Joint Macro-Industrial Working Group: Annual Energy Outlook 2013 Macroeconomic Modeling Plans

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WORKING GROUP PRESENTATION FOR DISCUSSION PURPOSES
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Presentation Goals

- Highlight proposed macroeconomic AEO2013 modeling changes

- Description of Proposed Reference Case
  - Highlight short-term vs. long-term growth
  - Forecast comparisons
  - Highlight macroeconomic concepts that other NEMS modules use

- Briefly describe Macroeconomic Activity Module and its components and how it fits into NEMS

Macroeconomic Modeling Updates Planned for AEO2013

- Increased breakout for some energy-intensive industries
  - More detail in food processing
  - More detail in other chemicals

- Enhanced relationship of feedstock prices for organic chemicals

- Examining energy export linkages in macroeconomic model

- Macroeconomic growth simulations included
  - Increased flexibility for users by having entire simulation rather than a subset of variables reflecting high or low economic growth

Expansion of Industrial Detail

- Food Manufacturing (311)

  – Grain and Oilseed Milling (3112)

  – Dairy Product Manufacturing (3115)

  – Animal Slaughtering and Processing, and Seafood Product Preparation and Packaging (3116-7)

  – All remaining 311 categories not detailed above (311O)

- Other Chemical Manufacturing (3254-9)

  – Pharmaceutical and Medicine Manufacturing (3254)

  – Paint, Coating, and Adhesive Manufacturing (3255)

  – Soap, Cleaning Compound, and Toilet Preparation Manufacturing (3256)

  – Other Chemical Product and Preparation Manufacturing (3259)

The expansion of these energy-intensive industries will provide the opportunity for the NEMS Industrial Demand Module to project more detailed energy use by industry.

Organic Chemical Production & Feedstocks

- Currently organic chemical production (32511 & 9) is dependent on only natural gas price

- Requested additional term to account for feedstock pricing

- Feedstock pricing is one of several metrics that will indicate US competitiveness

- First attempt (*AEO2013*) will use ratio of natural gas price to oil price as a proxy for ethane to naphtha price ratio

- Future estimations to include direct pricing for ethane, naphtha, and possibly propane and butane

Preliminary Macroeconomic Forecast for AEO2013

- Initial runs use the May 2012 long term forecast, going out to 2041. Real GDP growth is similar to AEO2012's forecast, coming in at 2.6 percent growth from 2012 to 2040.

- The AEO projections use trend forecasts where there are no unplanned shocks; no rapid changes in either fiscal or monetary policies; and no major unforeseen changes in either productivity or technology besides seen in recent trends.

- However, the next 30 years will probably not be similar to the last 30 years. Growth in productivity, population, and labor force explains most of long-run GDP growth.

Preliminary AEO2013 Macroeconomic Reference Case, cont

	Previous 30 Year Growth	Forecasted 28 Year Growth
Real GDP	2.8%	2.6%
Consumption	3.1%	2.3%
Investment	3.1%	3.8%
Government	2.1%	0.7%
Exports	5.3%	5.8%
Imports	6.2%	4.0%

Preliminary Macroeconomic Forecast, cont

The Reference Case is a trend forecast; thus the annual GDP forecast settles into a long-run growth path.

