Office of the Chief Economist
Office of Energy Policy and New Uses

Biofuel in diesel and heating oil

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Agenda

- What is distillate fuel and which biofuels are compatible?
- Federal, state, and local policies on biofuels in distillate fuel
- Economics of biodiesel production, including the effects of biofuels policies

Distillate and heating oil overlap but not perfectly

- Distillate fuel consists of No. 2 diesel fuel and No. 2 heating oil
  - Kerosene (No. 1 fuel oil) is a separate product in EIA data
  - Blends easily with No. 2 distillate, often used to improve cold flow
- “Heating oil” can also refer to grades heavier than No. 2
  - No. 6 heating oil is classified as residual fuel by EIA
  - No. 4 heating oil is a blend of No. 2 and residual fuel
- Two trends in heating oil
  - Reduction in sulfur levels
  - Addition of biofuels
- Diesel and heating oil can contain biodiesel and renewable diesel
  - Both produced from vegetable oil or animal fat but different production processes
  - ASTM standards for diesel fuel and heating oil allow 5% biodiesel in fungible products
  - Blends of up to 20% biodiesel are supported by many engine and burner manufacturers
  - Renewable diesel can be used in any proportion in diesel or heating oil
- Cellulosic diesel and cellulosic heating oil are under development
  - Both are produced by pyrolysis of wood fiber; more upgrading of pyrolysis oil is required for diesel use

U.S. policies on biofuels are moving away from subsidies…

- Federal tax incentives for corn ethanol expired at the end of 2011
  - Ethanol blending tax credit (45 cents per gallon)
  - Ethanol import tariff (54 cents per gallon)
- Two other Federal incentives are still available
  - Biodiesel and renewable diesel blending tax credit ($1 per gallon)
    - Has lapsed several times but then renewed retroactively
    - In place at the beginning of 2016 and available for the entire year
  - Cellulosic biofuels tax credit ($1.01 per gallon) through 2016
  - In contrast to the Renewable Fuels Standard, there is no greenhouse gas reduction threshold for blending tax credits

