

WORKING GROUP PRESENTATION FOR DISCUSSION PURPOSES
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MEMORANDUM FOR: JOHN CONTI
ASSISTANT ADMINISTRATOR FOR ENERGY ANALYSIS

PAUL HOLTBERG
TEAM LEADER
ANALYSIS INTEGRATION TEAM

JAMES TURNURE
DIRECTOR
OFFICE OF ENERGY CONSUMPTION & EFFICIENCY ANALYSIS

LYNN WESTFALL
DIRECTOR
OFFICE OF ENERGY MARKETS & FINANCIAL ANALYSIS

FROM: MACROECONOMIC & INDUSTRIAL ENERGY
CONSUMPTION & EFFICIENCY ANALYSIS TEAMS

SUBJECT: Second AEO2016 Macro-Industrial Working Group Meeting
Summary, presented on 02-18-2016

Attendees: Nate Aden (World Resources Institute)
Bob Adler (EIA)
Vipin Arora (EIA)
Mark Bahner (RTI International)
Michael Chow (National Federation of Independent Business)
John Conti (EIA)
Joe Cresko (EERE)
David Daniels (EIA)
Chris Doleman (National Energy Board of Canada)
Neal Elliott (American Council for an Energy Efficient Economy)
Whitney Herndon (LBNL)
Robert Hershey, Consultant
Beatrix Jackson (RTI International)
Keith Jamison (Energetics)
Tom Lorenz (EIA)
Martha Moore (American Chemistry Council)
William Morrow (LBNL)
Prakash Rao (LBNL)
Jerry Schwartz (American Forest & Paper Association)
Anna Shipley (ICF International)
Peri Ulrey (Natural Gas Supply Association)
Frances Wood (OnLocation)

Presenters: Kay Smith, Elizabeth Sendich (Macro)
Kelly Perl, Peter Gross, Paul Otis (Industrial)

Macro: The macro team did not make a formal presentation as they did their major outreach in the first Macro Industrial Working Group (MIWG) meeting held on 12/03/2015. The macro team did participate in the ensuing discussion following the industrial team's presentation described below.

Industrial: The industrial team's working group presentation provided reference case results for the AEO2016. The focus was on results from the two latest updated industries in the Industrial Demand Model: pulp & paper and iron & steel. Highlights of the presentation are detailed below:

- It was reiterated in this second MIWG that the process flow modeling is now complete (steel and paper completed for AEO2016 in addition to the previously completed cement & lime, aluminum, and glass industries). These allow for explicit tech choice within each of process flows of these industries, and they will allow for better representation of the new AEO2016 "Energy Efficiency" side case as well as future carbon policy constrained side cases.
- Compared to the AEO2015 reference case, overall industrial energy consumption is higher for AEO2016 due to larger long-term growth in manufacturing shipments especially in bulk chemicals. The fuels most affected are natural gas and liquid feedstocks.
- Projections of CHP generation in the AEO2016 are lower than in the AEO2015 reference case due to updates in historical CHP data and the new process flow models which include steam recycling technologies.
- The lower energy projections for AEO2016 in pulp & paper reflected the new shipments profile from the macro model as well as the new process flow model structure which allows for technology choice in the various process flows such as pulping. In addition, the new pulp & paper process flow model elicited more reasonable CHP results by putting less emphasis on natural gas CHP growth and more on renewable CHP.
- Like the pulp & paper results, the AEO2016 energy consumption projections in the iron & steel industry are a reflection of both the new macro model shipments and the new iron & steel process flow model. Growth in electricity consumption projections in the AEO2016 was tied to a projected growth in the EAF (recycled mini mill) steel production, while growth in natural gas was tied partly to the new model's allowing of direct reduced iron (DRI) production.

Participants showed a lot of interest in these new technology choice-based models and there were two follow-up meetings following this MIWG: the industrial team met with representatives of the American Forest and Paper Association on 02/24/2016 to discuss the technology choice menus used in the new paper & pulp model. Also, Elizabeth Sendich and Kay Smith of the macro team met with members of the American Iron & Steel Institute on 02/23/2016 to discuss the AEO2016 reference case projections as they relate to both the new macro projections and the new Industrial Demand Model's tech choice model.

Discussion/questions:

1. Is the Clean Power Plan (CPP) part of the AEO2016 reference case? Answer: Yes, but EIA will also run a side case identical to the Reference case but without the CPP activated.

2. Why does steel energy consumption increase post-2025? Answer: The steel shipments projected by the macro model increase, and this is largely trade-related. In particular, the dollar appreciates early in the forecast causing trade intensive industrial output to initially decline; but then as the dollar later depreciates, output recovers. This depreciation also prevents cheap Chinese steel from flooding the market. Also, for emerging markets, growth recovers later in the forecast, thereby allowing for recovery in the growth of U.S. exports.
3. Why is there a lull in pulp & paper energy consumption? Answer: See #2...as with steel and other heavy industries, dollar appreciation followed by longer-term depreciation leads to a lull followed by growth in shipments, which in turn drives energy consumption.
4. Why is natural gas feedstock growing in the *AEO2016* projections? Answer: It is assumed that the current build-up and on-shoring of nitrogenous fertilizer (ammonia/urea) and methanol plants will continue into the mid-term with moderate growth in the long-term spurred on by the relative cheapness of U.S. natural gas.
5. Why is the industrial natural gas consumption slightly higher in the no CPP case as compared to the reference (CPP) case? Answer: industrial shipments are projected to be slightly higher in the no-CPP case due to higher investment costs in the Reference (CPP) case.
6. Why does coal-fired CHP make a comeback in the paper & pulp industry? Answer: coal CHP exists now, and these same CHP technologies slightly increase with the resurgence of the paper & pulp industry starting in 2021. Without much of a price divergence between natural gas and coal in the *AEO2016* projections, there is not much incentive for replacing natural gas CHP with coal CHP; but coal does move from 11% to 14% of pulp & paper CHP capacity by 2040 in the *AEO2016* Reference case.
7. Why is there petroleum fuel growth in the steel industry projections? Answer: the tech choice menu allows for heavy fuel oil-fired (HFO) basic oxygen furnaces (BOF). However, we have since modified our projections in order to make the HFO tech choices more costly since their environmental acceptance is likely to be quite low.
8. Do the new tech choice models have a fixed technology menu? Answer: yes, but there is room for new technologies as we learn about them for future *AEO* publications.
9. In the new process flow models does the Industrial Demand Model allow for energy intensity improvement of the technologies in the tech choice menus? That is, are retrofits and incremental improvements of existing technologies allowed? Answer: no, not currently, although we recognize the need for implementing this kind of "technology possibility curve" (TPC) to our process flow models to allow for energy efficiency improvement within a given technology (as we do currently to our older model components).

10. Does the tech choice menu for the new paper & pulp model include technologies for improvement in black liquor filtration? Answer: yes.