



Independent Statistics & Analysis

U.S. Energy Information
Administration

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MEMORANDUM FOR: Angelina LaRose
Assistant Administrator for Energy Analysis

FROM: John Staub
Director for Petroleum, Natural Gas, and Biofuels Analysis

Subject: Summary of Oil and Gas Supply, Liquid Fuels Markets, and Natural Gas Markets Working Group Meeting held on September 23, 2020

This memorandum summarizes the presentation given during the *Annual Energy Outlook* (AEO) 2021 Oil and Gas Supply, Liquid Fuels Markets, and Natural Gas Markets Working Group meeting and the resulting discussions that took place. The meeting had three parts. The first part covered the Oil and Natural Gas Supply Module (OGSM). The second part covered the Liquid Fuels Market Module (LFMM) and International Energy Model (IEM). The third part covered the Natural Gas Markets Module (NGMM). The presentation slides are available in separate documents on the U.S. Energy Information Administration's (EIA) website.

All slides, charts, and discussions for AEO2021 were preliminary and therefore, should not be quoted or cited. Final AEO2021 materials will be released in early 2021.

OGSM

In her presentation, Dana Van Wagener covered three main topics: data updates and model improvements for AEO2021, assumptions related to COVID-19, and preliminary results for AEO2021. She highlighted the following points:

Results (AEO2021)

- U.S. crude oil production and natural gas production are sensitive to resource availability and technological improvements.
- U.S. crude oil production and natural gas production continue to be driven by growth in tight oil and shale gas supply.
- U.S. crude oil production is generally lower in AEO2021 than in AEO2020 because of lower global oil prices.
- The Bakken and Wolfcamp formations lead growth in tight oil production.
- The Marcellus and Utica formations lead production of shale gas.
- U.S. production of natural gas plant liquids is lower in AEO2021 than in AEO2020.

Model and data updates (AEO2021)

- Updated estimated ultimate recovery (EUR) for tight and shale wells

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DO NOT QUOTE OR CITE AS RESULTS ARE SUBJECT TO CHANGE.**

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- Updated historical production through 2019 and estimate for 2020
 - Improved the offshore discovery process component
 - Updated offshore announced discoveries for Alaska and Lower 48 states

COVID-19 related assumptions (AEO2021)

- Increased hurdle rate of return
- Reduced drilling responsiveness to price changes in the short term

Discussion

The first question was about how drilling costs will change with the recent drop in drilling activity and improved drilling efficiency and technology. We (EIA) explained that decreasing oil prices and decreasing activity levels put downward pressure on costs. Another question was related to oil production (particularly about the Bakken and Eagle Ford regions and EIA's expectations for their production levels in the long term). We explained that in the OGSM methodology, production is modeled at the play level. The Bakken has a lot of technically recoverable reserves, and better quality resources are produced first. Over time, drilling moves to less-productive areas, which become economical as the oil price increases. The Eagle Ford is a smaller area than the Bakken, so drilling moves to less-productive areas less often but still moves.

Participants also asked about natural gas production. One question was about drilling shifting to *gassier* plays if natural gas prices have a stronger recovery than oil prices. We explained that if natural gas prices have a stronger recovery than oil prices, *gassier* plays will become more economical than *oilier* plays, all based on the economics of projects within each play. Another question was asked about EIA's view of associated gas production. We explained that as with crude oil production, natural gas produced in primarily oil formations (associated gas) also declines because of the relatively low prices in the short term. We do not project associated gas to return to 2019 levels until 2024, and then we expect it to steadily increase at a modest rate through 2050, primarily driven by increased drilling in the Permian Basin. We also clarified that natural gas production in the AEO does not include flared gas.

LFMM and IEM

Estella Shi gave the next presentation. She began by showing the updated crude oil price path for AEO2021. She described trends in refining, crude oil and petroleum product trade, and petroleum product prices. She focused on updates to biofuels data and representation in LFMM.