…and toward consumption standards that can act like subsidies

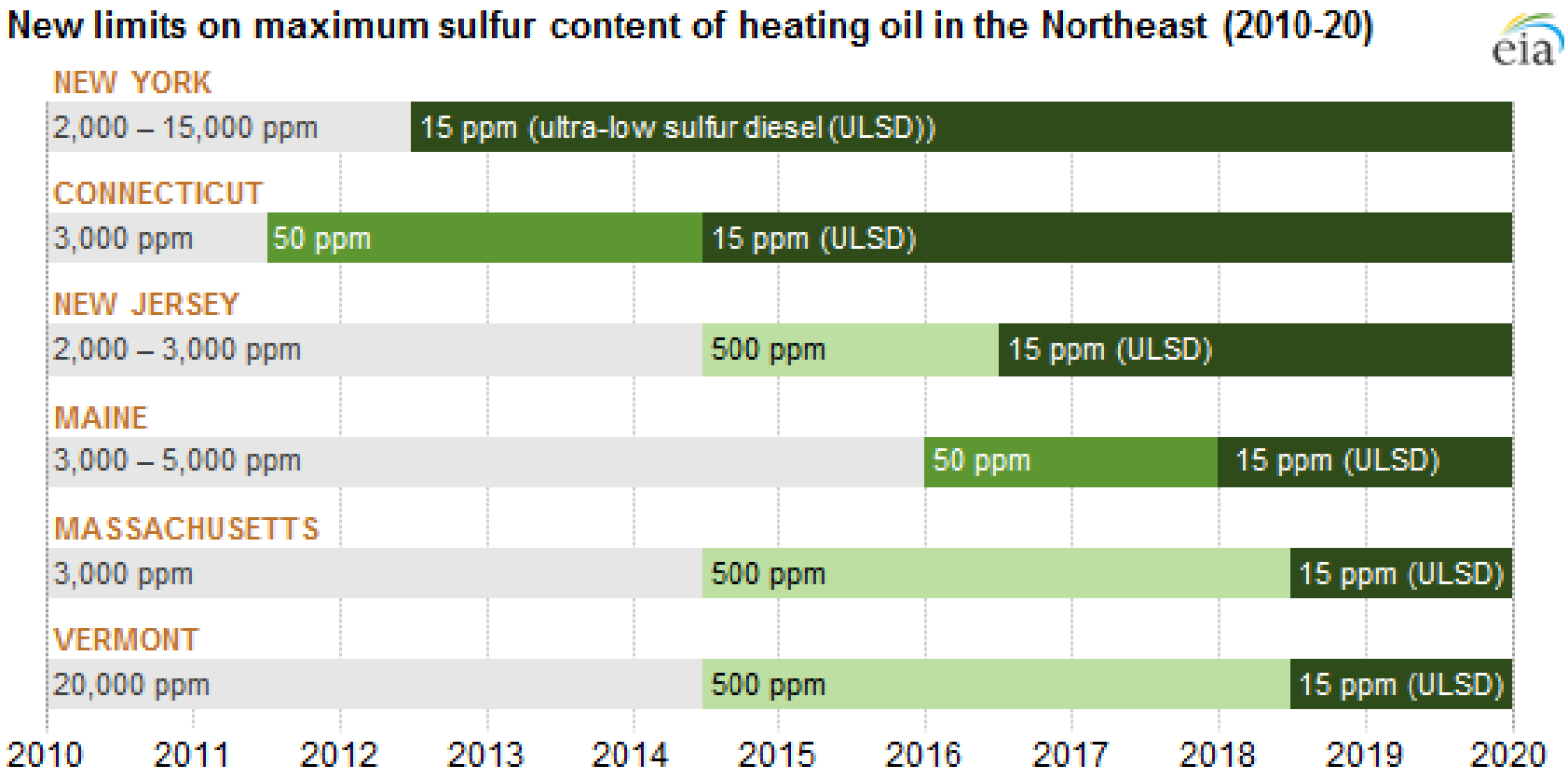
- Federal Renewable Fuels Standard
  - Petroleum refiners and importers are obligated in proportion to their total volumes of petroleum-based gasoline and diesel sold into the U.S. market
  - Compliance is demonstrated by Renewable Identification Numbers (RINs) which can be traded between parties
  - 4 nested standards (RIN type in order of descending value):
    - Cellulosic biofuel (D7, D3)
    - Biomass-based diesel (D7, D4)
    - Advanced biofuel (D7, D3, D4, D5)
    - Total renewable fuel (D7, D3, D4, D5, D6)
- California Low Carbon Fuel Standard (LCFS)
  - Each biofuel and associated production process (pathway) receives a carbon score
    - Yellow grease biodiesel has lower (better) score than soybean biodiesel
  - LCFS credits can be traded between parties
- Commercial data services collect prices of D4, D5, and D6 RINs and LCFS credits

State and local standards for biodiesel blending also play a role in diesel and heating oil markets

State or locality	Laws and regulations relating to biodiesel in distillate fuel
Minnesota	All diesel fuel must be B10 in summer and B5 in winter; summer requirement for B20 in 2018
Maryland	3 cent-per-gallon tax credit for bioheat blends with at least 5% biodiesel, $500 limit per taxpayer; half of oilheat equipment in state buildings must use bioheat with at least 5% biodiesel
New York City	2% biodiesel blend required for No. 2 and 4 fuel oil
New York	Each percentage point of biodiesel in heating oil up to 20% earns a credit of 1 cent per gallon against the state income tax through December 31, 2016
Rhode Island	4% biodiesel blend required; 5% as of July 1, 2017
Massachusetts	5% biodiesel blend requirement legislated *but not implemented*
Connecticut	10% biodiesel blend if neighboring states establish similar requirements
Vermont	7% biodiesel blend if surrounding states establish similar requirements

