This memorandum summarizes the presentation and discussion at the *Annual Energy Outlook 2021* (AEO2021) Macro-Industrial Working Group meeting. First, the Industrial team presented:

- A review of key *Annual Energy Outlook 2020* industrial sector energy trends
- Preliminary results, focusing on trends in gross domestic product (GDP) and business investment
- Module updates incorporated into AEO2021
- Changes to the value of shipments (which come from the macroeconomic module and are the primary driver of industrial energy use) and industrial energy consumption
- Plans for longer-term modeling and data enhancements

After the presentation, presenters addressed questions and comments from attendees.

**Macroeconomic Activity Module updates**

EIA staff discussed the key updates to the Macroeconomic Activity Module. Because of the severe and lasting economic impacts of the COVID-19 pandemic along with the uncertainty about the timing and strength of the recovery, in the fall of 2020, EIA staff updated, for a second time, the IHS Markit long-term U.S. model scenarios for the Reference case and high and low economic activity cases.

**Industrial Demand Module updates**

EIA staff discussed the key updates made to the industrial module, including:

- Implementing *Manufacturing Energy Consumption Survey* benchmarking of process flow industries
• Updating relative energy intensities (REIs) for equipment in the food, metal-based durables, and bulk chemicals industries
• Implementing technology possibility curves for process flow industry technologies
• Aligning petroleum coke consumption data with the refinery industry

Changes to macroeconomic shipments also affected industrial energy use. Although most industries experienced a decrease in shipments relative to AEO2020 because of responses to the COVID-19 pandemic, total shipments from energy-intensive industries returned to approximately the same level by 2030, while total shipments from non-energy-intensive industries never return to AEO2020 levels. As a result, energy consumption in the industrial sector remains lower over the projection period than in AEO2020.

Discussion

An attendee asked about the increased GDP growth rate between AEO2020 and AEO2021, and whether it was all a result of recovery from the pandemic. EIA staff said the difference resulted from computing the growth rate at 2020’s low, pandemic-driven level. If the projection for 2020 from AEO2020 was used as the starting point, the growth rate in AEO2021 would be the same as AEO2020, i.e., 1.9%.

An attendee asked where the industrial module got its natural gas price. EIA staff responded that natural gas prices came from the Natural Gas Markets Module (NGMM) and EIA’s Short-Term Energy Outlook (STEO). The attendee was also referred to the NGMM working group.

An attendee asked whether technology specifications in the process flow part of the industrial module were publicly available. EIA staff responded that this and other unpublished inputs were available upon request.

An attendee asked for more details on how petroleum coke (petcoke) projections were derived. EIA staff responded that petcoke is used in refineries (where it is produced), other industries such as cement, and to a minor extent in the power sector. EIA does not consider petcoke to be a feedstock. EIA staff explained that there are two kinds of petcoke: catalytic coke (catcoke), which is unusable outside of refineries, and marketed coke, which is used as a fuel in industries outside petroleum refining. EIA’s Petroleum Supply Annual provides historical data and the STEO provides short-term projections of petcoke consumption. Published data representing marketed petcoke is a residual and is computed as total petcoke minus catcoke. EIA staff said they were working with the Liquid Fuels Market Module to increase the accuracy of the historical split in petcoke consumption between refining and the rest of the industrial sector.

An attendee asked whether the primary driver of combined-heat-and-power (CHP) growth in the bulk chemicals industry was either chemicals growth or the return of chemical industries to the United States. EIA staff responded that both factors drive CHP growth because we base CHP growth on that industry’s large power and heat/steam demand.
An attendee asked more generally about the reshoring of supply chains to the United States and whether EIA’s projections reflect that reshoring effect was reflected in EIA’s projections. EIA staff responded that the module did not currently have that ability, but it would be considered in the future.

An attendee asked if the National Energy Modeling System needed to address plastic recycling. EIA staff agreed that it needed to be thought about, both in the plastics industry and for bulk chemical feedstocks. EIA staff hopes to model it in the future.

An attendee asked about the granularity of REIs, and if they went as far as industrial subsectors. EIA staff responded that REIs exist for specific end-use activities, such as heating and cooling, and sub-industries, such as grain milling in food or organic chemicals in bulk chemicals.