Ending Year

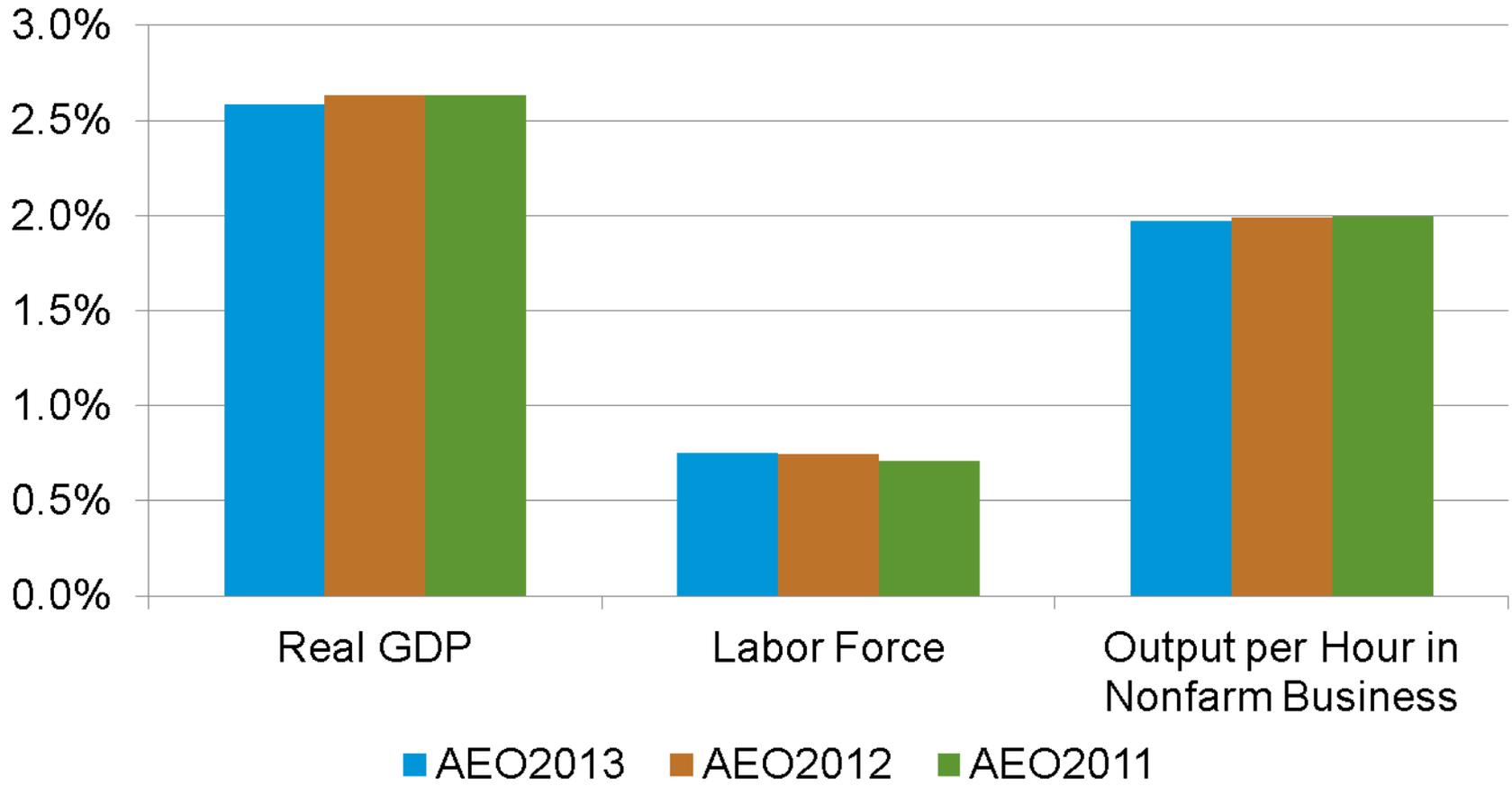— ◆ — 30 Moving Average   — □ — Annual Growth