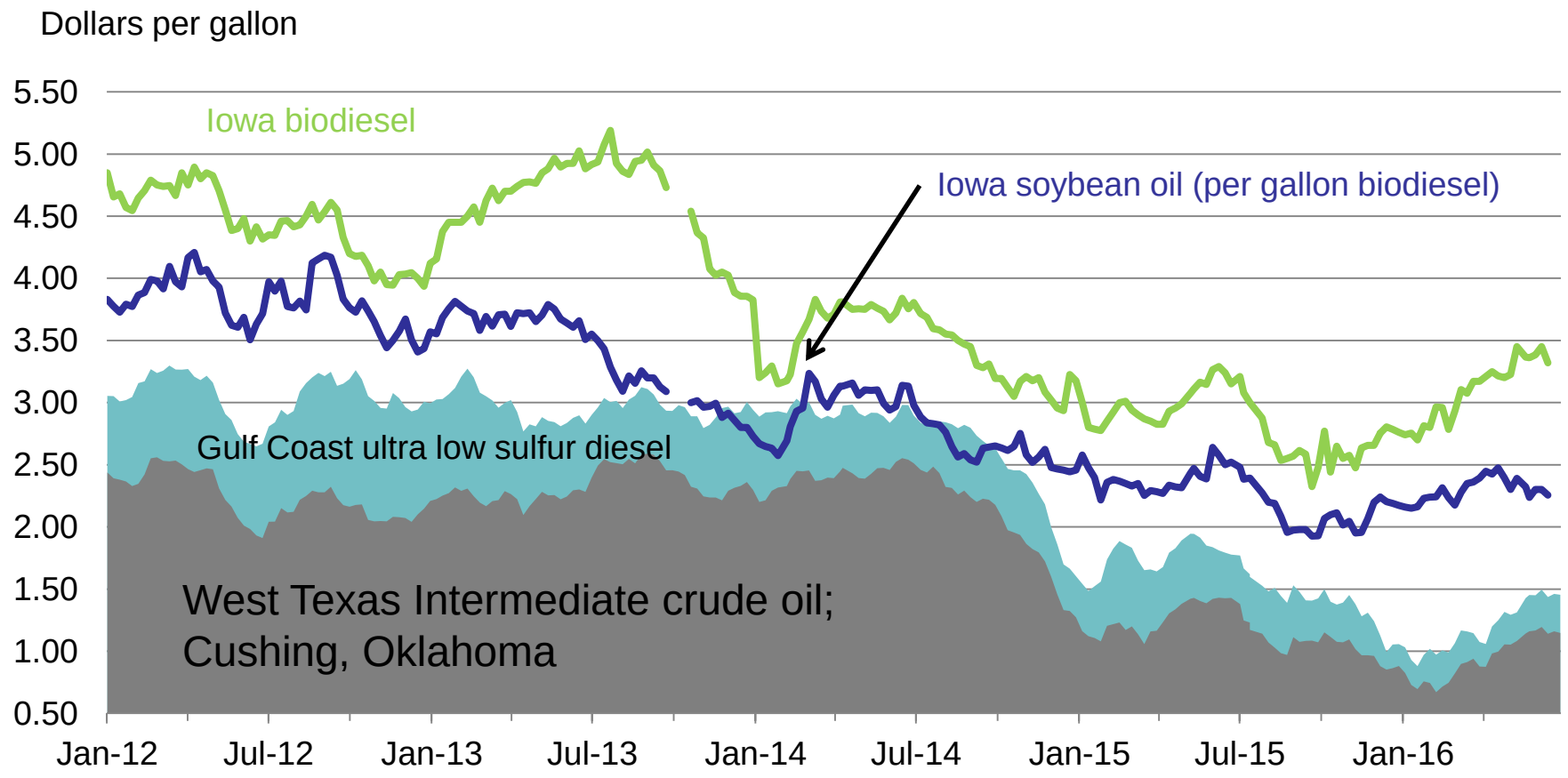
Source: National Oilheat Research Alliance, https://noraweb.org/2015/07/sulfur-and-bioheat-requirements-in-the-northeast-states/

Since May 2013, the New York Mercantile Exchange has based its heating oil contract on ultra low sulfur diesel



