



MEMORANDUM FOR: Angelina LaRose
Assistant Administrator for Energy Analysis

FROM: Jim Diefenderfer
Director, Office of Long-Term Energy Modeling

SUBJECT: Summary of AEO2022 Macro-Industrial Working Group held on
Thursday, May 20, 2021

This memorandum summarizes the presentation and discussion at the *Annual Energy Outlook 2022* (AEO2022) Macro-Industrial Working Group meeting. The industrial team presented:

- A review of key *Annual Energy Outlook 2021* industrial sector energy trends
- Module updates to be incorporated into AEO2022, including a detailed look at the *Manufacturing Energy Consumption Survey* (MECS) data update
- Plans for longer-term modeling and data enhancements
- A summary of regular data updates

A question-and-answer discussion followed the presentations.

The presentation slides are available in a separate document on our website. All slides, charts, and discussions for AEO2022 were preliminary and, therefore, should not be quoted or cited. Final AEO2022 materials will be released in early 2022.

Macroeconomic Activity Module (MAM) updates

We discussed the key updates planned for the MAM this year, including for the following models:

- The IHS Markit U.S. Macroeconomic Model
- Industrial Output Model
- Employment by Industry Model
- Regional Economic Activity Model
- Commercial Floor Space Model

Industrial Demand Module (IDM) updates

EIA staff discussed the key updates planned for the industrial module this year, including:

- Updating the MECS data used for benchmarking industry-level consumption
- Improving combined-heat-and-power (CHP) calculations, including technology parameters and the paper industry's ability to sell excess CHP electricity to the grid

- Allowing ethane versus naphtha feedstock switching in the bulk chemical subroutine
- Integrating more fuel price sensitivity into the process flow models (cement and lime, iron and steel, paper, glass, and aluminum)

We also discussed longer-term plans for updates to the IDM, including:

- Enhancing the sensitivity of industrial energy intensity to changes in capacity utilization
- Investigating the source of the apparent large amount of nonmanufacturing natural gas consumption, calculated as the difference between total natural gas consumption from our *Natural Gas Annual* and manufacturing natural gas consumption from our *Manufacturing Energy Consumption Survey*
- Restructuring the industrial module in various ways, including by using Python

Discussion

An attendee asked if allowing excess CHP electricity from the paper industry to be sold back to the grid was based on any specific assumptions and whether it might result in increased investments in new CHP systems. We said this change reflects something that is already occurring in the real world but that the IDM was previously unable to account for the sale of excess electricity from the paper industry.

An attendee was glad to hear about the IDM's eventual transition to Python.

An attendee wanted to know if we could update MECS more frequently. We responded that it is not possible at this time.

An attendee asked how we are planning to incorporate the trend of companies shifting toward carbon intensity reductions into the AEO. We responded that we have no plans to incorporate deep decarbonization in AEO2022. However, we are currently working on an assessment for Congress to determine what resources would be needed to implement deep decarbonization in the National Energy Modeling System (NEMS).

An attendee asked for more details on how industrial capacity utilization would be examined. We responded that we are still in the early stages of this investigation. Basically, energy intensity should not really change linearly between a plant operating at a high capacity and a plant operating at a low capacity, but the IDM currently functions in this manner. For example, a lot of blast furnaces were kept operating during the early months of the COVID-19 pandemic, even though they were producing very little steel, and the IDM ideally should be able to account for such behavior.

An attendee wondered if we had noticed any shift in the intent of petrochemical companies to build ethylene cracker facilities. We responded that the ethylene cracker forecast came from an analyst outside the industrial group, but as far as we could remember, the forecast for ethylene cracker additions has not changed much recently, other than perhaps some delays in 2020. We said the industrial group does look into facilities that use natural gas feedstock, mainly ammonia and methanol

plants. Not many new U.S. facilities for these types of chemical plants have been announced recently, although a few methanol plants are under construction, some of which have had delays.

An attendee was interested in more details about improving the fuel price sensitivity in the process flow industries. We responded that currently, for some industries (such as cement and lime), changes in fuel price do not shift the technological choices for a given process much, so fuel shares for those industries also do not shift very much. We need to improve this sensitivity to price in the IDM. For example, high coal prices do not shift the cement industry away from coal as quickly as we believe they should.