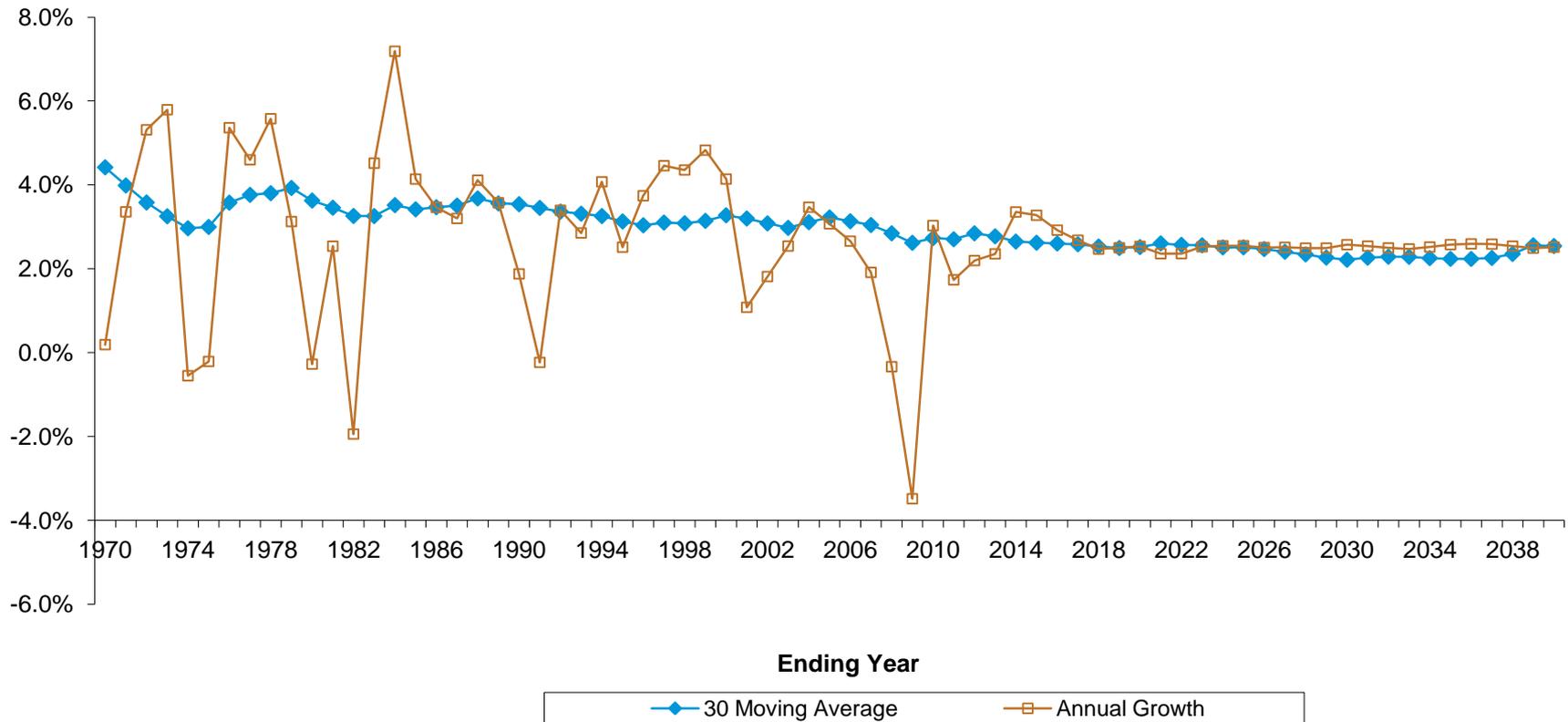
Comparisons with other Projections