Results (AEO2021)

- Projections for the crude oil price path in AEO2021 will be lower than in AEO2020.
- Crude oil supply to U.S. refineries is lower in AEO2021 than in AEO2020, reflecting lower atmospheric distillation capacity.
- U.S. crude oil exports are higher in AEO2021 than in AEO2020 in the long term.
- The spread between gasoline and diesel prices is lower in the short term, but it returns to a similar spread in AEO2021 as in AEO2020 in the long term.
- Biofuels supply recovers quickly but remains lower in AEO2021 than in AEO2020.

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- Biodiesel and renewable diesel supply are more in line with historical levels in AEO2021 compared with AEO2020.

Model and data updates (AEO2021)

- Updated international crude oil and product import and export curves
- Updated crude oil price differentials
- Updated pipeline capacity and transportation costs
- Updated annual data on state and federal fuel taxes
- Updated annual capacity data for refinery and cogeneration
- Reactivated and extended the biodiesel blender tax credits through 2022 (per legislation)
- Added revenue for sale of distillers dried grain
- Updated annual capacity data for ethanol, biodiesel, and renewable diesel
- Updated data on E15 maximum market penetration rates (slower growth through 2025)
- Improved representation of biodiesel imports
- Added representation of renewable diesel imports
- Updated E85 representation

Discussion

All of the questions were related to biofuels.

A participant asked about renewable jet fuel, and we confirmed that we consider it a separate stream in the model. To be clear, the model produces liquid streams from renewable feedstocks that are available to blend into jet fuel, but renewable jet fuel production is not specifically tracked in the model. Another participant asked how LFMM will handle renewable fuel mandates (RFS) after 2022 when the congressionally mandated volumes will end. We explained that in the model, RFS increases through 2030 and then it is constant. We also updated this assumption to reflect current congressional mandates. We modeled RFS levels through 2030 instead of 2022 because LFMM includes a phase out (through 2030) of the small refinery exemptions (SRE), which we included in the RFS adjustment because the LFMM was not designed to explicitly model SRE. As a result, we modeled RFS levels as increasing through 2030, and then they were kept constant after that. One participant was concerned about the distribution cost for corn ethanol not being appropriately represented. We noted that we do not plan to update this cost for AEO2021 but may consider researching it for AEO2022.

A couple of participants were curious about how the E85 consumption volumes would be different in AEO2021 compared with AEO2020. We explained that although we are still working on the transportation side of NEMS, which can have implications on this result, E85 volumes will be slightly higher in AEO2021 but will account for a small fraction compared with other petroleum products. Another participant had a question about E85 costs. This participant wanted to know if we considered increased costs for E85 (as a result of being taxed at the same rate as gasoline). We confirmed that we do. Lastly, a participant asked if renewable diesel capacity data are available on our website, and we said that it is not; only biodiesel capacity data are available.

NGMM

Katie Dyl presented natural gas prices, consumption, production, and trade preliminary results for AEO2021 as well as assumptions made regarding liquefied natural gas (LNG) exports and COVID-19.

Results (AEO2021)

- U.S. natural gas consumption and production are both lower in the short term. In AEO2021, consumption returns to AEO2020 levels, but production remains lower than AEO2020 levels.
- U.S. Henry Hub natural gas spot prices are higher in AEO2021 than in AEO2020 in the short term.
- U.S. natural gas exports to Canada are lower in AEO2021 than in AEO2020.
- Preliminary results suggest that no additional LNG export capacity will be built in the Reference case.

Model and data updates (AEO2021)

- Incorporated data from the *Natural Gas Annual*, released November 2019 (2018 annual data)
- Incorporated data from the *Natural Gas Monthly* through April 2020 (complete 2019 history)
- Updated pipeline capacity data, natural gas price data, and historical data for Mexico and Canada
- Updated dates of LNG export facility projects
- Will potentially update nameplate versus peak capacity for LNG export facilities and shipping costs from both the U.S. Gulf Coast and the East Coast to Asia and Europe

Discussion

Participants asked a few questions about the NGMM. One was about accounting for biogas and renewable natural gas. We explained that we account for both under *Supply* in *Supplemental natural gas*. We elaborated that we use our surveys for data inputs into the model, that the current relevant EIA survey (Form EIA-176) does not have a good way to account for renewable natural gas, and that not all suppliers are represented. Another question was about how much of the Elba Island LNG facility's capacity is included in AEO2021, and we confirmed that all of this capacity is included and a spreadsheet with all LNG facilities is available on the EIA website. Another participant wanted to know if EIA considers hydrogen production from natural gas in the context of natural gas demand. We explained that we would potentially consider that idea as a future project.