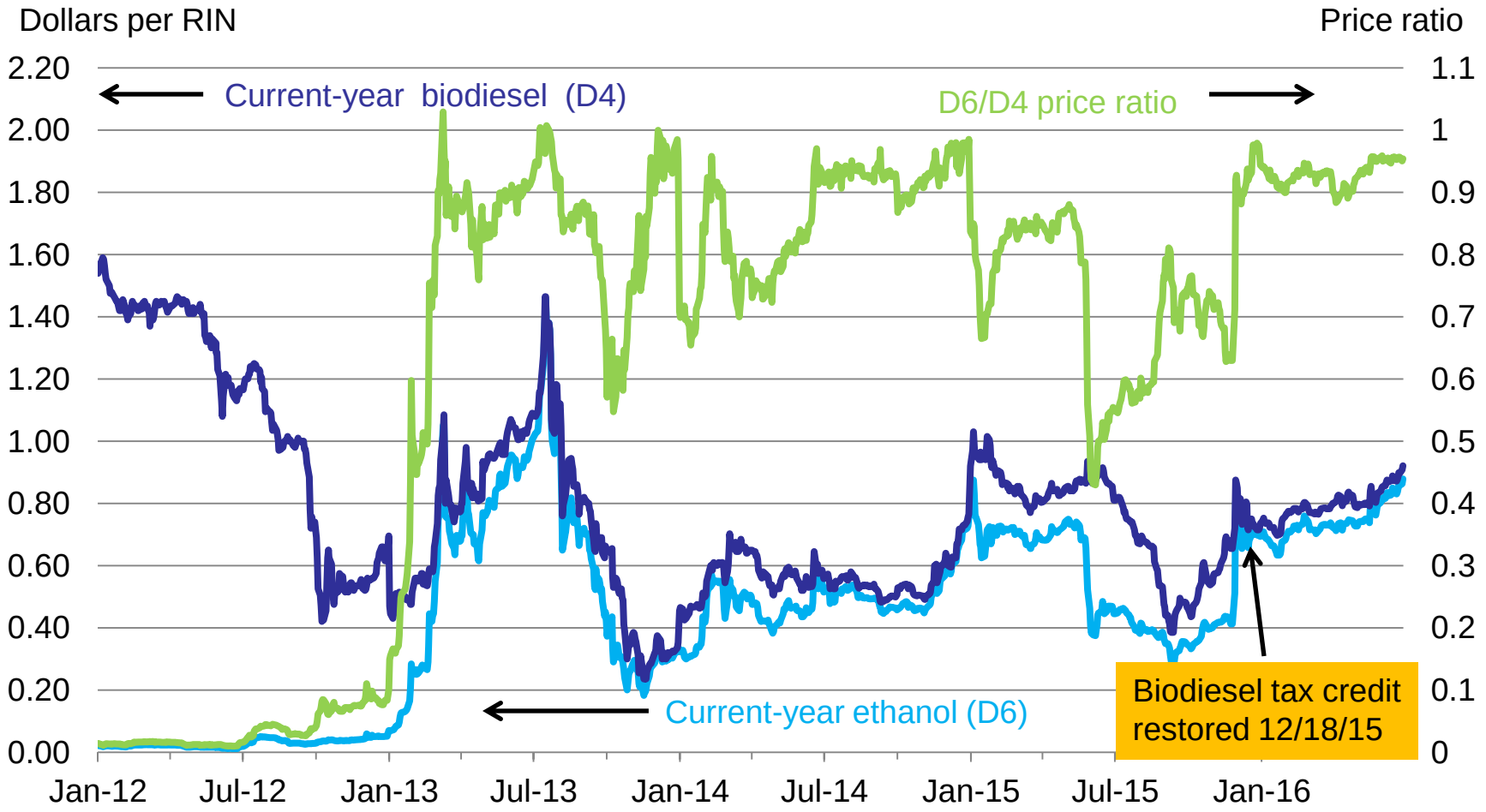
Source: Energy Information Administration *Today In Energy*, May 10, 2013
http://www.eia.gov/todayinenergy/detail.cfm?id=11211

Soybean oil is generally not cost-competitive with crude oil or diesel fuel



Sources: United States Department of Agriculture, Agriculture Marketing Service; and Thomson Reuters as republished by the Energy Information Administration