- More similarity in long run growth across projections compared to short run forecasts

- Relatively fewer long-run growth comparisons available

- The administration and CBO forecasts are updated twice yearly; while other forecasts update their long run projections quarterly
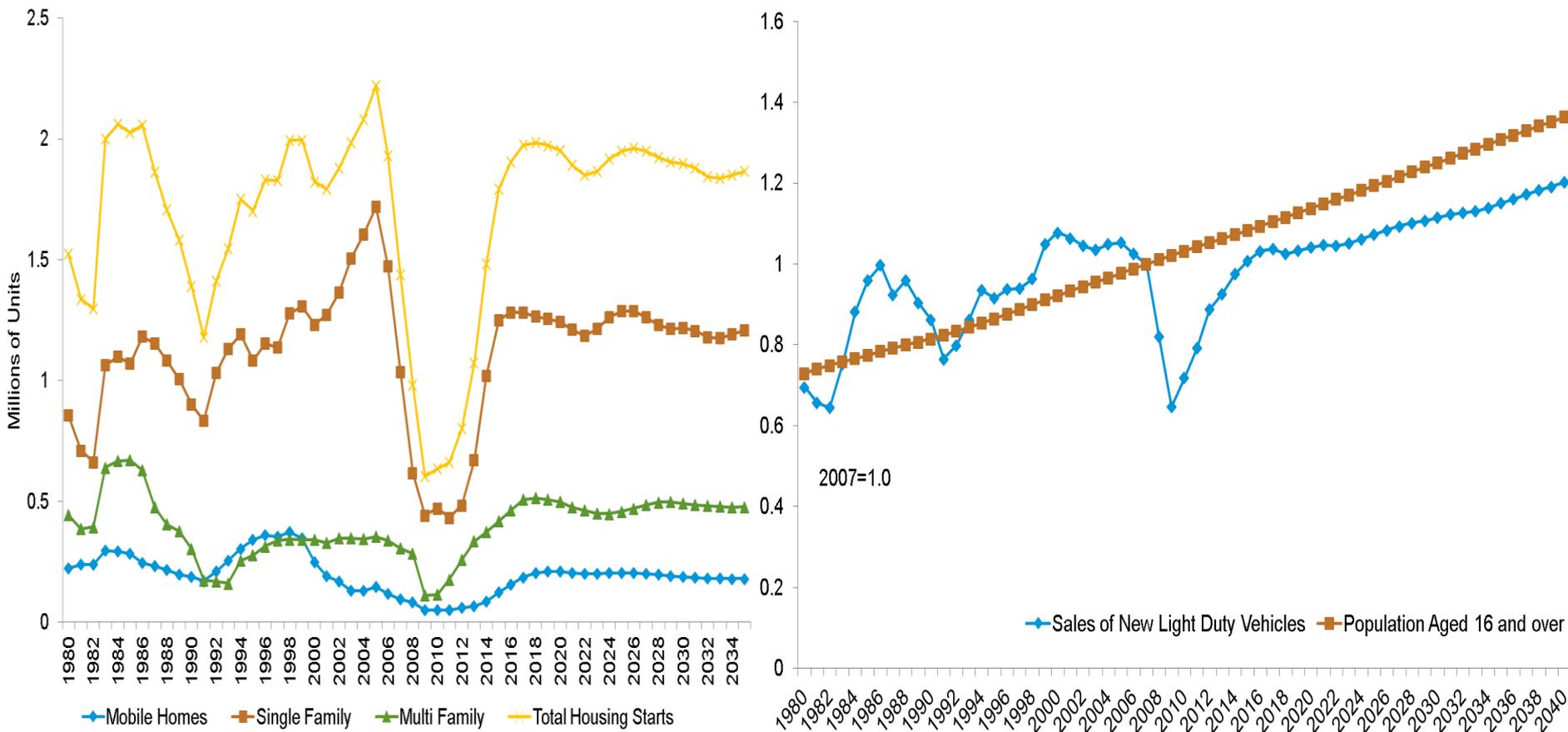
Real GDP, Annual Percent Change

