Preliminary AEO2013: Biofuels and Petroleum

AEO2013 Liquid Fuels Markets Working Group Meeting

Office of Petroleum, Natural Gas & Biofuels Analysis

October 4, 2012 | Washington, DC

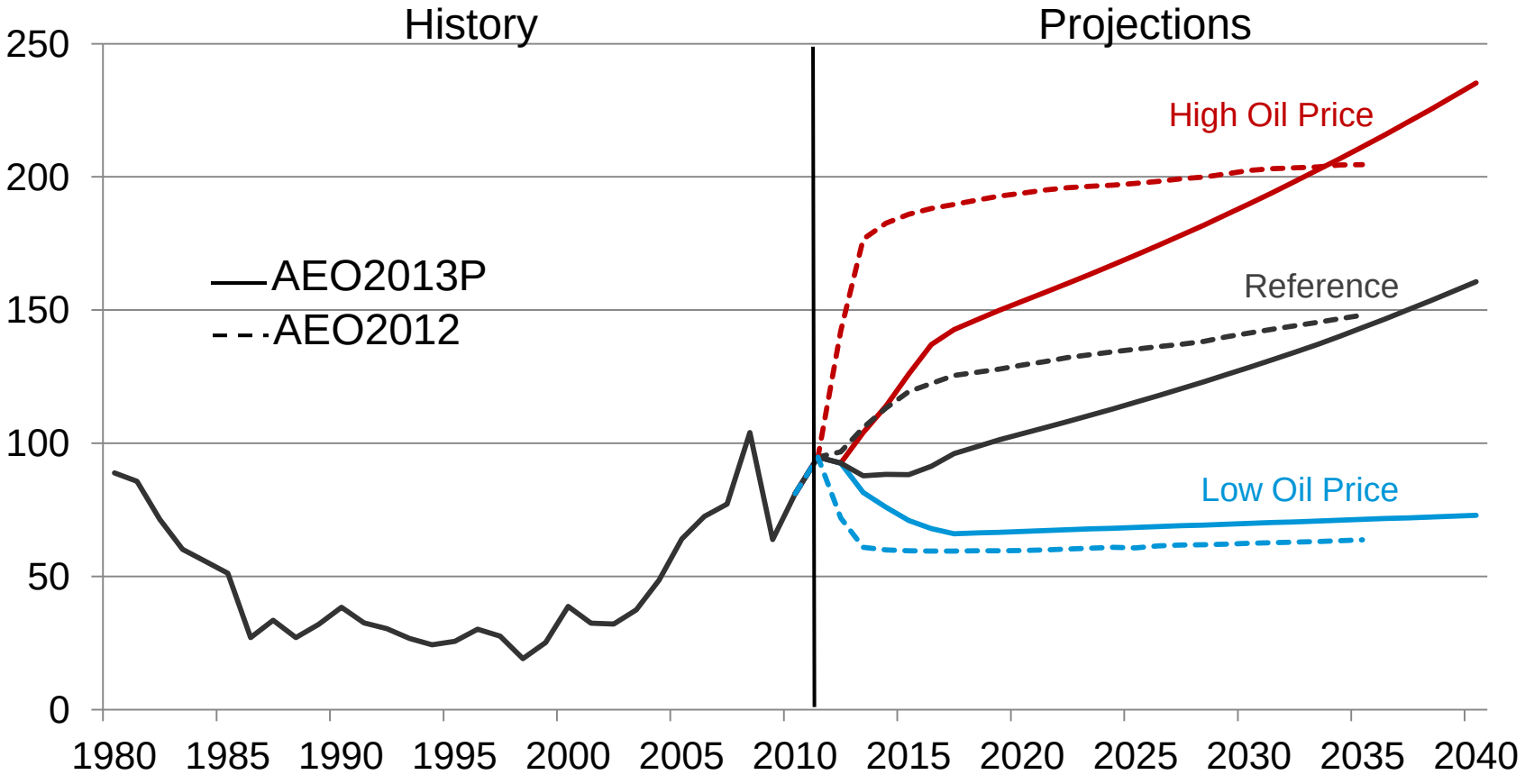
WORKING GROUP PRESENTATION FOR DISCUSSION PURPOSES
DO NOT QUOTE OR CITE AS RESULTS ARE SUBJECT TO CHANGE

Overview

- World oil price path assumptions
- Liquid fuels demands
- Biofuels production and consumption
- Technology assessment update
- Petroleum product imports and exports