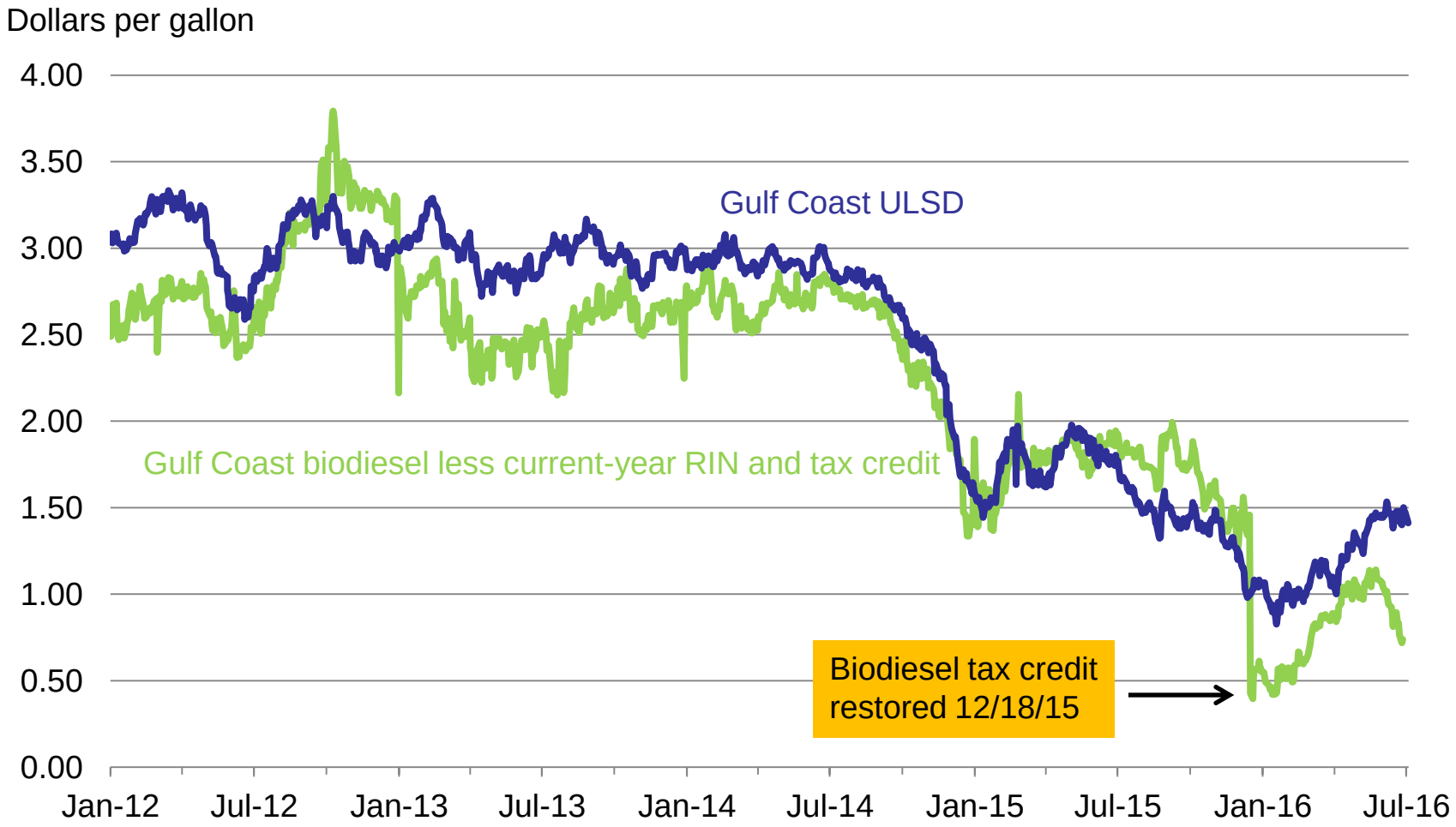
The relationship between D6 and D4 RIN prices indicate that ethanol blending alone cannot meet the total renewable fuel requirement