An attendee asked if there was any meaningful macroeconomic growth given national factors. EIA staff responded that the only positive growth in 2020 was in government spending at 1.9%. We project real GDP to decline 4.8% in 2020 and the economy to resume growing in 2021 (real GDP growth of 3.1%). Further, the economy won’t match its 2019 performance until 2022 (real GDP growth of 4.4%).

An attendee asked what accounted for the decline in the share of government spending relative to AEO2020. EIA staff responded that the decline in the share of government spending was the result of unwinding stimulus packages that will be gone by 2050. EIA staff noted that overall growth of government spending is 0.7%, up 0.2 percentage points from AEO2020.

EIA staff were asked to say more about differential recovery pathways in terms of value of shipments for energy-intensive versus non-energy-intensive industries. EIA staff said many of the non-energy-intensive industries supply retail (textiles, printing), household formation (furniture, paint, appliances), shipping (wood products), the automotive sector (transportation equipment), and capital investment (machinery), which are sectors of the economy that may experience more lasting impacts from the COVID-19 pandemic.

An attendee asked if EIA was considering running decarbonization cases in the Reference case or side cases for AEO2021. Another attendee asked about electrification of industries in terms of a decarbonization strategy, which EIA staff said was not yet modeled as a method of decarbonization. EIA staff said it would consider it in the future, as well as the potential use of hydrogen as a large part of decarbonization.
### Attendees

**Guests (Webex/phone)**
- Martha Moore: ACC
- R. Neal Elliott III: ACEEE
- Andrew Hoffmeister: ACEEE
- Ed Rightor: ACEEE
- David Shin: American Petroleum Institute
- Kevin Dubina: BLS
- Katy Laurence: BLS
- Carl Bozzuto: CIBO
- Joe Cresko: DOE
- Bob Gemmer: DOE
- Keith Jamison: DOE
- Betsy Dutrow: EPA
- Serpil Kayin: EPA
- Danny Macri: EPA
- Walt Tunnessen: EPA
- Dylan Sawyer-Villers: Equitrans Midstream
- Paul Kress: ETRN
- Rishi Garg: FERC
- Eric Fox: Itron, Inc.
- Mike Russo: Itron, Inc.
- William Morrow: Lawrence Berkeley National Laboratory
- John Meyer: Leidos
- Sugandha Tuladhar: NERA
- Peri Ulrey: NGSA
- Rob Boteler: Nidec Motor Corporation
- Cheryl Marcum: Nidec Motor Corporation
- Alberta Carpenter: NREL
- Frances Wood: OnLocation, Inc.
- Robert Hershey: Professional
- Robert Terry: Professional
- Whitney Herndon: Rhodium Group
- Ben King: Rhodium Group
- Hannah Kolus: Rhodium Group
- Hannah Pitt: Rhodium Group
- Brian Atkins: Southern Company
- Francesco Memoli: Tenova Inc.
- Eric Masanet: UC Santa Barbara
- Sarah Kuhnell: Worthington Industries
- Shellee Simmons-Taylor: Worthington Industries
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<tr>
<th>EIA attendees (Webex/phone)</th>
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<tbody>
<tr>
<td>Daniel Agee             EIA</td>
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<td>Lindsay Aramayo         EIA</td>
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<td>Nicholas Chase          EIA</td>
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<td>Jim Diefenderfer        EIA</td>
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<td>John Duff               EIA</td>
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<td>Joshua Eiermann         EIA</td>
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<td>Mindi Farber-DeAnda     EIA</td>
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<td>David Fritsch           EIA</td>
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<td>Peter Gross             EIA</td>
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<td>Angelina LaRose         EIA</td>
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<td>Perry Lindstrom         EIA</td>
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<td>Tom Lorenz              EIA</td>
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<td>Farah Naz               EIA</td>
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<td>Kelly Perl              EIA</td>
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<td>Elizabeth Sendich       EIA</td>
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<td>Nicholas Skarzynski     EIA</td>
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<td>John Staub              EIA</td>
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<td>Russ Tarver             EIA</td>
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<td>James Turnure           EIA</td>
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<td>Warren Wilczewski       EIA</td>
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