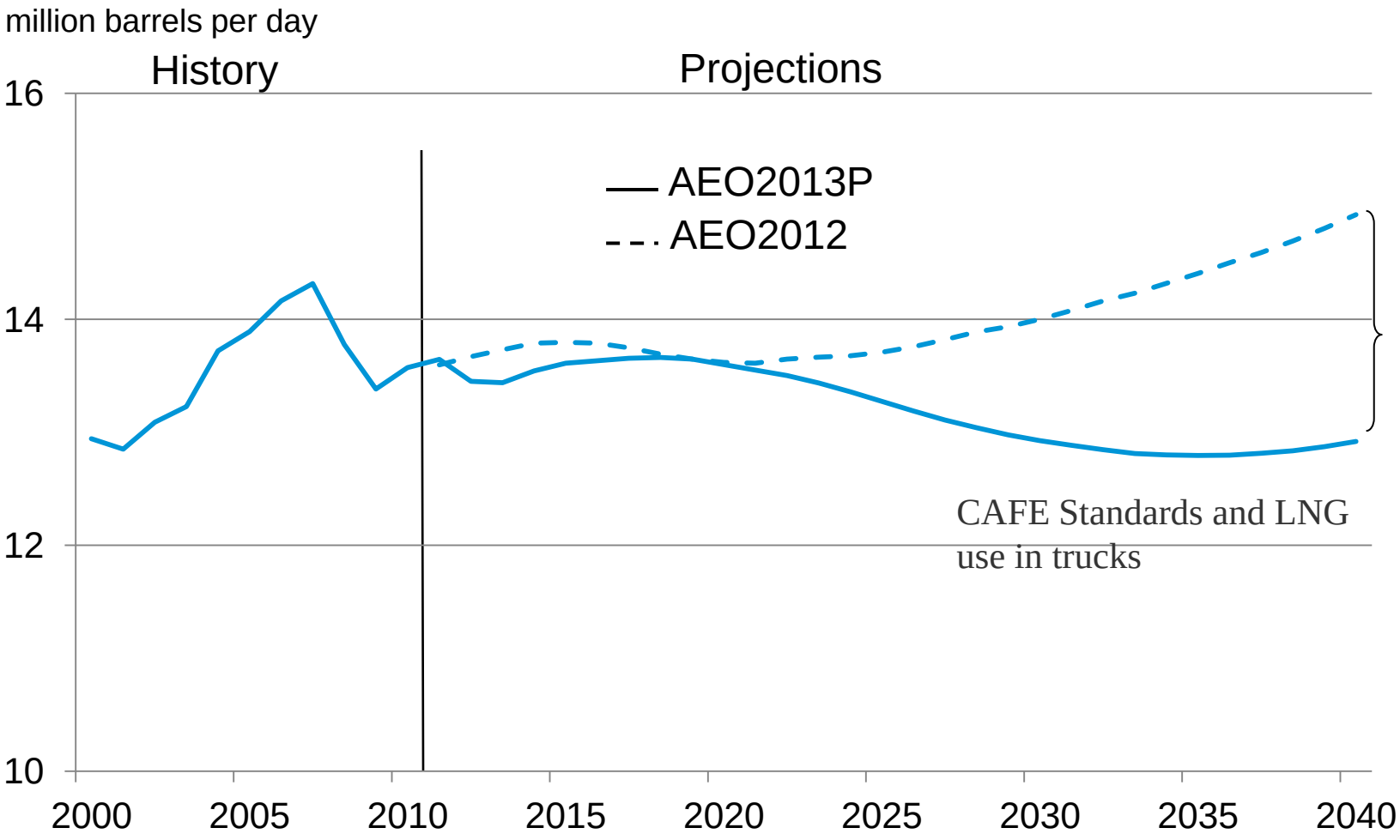
Oil price cases for AEO2013P compared to AEO2012