Legend: AEO2012, AEO2013, CBO January 2012, Global Insight May 2012, Blue Chip March 2012, OASDI Aug. 2011, OMB January 2012, INFORUM May 2012
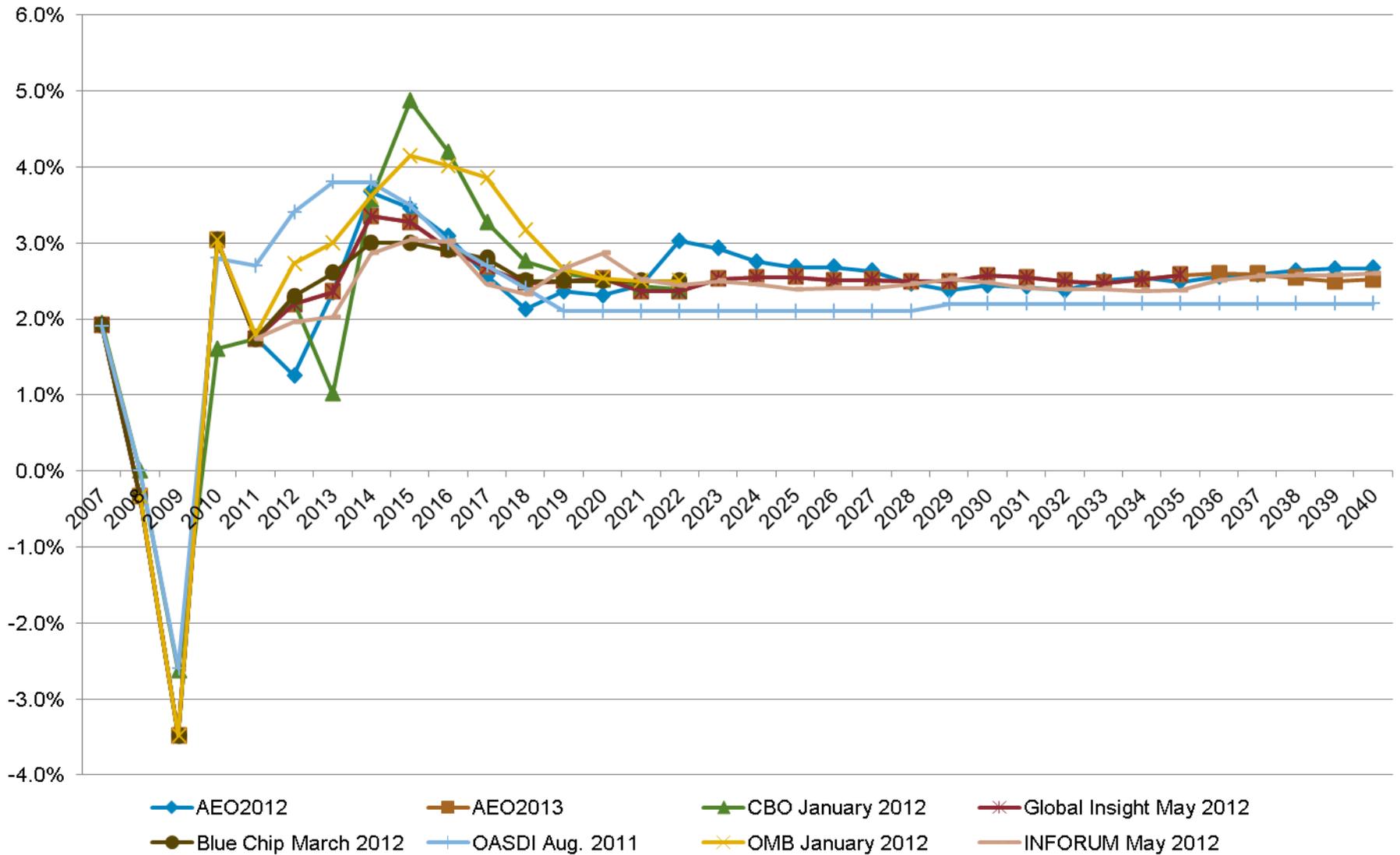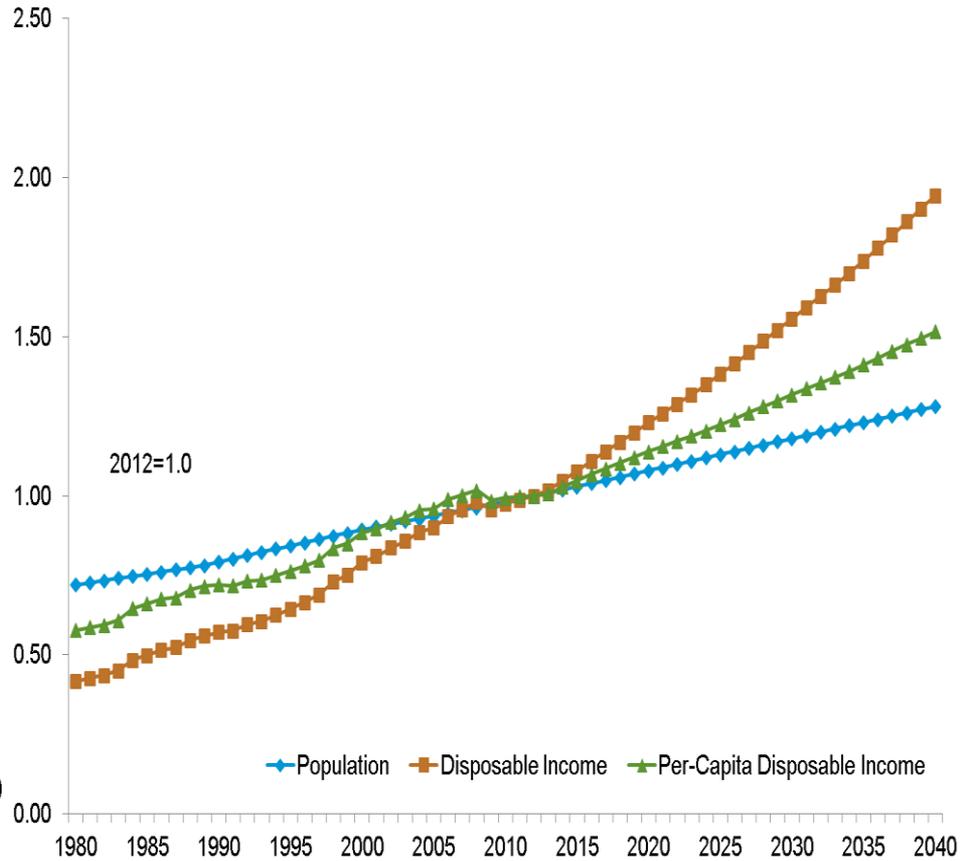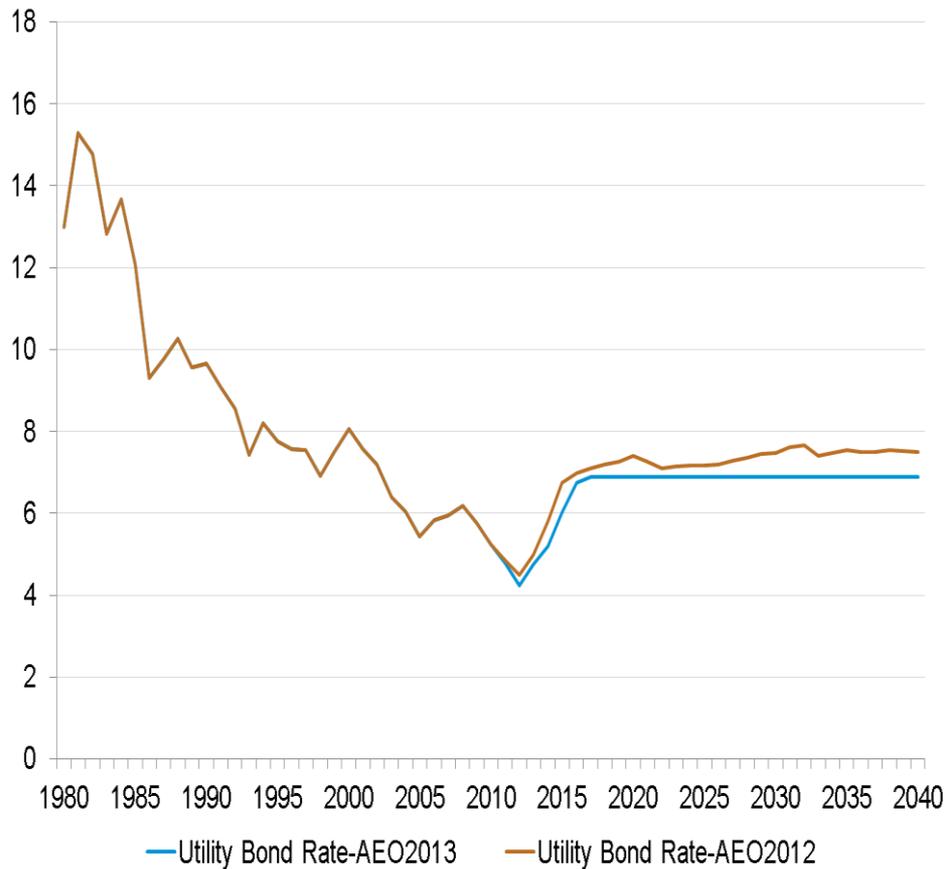
Real GDP, Labor Force, and Labor Productivity Growth Rates (2012-2040)