Attendees

Registered Guests (WebEx/phone)

Emil Attanasi	U.S. Geological Survey
Jose Benitez	U.S. Department of Energy
Ray Boswell	National Energy Technology Laboratory
James Brooks	RBAC Inc.
Phillip Brown	Congressional Research Service
Dallas Burkholder	U.S. Environmental Protection Agency
Chris Carr	n.a.
Ernest Carter	U.S. Department of Agriculture

Luciane Cunha	National Energy Technology Laboratory
Trisha Curtis	n.a.
Anthony Dixon	California Energy Commission
Kevin Easley	U.S. DOE Fossil Energy Program
Melchert Elena	U.S. Department of Energy
Nicholas Farrar	IPA Global
Cory Forgrave	U.S. Dept of Interior, Office of Natural Resources Revenue (ONRR)
Evan Frye	U.S. Department of Energy
Kathy Gramp	Congressional Budget Office
Scott Greenip	U.S. Dept of State, Bureau of Energy Resources
Walter Guidroz	U.S. Geological Survey
Robert Gulliksen	California Energy Commission
Donald Hanson	Argonne National Lab
David Hughes	Global Sustainability Research, Inc.
Blu Hulsey	Continental Resources, Inc.
Svetlana Ikonnikova	TUM School of Management
Gabby Intihar	U.S. Department of Energy
Joanne Ivancic	Advanced Biofuels USA
Bryan Just	American Petroleum Institute
Jordan Kislear	U.S. Department of Energy
Brian Lavoie	U.S. Department of Energy
Yupo Lin	Argonne National Laboratory
Michael Lynch	Energy Policy Research Foundation, Inc. (EPRINC)
John Meyer	Leidos Inc.
Marianne Mintz	Argonne National Lab
Ryan Monson	n.a.
David Morgan	National Energy Technology Laboratory
Brett Murray	Advanced Resources International, Inc.
Dale Nesbitt	Stanford University and ArrowHead
Chris Nichols	National Energy Technology Laboratory
Ramses Omar Cabrales	Federal Energy Regulatory Commission
John Powell	U.S. Department of Energy
Tony Radich	U.S. Department of Agriculture
Tim Reinhardt	U.S. Department of Energy
Michael Schaal	OnLocation, Inc.
Charles Sheppard	EOG Resources, Inc.
Zota Stevens	U.S. Department of Energy
Tony Straquadine	The INGAA Foundation Inc.
Morgan Summers	National Energy Technology Laboratory
Wyatt Thompson	University of Missouri
Paul Touradji	Touradji Capital Management
Barbara Treat	Infrastucture World
Peri Ulrey	Natural Gas Supply Association
Boddu Venkatesh	ICF International, Inc.

Shree Vikas	Conoco Phillips
Ken Walsh	Leidos, Inc.
Jarrett Whistance	University of Missouri
Frances Wood	OnLocation, Inc.
Lester Wyborny	U.S. Environmental Protection Agency
Yan Zhou	Argonne National Laboratory

EIA participants (WebEx/phone)

Erin Boedecker
Hannah Breul
Michael Cole
Meg Coleman
Troy Cook
Jim Diefenderfer
Kathryn Dyl (presenter)
Mindi Farber-DeAnda
Adrian Geagla
Peter Gross
Sean Hill
Ari Kahan
Angelina LaRose
Kirby Lawrence
Mary Lewis
Perry Lindstrom
John Maples
Barbara Mariner-Volpe
Elizabeth May
Jim O'Sullivan
Albert Painter
Corrina Ricker
Elizabeth Sendich
Estella Shi (presenter)
Nicholas Skarzynski
John Staub
Manussawee Sukunta
Dana Van Wagener (presenter)
Warren Wilczewski
Stephen York
Victoria Zaretskaya