annual average price of light, low sulfur crude oil
real 2011 dollars per barrel



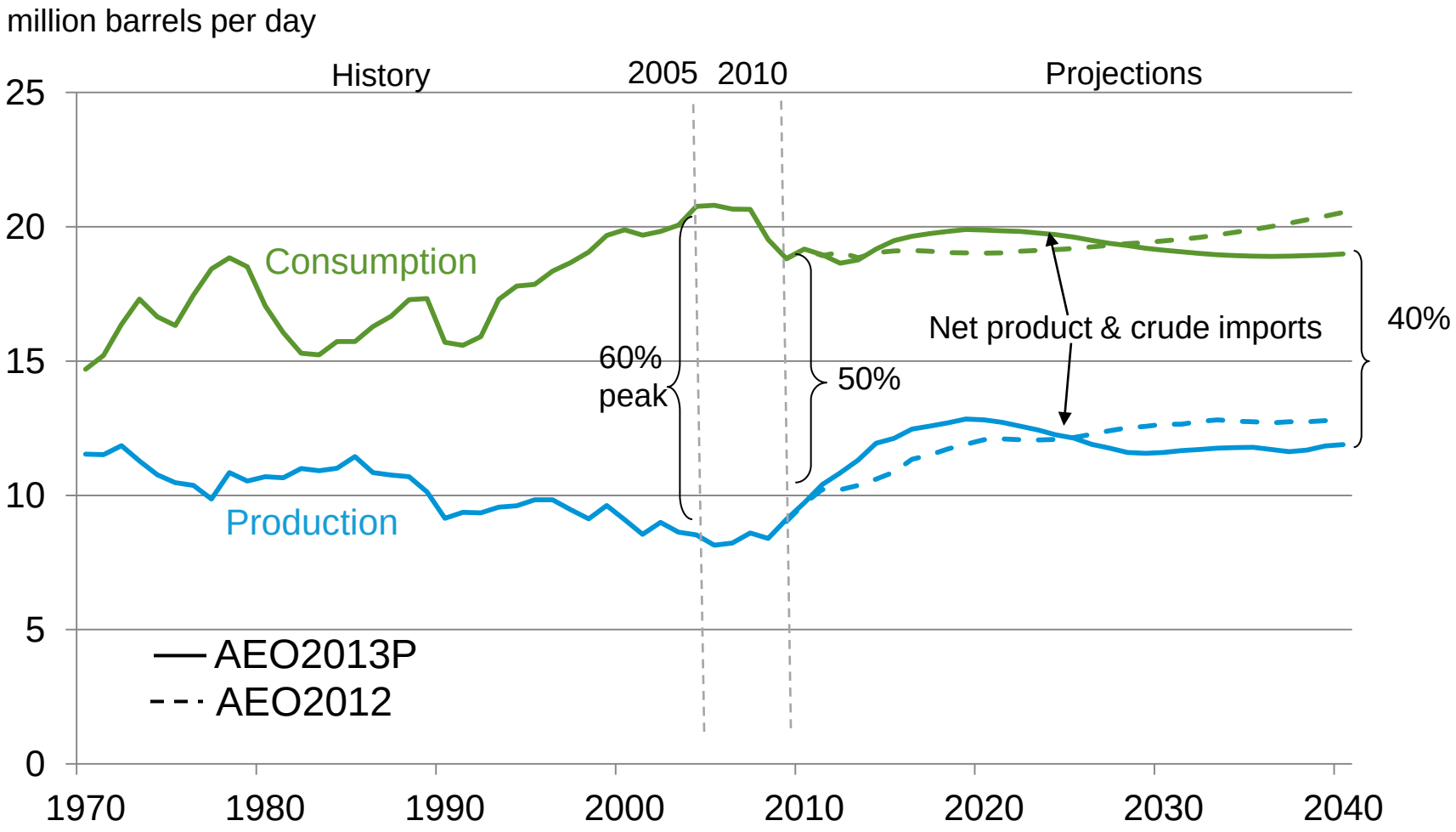
Source: Preliminary AEO2013 runs, dated as of 10/01/12

AEO2013 projects lower U.S. transportation liquid fuels demand, compared to AEO2012 projections