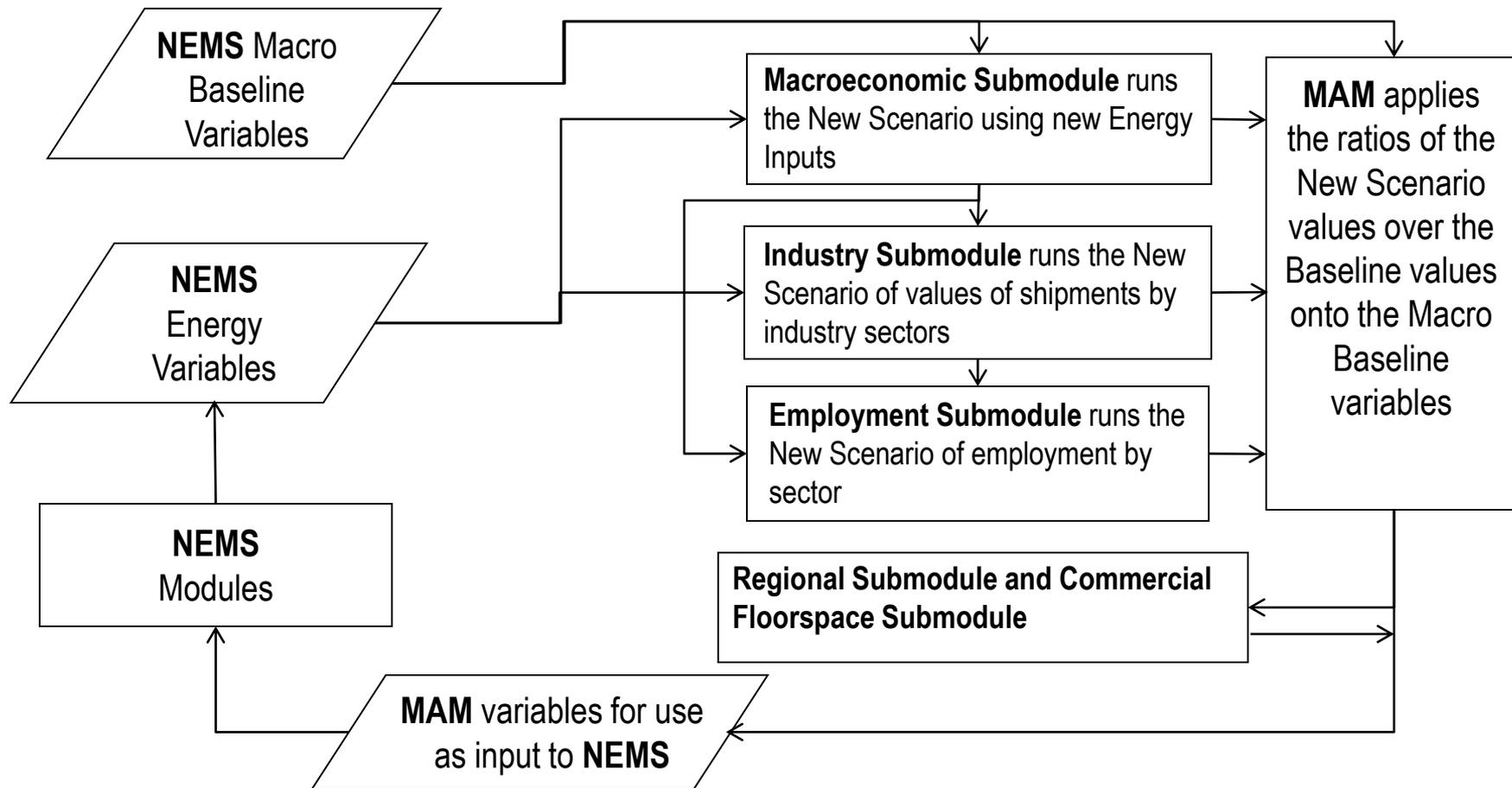# Proposed Reference Case Projections that other NEMS Models Uses