An attendee asked whether we have considered collecting or providing analysis in the AEO on renewable energy attributes being purchased or generated by industry. We replied that it would be difficult for NEMS to account for all carbon offsets that are used because many offsets are outside the scope of the model.

An attendee noted that supply chains have recently shifted toward being located in the United States and wondered how the AEO reflected this shift. We said that current and expected near-term relocations of business operations back to the United States are included in the baseline of IHS Markit's U.S. Macroeconomic Model used in the AEO.

An attendee asked if industrial energy use affects the macro economy. We responded that industrial energy use has no direct effect on the macro economy. However, it does have some indirect effects because the MAM is integrated with the other NEMS modules. Industrial energy use from the IDM will indirectly affect energy price, production, and consumption drivers used as assumptions in the U.S. model as that energy use makes its way through NEMS.

An attendee wanted to know if we have a forecast for onsite renewables at industrial facilities. We confirmed that we have an industrial renewables consumption series. Papermaking waste products (biomass) that are consumed for heat and power account for most of this series. Solar and other renewable generation in the industrial sector do have a series, but it is small. In addition, existing industrial solar photovoltaic installations are under the commercial sector in NEMS.

An attendee asked how the industrial module accounts for state-level policies and carbon taxes. In terms of state-level policies, the IDM accounts for SB-32 in California, which is designed to reduce greenhouse gas emissions in the state by adjusting fuel prices.

Attendees

Guests (WebEx/phone)

R. Neal Elliott III	American Council for an Energy-Efficient Economy
Ed Rightor	American Council for an Energy-Efficient Economy
Lowell Ungar	American Council for an Energy-Efficient Economy
Benjamin Caplan	BP plc
Kevin Dubina	U.S. Bureau of Labor Statistics
Katy Laurence	U.S. Bureau of Labor Statistics
Doug Vine	Center for Climate and Energy Solutions
Matthew Doolin	Duke University
John A. Laitner	Economic and Human Dimensions Research Associates
Kenta Shimizu	Energetics
Betsy Dutrow	U.S. Environmental Protection Agency
Ozge Kaplan	U.S. Environmental Protection Agency
Danny Macri	U.S. Environmental Protection Agency
Walt Tunnessen	U.S. Environmental Protection Agency
Rishi Garg	Federal Energy Regulatory Commission
Marilyn Brown	Georgia Tech
Eric Fox	Itron
Michael Russo	Itron
John Meyer	Leidos
Rachel Jones	National Association of Manufacturers
Amogh Prabhu	OnLocation
Jae Edmonds	Pacific Northwest National Laboratory
Haewon Mcjeon	Pacific Northwest National Laboratory
Sha Yu	Pacific Northwest National Laboratory
Robert Hershey	Professional
Naveen Dasari	Rhodium Group
Hannah Kolus	Rhodium Group
Alfredo Rivera	Rhodium Group
Beatrix Jackson	RTI International
Thomas Budd	Simon Fraser University
David White	Synapse Energy Economics
Francesco Memoli	Tenova Inc.
Bob Gemmer	U.S. Department of Energy
Alan Fox	U.S. International Trade Commission
Eric Masanet	University of California, Santa Barbara

EIA attendees (WebEx/phone)

Eugenio Aleman
Aaron Bergman
Erin Boedecker
Caroline Campbell
Michael Cole
Peter Colletti
Jim Diefenderfer
John Duff
Kathryn Dyl
Joshua Eiermann
Mindi Farber-DeAnda
Kevin Jarzowski
Ari Kahan
Mala Kline
Angelina LaRose
Mary Lewis
Perry Lindstrom
Tom Lorenz
John Maples
Elizabeth May
Mark Morey
Kyle Morley
Kevin Nakolan
Albert Painter
April Patel
Andri Rizhakov
Elizabeth Sendich
Estella Shi
Courtney Sourmehi
Dana Van Wagener
Warren Wilczewski
Stephen York