Note: One RIN represents the energy equivalent of one gallon of ethanol

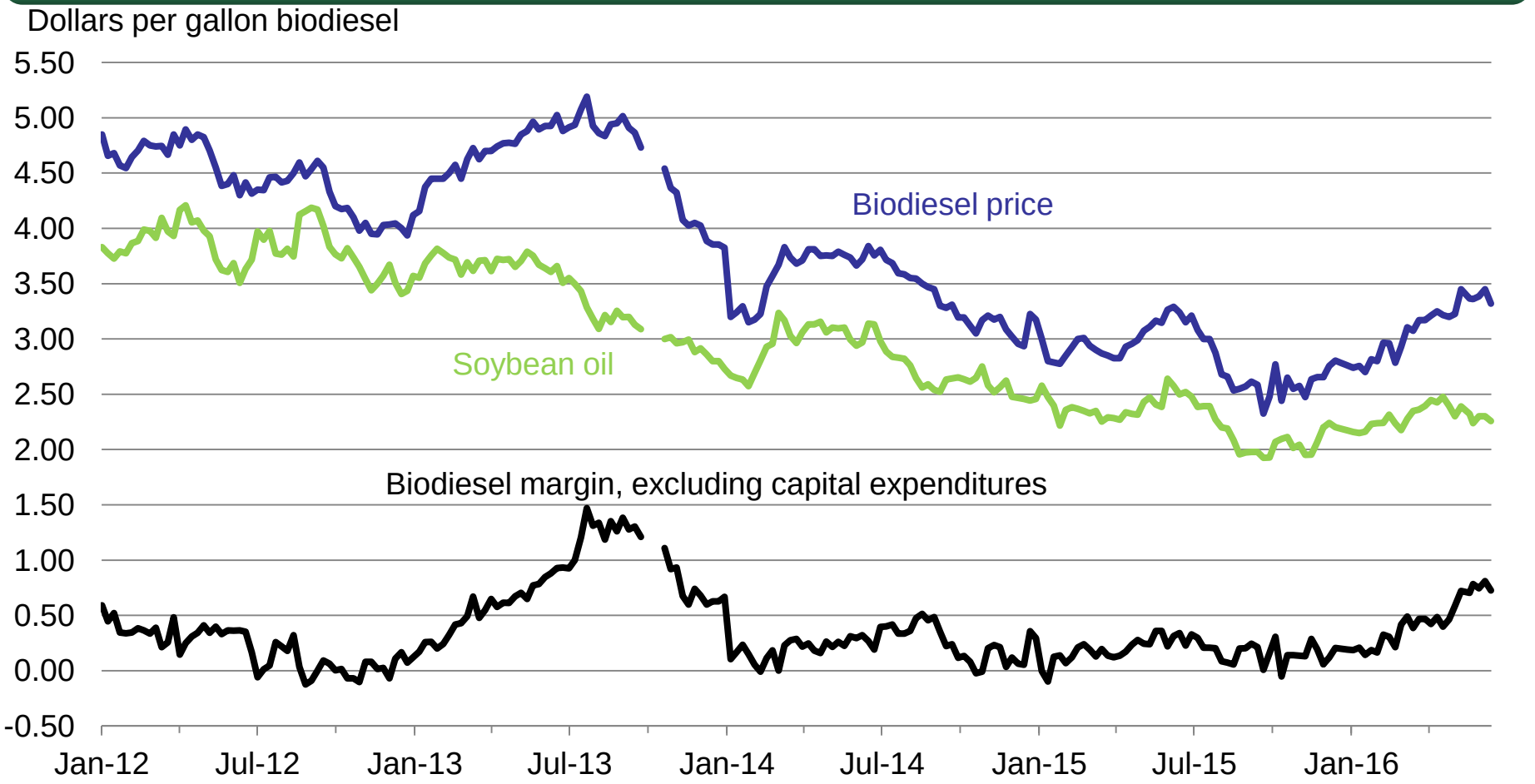
Source: Oil Price Information Service

The biodiesel blending tax credit has more than offset biodiesel's price disadvantage relative to petroleum diesel



Source: Oil Price Information Service and Thomson Reuters as republished by the Energy Information Administration

