. The presentation slides used to support this discussion are provided in a separate document.

Industrial Model Updates

AEO2017 is a “light” Annual Energy Outlook (AEO), where few improvements are typically introduced into the model. However, a few improvements related to energy consumption and efficiency were made to the model during the current AEO cycle:

- Extend model to 2050 (now complete)
- Individual industry benchmark improvements
- Regulation: Kept boiler Maximum Achievable Control Technology
- Lowered Direct Reduced Iron (DRI) and relaxed constraints on Electric Arc Furnace (EAF) usage

In addition, we are currently trying to explain steel output increase in 2040 and may make some additional DRI adjustments beyond what has already been done.

Initial Results

- Energy consumption in the industrial sector is generally lower compared to AEO2016. We believe this is due to lower feedstock projections in the early years.
- The industrial sector does not participate in the clean power plan as far as modelling. There is no mechanism to model cap and trade in the industrial module outside the current California cap and trade regulations.
- Industry share of fuel types are fairly steady over time.

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- Higher Combined Heat and Power (CHP) generation is most likely due to bulk chemicals. Bulk chemicals is a major user of CHP, and this industry is growing over the projection period.
- Total energy consumption in the bulk chemicals industry is lower than projected in AEO2016. This is most likely due to lower projections of feedstock consumption.

Discussion/questions

- *Can you speak to the increase in shipments from 2040 to 2050?* The economy, as measured by Gross Domestic Product (GDP), is expected to grow for a number of reasons, including an increase in population. Shipments grow along with GDP.
- *Is there a strong effect on the paper industry from international economic developments?* Yes, in particular, there are currency effects. In the short run, the dollar is projected to be relatively strong against other currencies, limiting exports.
- *In light of the initial result that iron and steel grow more after 2040 as the share of coal decreases, is China soaking up a lot of scrap?* The industrial module does not model supply or consumption of scrap explicitly.
- *Which cases will be modeled for industrial in AEO2017?* The cases will include Hi/Low Oil Prices, Hi/Low Macroeconomic Growth, and Hi/Low Resource.
- *Have you changed the rate of decrease in the Unit Energy Consumption (UEC) based on new technology?* For end-use industry models, the Technology Possibility Curve (TPC) is the same as it was last year. For process-flow industry models, we are doing some work with technologies to allow the UEC to evolve over time, although we do not utilize a TPC. We are also experimenting with obsolescence parameters.
- *Does the model have options for switching away from coal? Is there a growth in electricity as a replacement for coal?* The process flow models switch fuels by switching processes and technologies. For a lot of heat intensive industries, it is not possible to substitute electricity for fossil fuels.
- *Are the macroeconomic results final, and have there been any changes to the underlying model?* The results are not final. In addition, over the last few years we've restructured the macro output. We added dynamic input-output and allowed supply changes in downstream industries to influence results for upstream industries— for example, growth in the iron and steel industry is facilitated by growth in the metals based durables industry.
- *Do you see anything different in how the US is supplying the international market in bulk chemicals?* The shipments model does not distinguish between domestic final uses and exports. However, information on overall exports can be found in the [macroeconomic working group presentation](#).

- *How far into the future does the International Energy Outlook (IEO) go?* The IEO projection will extend to 2050 and will be released in the late spring of next year. We want the international forecast to reflect what we are doing in the domestic forecast.
- *There is a big push in other countries reduce the Carbon Dioxide (CO2) footprint. Do you expect the EAF share, in the iron and steel industry, to grow because EAF has a smaller CO2 footprint?* We are continuing to update the iron and steel model, which includes carbon measurements. At present, technology choice in the Reference case is not driven by the CO2 footprints of different technologies. But this could be a future refinement.
- *How is scrap steel modeled? And is the market for scrap a constraint?* At present, we do not model scrap steel, but we don't expect scrap availability to be a constraint in U.S. steel production.
- *Is there any expectation for lower demand for steel in the transportation industry?* There is a link between the steel industry and the downstream industries, like transportation equipment, through the macroeconomic model.
- *Why is the bulk of growth in fuels in the petroleum category?* Because "petroleum" includes natural gas liquids and petrochemical feedstocks, which are large.
- *Where is coal used in the Industrial Model?* Coal is primarily used in the iron and steel, cement and lime, and food industries.

Attending in Person

Bob Hershey
Keith Jamison
Peri Ulrey

Attending by WebEx/Phone

Bharat Ramkrishnan
Chris Doleman
David Rosner
Elizabeth Dutrow
Elke Hodson
Frances Wood
Francesco Memoli
Jan Mares
Joe Cresko
Keith Benes
Marilyn Brown
Mark Bahner
Martha Moore
Michael Chow

Peter Marsters
Wade Shafer
Whitney Herndon
William Morrow

EIA Attendees

John Conti
Kelly Perl
Susan Hicks
Paul Otis
Matt Skelton
Chris Dickerson