



Independent Statistics & Analysis

U.S. Energy Information  
Administration

October 18, 2021

**MEMORANDUM FOR:** Angelina LaRose  
Assistant Administrator for Energy Analysis

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

**SUBJECT:** Summary of second AEO2022 Macro-Industrial Working Group, held on  
Thursday, September 30, 2021

This memorandum summarizes the presentation and discussion at the second *Annual Energy Outlook 2022* (AEO2022) Macro-Industrial Working Group meeting. The macroeconomic and industrial teams presented preliminary AEO2022 results and model 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 are preliminary and, therefore, should not be quoted or cited. We will release final AEO2022 materials in early 2022.

### Macroeconomic Activity Module (MAM) updates

We discussed the key updates to the MAM this year, which included the following models:

- IHS Markit's U.S. Macroeconomic Model
- Industrial Output Module
- Employment by Industry Module

### Industrial Demand Module (IDM) updates

We discussed the key updates for the IDM this year, including:

- Updating the base-year energy intensities with the newly released *Manufacturing Energy Consumption Survey* (MECS) data; this update also includes an update to the non-manufacturing baseline data for 2018 using both EIA and non-EIA data sources
- Improving combined-heat-and-power (CHP) calculations, including technology parameters and the paper industry's ability to sell excess CHP-generated electricity to the grid
- Improving the ethane and propane price forecast by employing more accurate chemical shipment drivers and feedstock consumption drivers
- Allowing ethane versus naphtha feedstock switching in the bulk chemicals subroutine and making ethane and propane feedstock prices more sensitive to supply and demand dynamics

**WORKING GROUP PRESENTATION FOR DISCUSSION PURPOSES ONLY  
DO NOT QUOTE OR CITE BECAUSE RESULTS ARE SUBJECT TO CHANGE**

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

- Allowing electric boiler use in the end-use industries (such as bulk chemicals and food)
- Integrating more fuel price sensitivity into the process flow models (cement and lime, iron and steel, paper, glass, and aluminum)
- 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 MECS
- Restructuring the IDM and data preprocessing in various ways, including by using Python

## Discussion

An attendee asked if a change in the forecast for natural gas production would be included in the new ethane and propane pricing model. We said hydrocarbon gas liquid prices depended inherently on the Henry Hub natural gas spot price, so any changes in that price as a result of production differences would be reflected in ethane and propane prices.

An attendee wondered if the Reference case included possible climate damage. We said it did not.

An attendee asked if we anticipated structural reshoring of imports. We responded that assumptions regarding structural reshoring of imports would be made by IHS Markit economists and would, therefore, be a part of the U.S. model that IHS Markit provides to us.

An attendee noted that Illinois just passed a law that requires electric generating units, including CHP units, to stop using fossil fuels by 2045. The law does not address industrial units that just make steam, and the attendee said this factor would force industrial steam units to remain coal- and natural-gas-fueled and not convert to CHP.

An attendee asked if we could review how the MAM couples to the main energy model and if it was a one-way or two-way connection. We said the MAM is a distinct, integrated module of the National Energy Modeling System (NEMS). Energy assumptions from the remaining modules of NEMS supplant energy concepts in the MAM. The modules in the MAM solve using these NEMS energy assumptions. The resulting economic projections are then supplied to the remaining NEMS modules. This cycling continues as the modules of NEMS solve over the projection period.

An attendee asked if an update from the Census Bureau for its long-term population forecast is forthcoming. We said that IHS Markit economists include updates to population projections in the U.S. model as the Census Bureau makes those projections available. We advised that we are not sure when the next population projection release would be.

An attendee asked if the Reference case included the effects of outdated infrastructure as suggested by the American Society of Civil Engineers. We said it did not.

An attendee asked if we saw the many decarbonization commitments from companies affecting fuel use. We said that we do not incorporate stated goals of companies in our modeling, only laws on the books concerning decarbonization or otherwise. We said that the number of companies that have announced decarbonization plans does indicate interest in industrial decarbonization technologies, however, and industrial decarbonization technologies are something we are continuing to look into as we look to expand and update our equipment technology base in the process flow model industries.

An attendee inquired what the change in energy intensity would be if feedstocks were not included in the calculation. We said that number has not yet been calculated, but it will be in the final AEO.

An attendee asked if we had explored the possibility of increased demand for construction materials, for example, cement and steel. We responded that industrial shipments of intermediate goods such as cement and steel are determined by final demands, such as consumption, investment, government expenditures, and trade, which are projected in the IHS Markit U.S. model.

An attendee noted that work from MIT has shown that the energy intensity of the U.S. economy has declined by 1% per year since 1945.

## **Attendees**

### *Guests (WebEx/phone)*

R. Neal Elliott III	American Council for an Energy-Efficient Economy
Pavitra Srinivasan	American Council for an Energy-Efficient Economy
Brett Smith	American Iron and Steel Institute
Carl Bozzuto	Council of Industrial Boiler Owners
John "Skip" Laitner	Economic and Human Dimensions Research Associates
John Meyer	Leidos
Colin McMillan	National Renewable Energy Laboratory
Robert Boteler	Nidec Motor Corporation
Amogh Prabhu	OnLocation
Jae Edmonds	Pacific Northwest National Laboratory
Haewon McJeon	Pacific Northwest National Laboratory
Sha Yu	Pacific Northwest National Laboratory
Robert Hershey	Professional
Ben King	Rhodium Group
Hannah Kolus	Rhodium Group
Thomas Budd	Simon Fraser University Energy and Materials Research Group
Clayton Vernon	Sunoco
David White	Synapse Energy Economics
Kevin Dayaratna	The Heritage Foundation
Kevin Dubina	U.S. Bureau of Labor Statistics
Joe Cresko	U.S. Department of Energy
Elizabeth McNamee	U.S. Department of Energy
Danny Macri	U.S. Environmental Protection Agency

Ana Han  
Ryszard Wycisk

U.S. House of Representatives  
Vanderbilt University

*EIA attendees (WebEx/phone)*

Eugenio Aleman  
Lindsay Aramayo  
Erin Boedecker  
Caroline Campbell  
Peter Colletti  
Jim Diefenderfer  
Michael Dwyer  
Kathryn Dyl  
Mindi Farber-DeAnda  
Travis Freidman  
David Fritsch  
Kevin Jarzomski  
Ari Kahan  
Mala Kline  
Mary Lewis  
Perry Lindstrom  
Tom Lorenz  
John Maples  
Elizabeth May  
Mark Morey  
Kevin Nakolan  
April Patel  
James Preciado  
Elizabeth Sendich  
Matthew Skelton  
Courtney Sourmehi  
John Staub  
Stephen York