Biodiesel producer margins have improved in 2016



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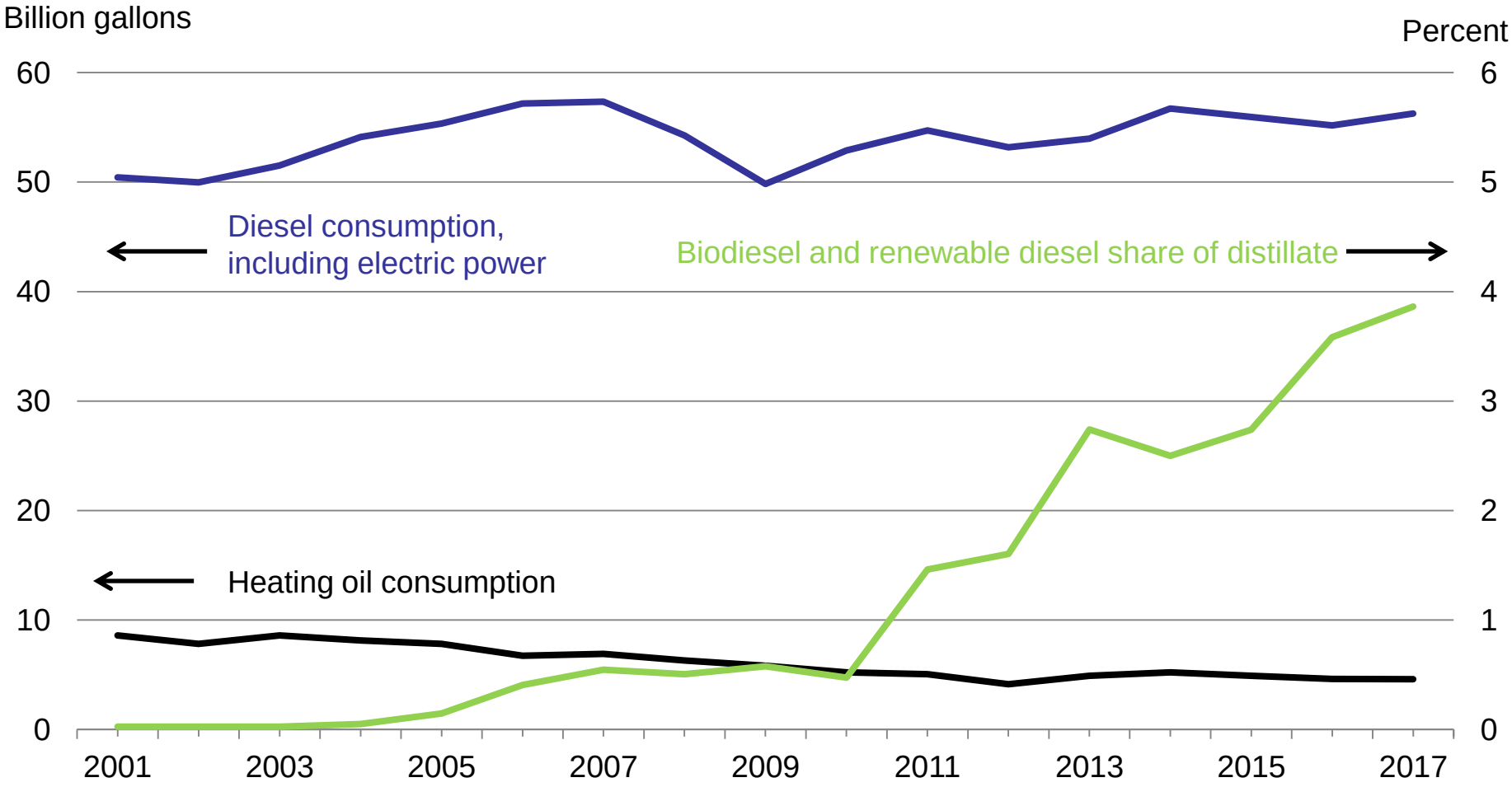
The biofuels share of distillate has grown substantially since the commercialization of biodiesel in 2001



Source: Energy Information Administration, *Short-Term Energy Outlook July 2016*

THANK YOU