Most Energy Supply NEMS Modules use Interest Rates, Population and Disposable Income

Linkage between NEMS and MAM

National Energy Modeling System (NEMS)

Macroeconomic Activity Module (MAM)

- NEMS Macro Baseline Variables
- NEMS Energy Variables
- NEMS Modules
- **Macroeconomic Submodule** runs the New Scenario using new Energy Inputs
- **Industry Submodule** runs the New Scenario of values of shipments by industry sectors
- **Employment Submodule** runs the New Scenario of employment by sector
- **Regional Submodule and Commercial Floorspace Submodule**
- **MAM** applies the ratios of the New Scenario values over the Baseline values onto the Macro Baseline variables
- **MAM** variables for use as input to **NEMS**

National Macroeconomic Model

- Uses Global Insight's macroeconomic model, whose forecast horizon matches NEMS

- Keynesian model capturing short-run cyclical developments with long-run equilibrium as specified by production function

- Model of output, prices and financial conditions allows depiction of both monetary and fiscal policies.

- The level of inflation-adjusted demand is driven by the price level, income, wealth, expectations and financial conditions. Supply is keyed to a production function combining inputs of labor hours, energy, and capital stocks of business equipment, structures and government infrastructure.

- Major drivers: total factor productivity, labor supply, capital stock, technological progress

Industrial Activity Model

- Manufacturing: Most at 3-digit NAICS (North America Industrial Classification) and some at 4-digit NAICS level

- Nonmanufacturing and Services: 3-digit SIC industries or their aggregations

- Industrial Energy Demand Module is main consumer; requires 4-digit NAICS detail and wants even more disaggregation

- No preliminary results available now from the Industrial activity model

Commercial Floor Space Model

- Stock-adjustment model solved at a quarterly interval

- Thirteen commercial floor space types in each of nine Census divisions

- Explanatory variables include lagged values of floor space, per capita real gross domestic product, real per capita consumption of goods and services, real private investment in commercial buildings, real change in the stock of business inventories, employment, interest rates and floor space removals

- Forecasts additions to and stock of commercial floor space measured in thousands of square feet

- Users: Commercial Module

Employment Model

- Econometric model with behavioral equations for employment by sector and for productivity in the manufacturing sector

- Changes in labor-to-output ratio (employment over gross output) is related to changes in relative factor prices, productivity, capacity utilization rates, cyclical unemployment rate, and technological change, represented by a trend variable

- There is an alignment process in which the forecasts of the manufacturing, nonmanufacturing and service sectors are adjusted so that their sum aligns to the total nonfarm employment from the macroeconomic model

- The forecasts of the detailed manufacturing sectors are adjusted so that their sum aligns to the total manufacturing employment

- For coal mining and oil & gas extraction, forecasts are replaced by employment forecasts from other NEMS Modules

Modeling Approach

- We needed one macro model to produce short (up to 2 years) and mid-term forecasts.

- The amount of macroeconomic detail needed involves interest rates, employment, detailed industrial output and commercial floorspace implied that we needed some model to describe conditions other than full employment.

- We needed a model to generate a baseline.

For more information

U.S. Energy Information Administration home page | www.eia.gov

Short-Term Energy Outlook | www.eia.gov/steo

Annual Energy Outlook | www.eia.gov/aeo

International Energy Outlook | www.eia.gov/ieo

Manufacturing Energy Consumption Survey | www.eia.gov/emeu/mecs

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