Source: Preliminary AEO2013 runs, dated as of 10/1/12

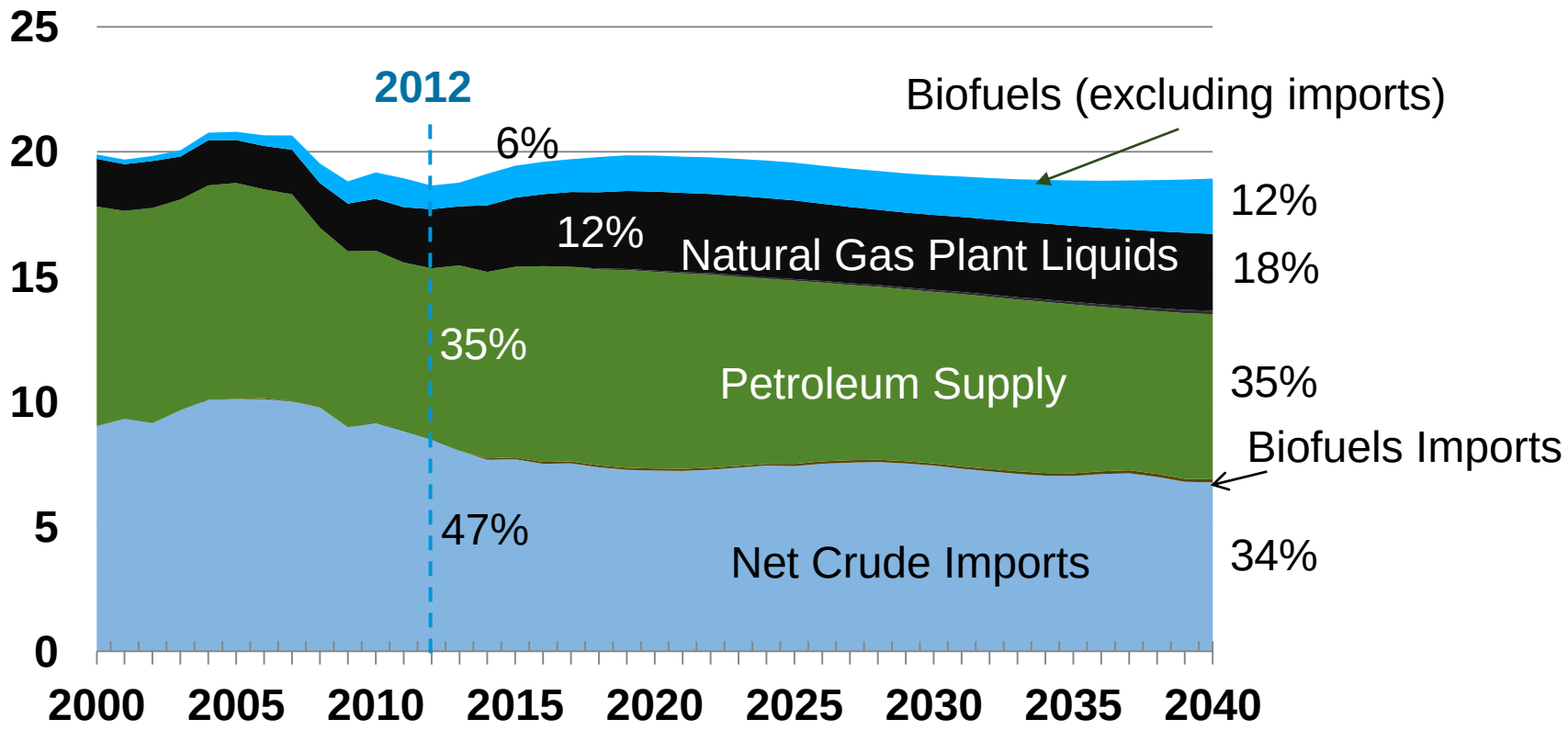
U.S. reliance on imported liquid fuels is lower due to increased domestic production and greater fuel efficiency



Source: Preliminary AEO2013 runs, dated as of 10/1/12

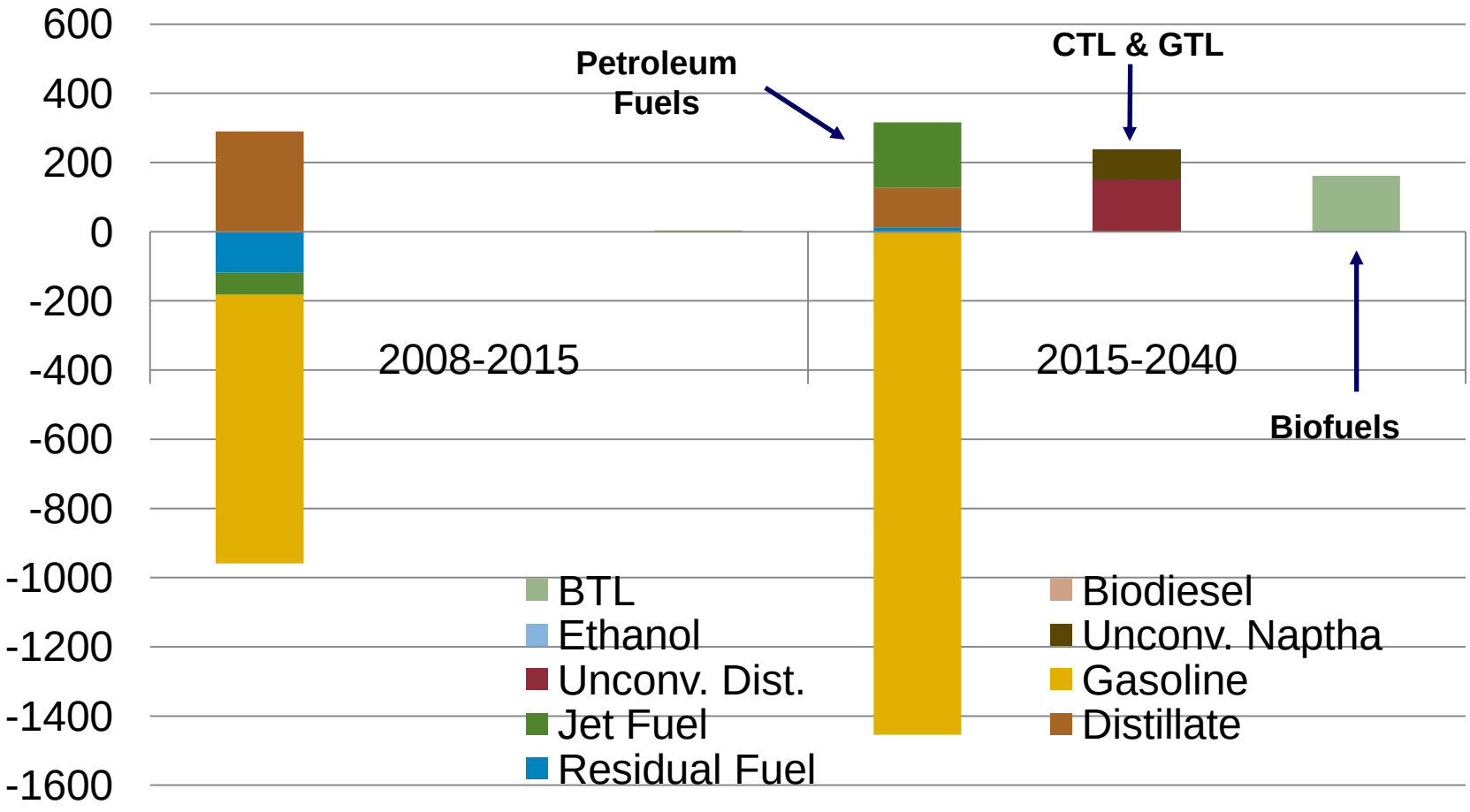
U.S. Liquid Fuels Consumption by Source

Million barrels per day



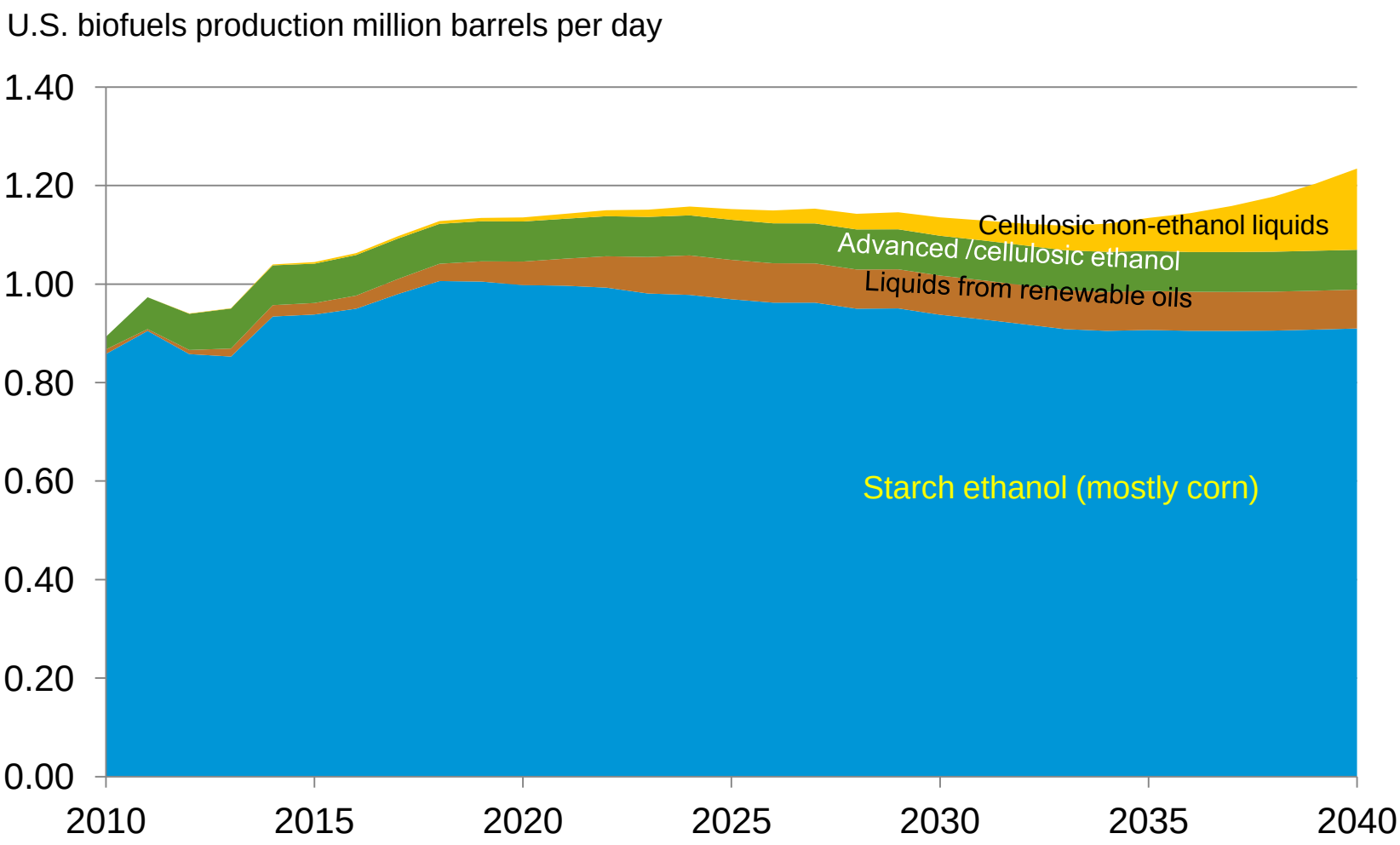
Source: Preliminary AEO2013 runs, dated as of 10/1/12

Fuel consumption changes, 2008-2015 and 2015-2040 (thousand barrels per day)



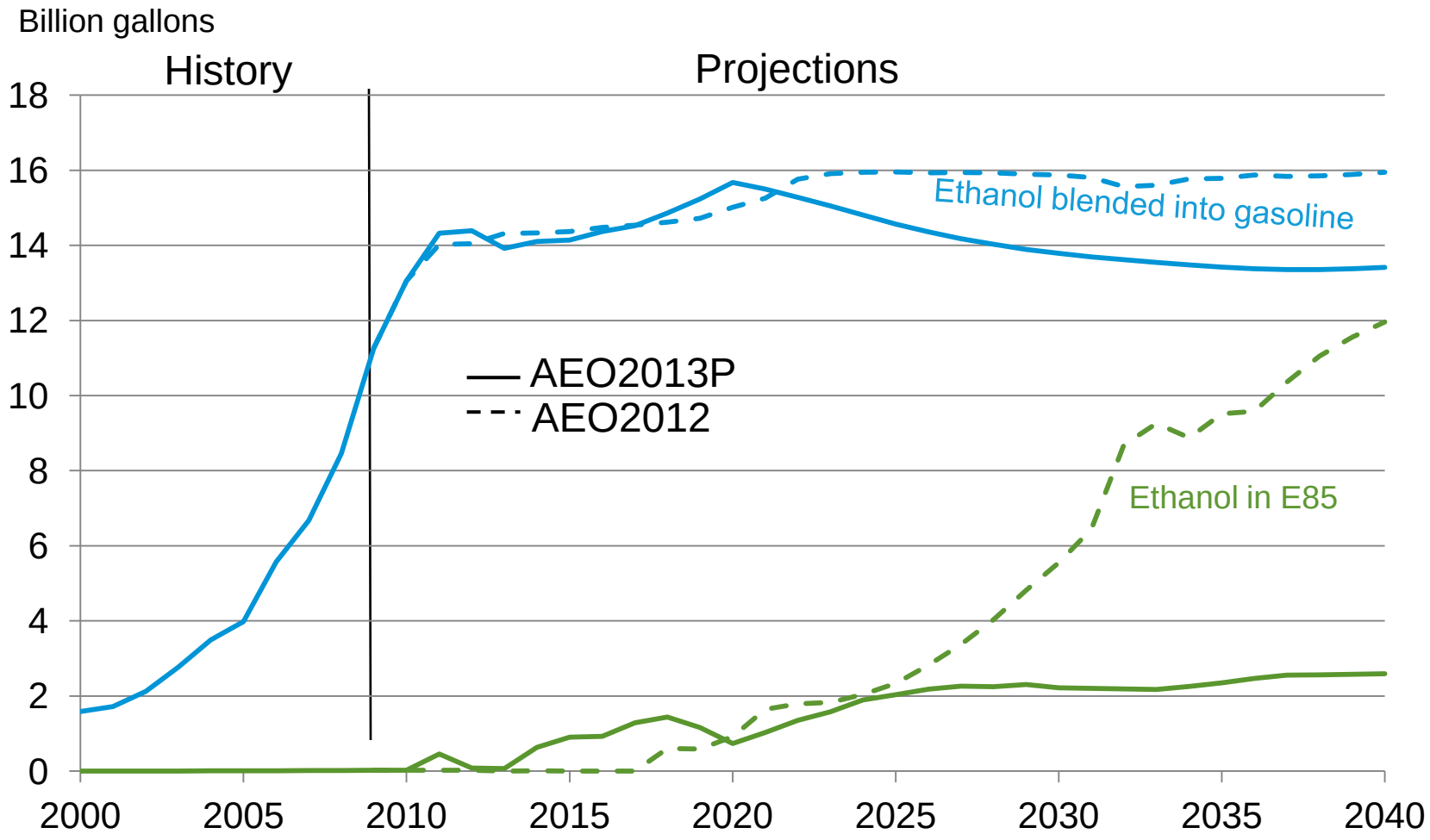
Source: Preliminary AEO2013 runs, dated as of 10/1/12

U. S. Biofuels Production



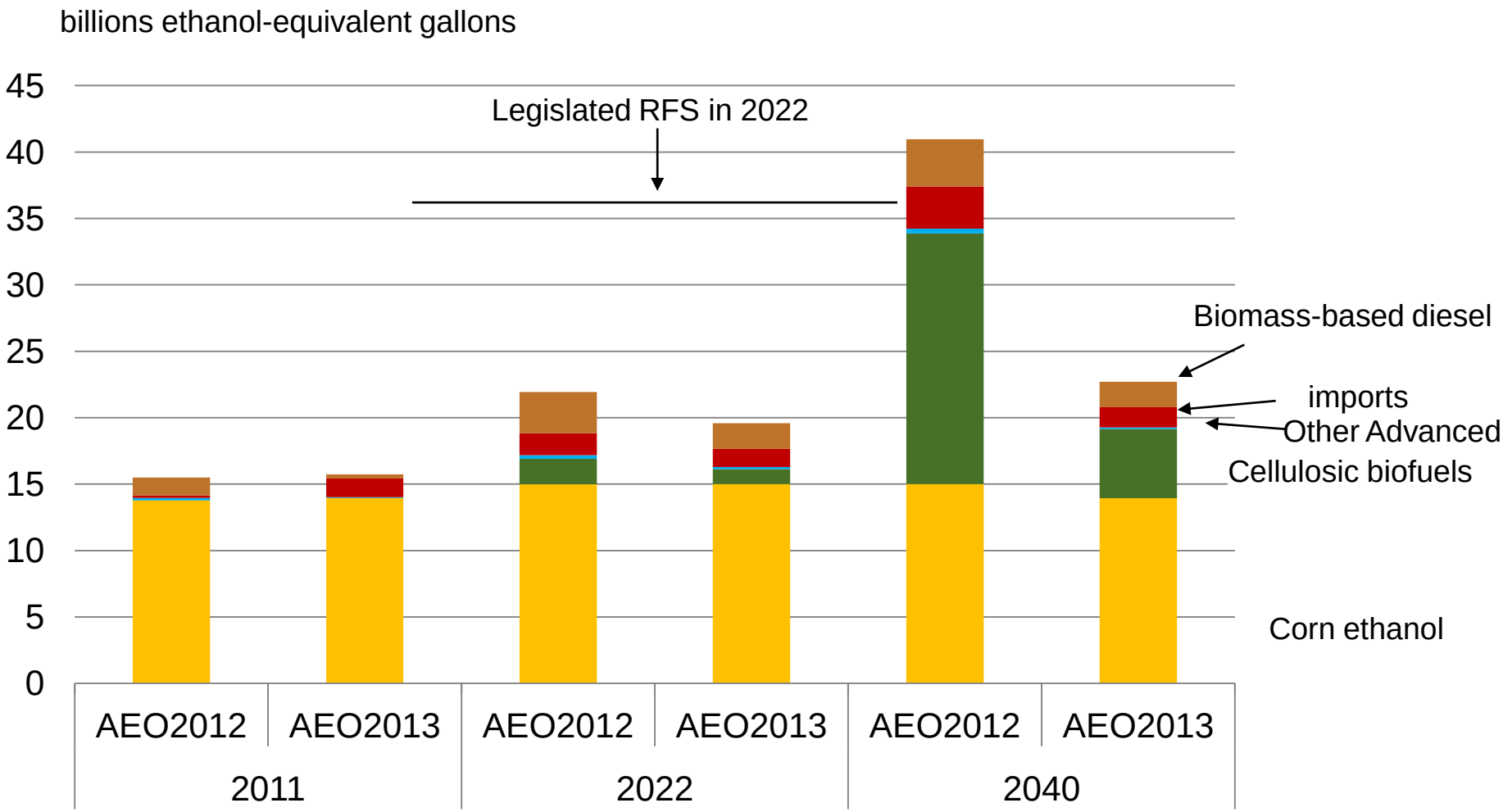
Source: Preliminary AEO2013 runs, dated as of 10/1/12

Ethanol Consumption in E85 and E10/E15 Motor Gasoline Blends



Source: Preliminary AEO2013 runs, dated as of 10/1/12

Biofuel RIN generation falls short of goal throughout projection



Source: Preliminary AEO2013 runs, dated as of 10/1/12

California Low Carbon Fuel Standard (LCFS)

- The California LCFS "will reduce greenhouse gas emissions by reducing the full fuel-cycle, carbon intensity of the transportation fuel pool used in California", according to http://www.arb.ca.gov/fuels/lcfs/CleanFinalRegOrder_02012011.pdf

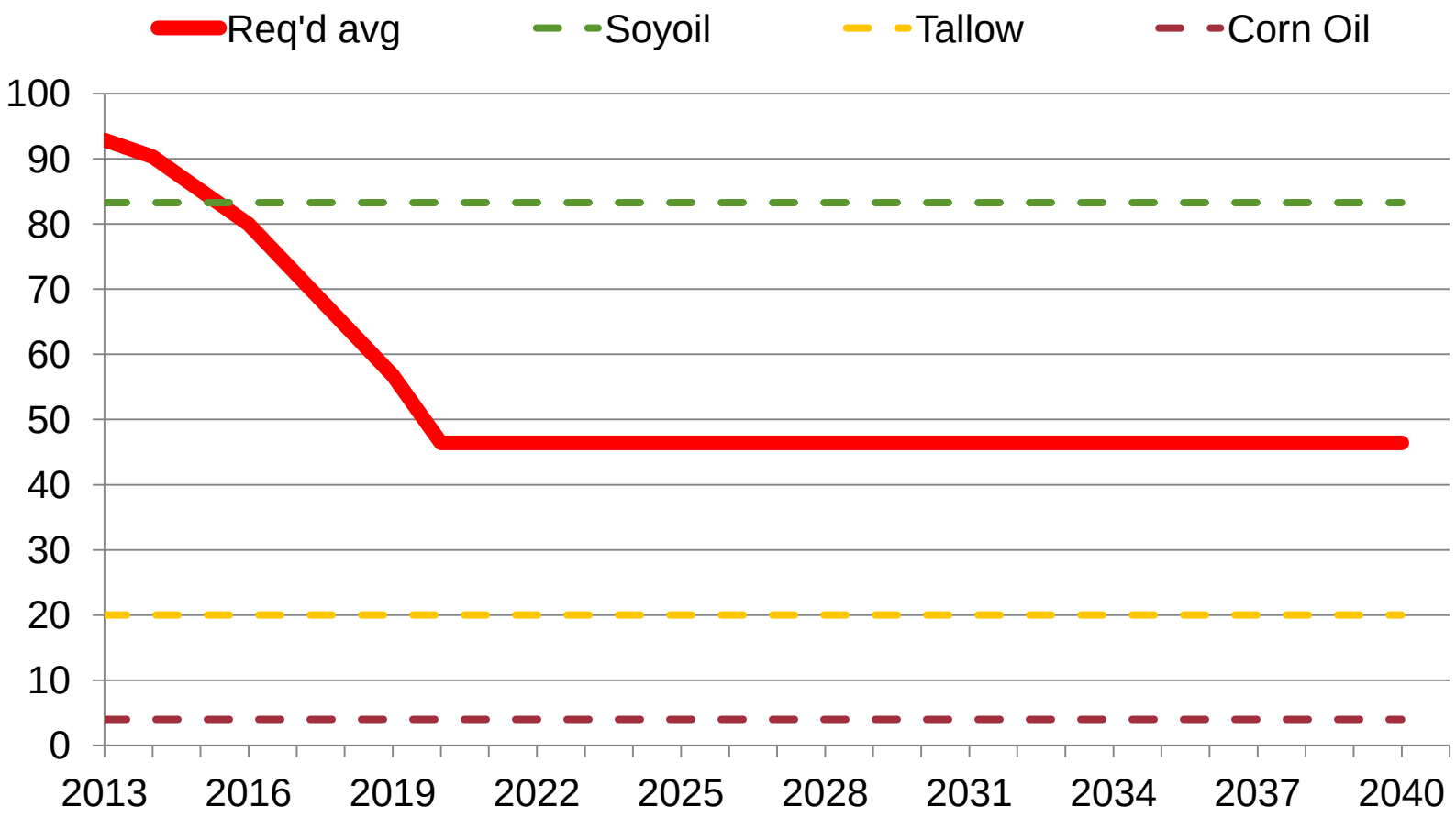
- The average carbon intensity (CI), measured in gCO2e/MJ, for mogas-related fuels and diesel-related fuels must decrease by 10% from 2010 to 2020 according to schedules published in the Regulation.

- Key drivers for LCFS projections in AEO2013:
  - Availability of flex fuel vehicles, E85 penetration, electric vehicles, etc.
  - Development of drop-in fuels
  - Cost for non-compliance

The *average* Carbon Intensity of biodiesel in B20 required to meet LCFS targets is much lower than conventional soy biodiesel

Carbon intensity

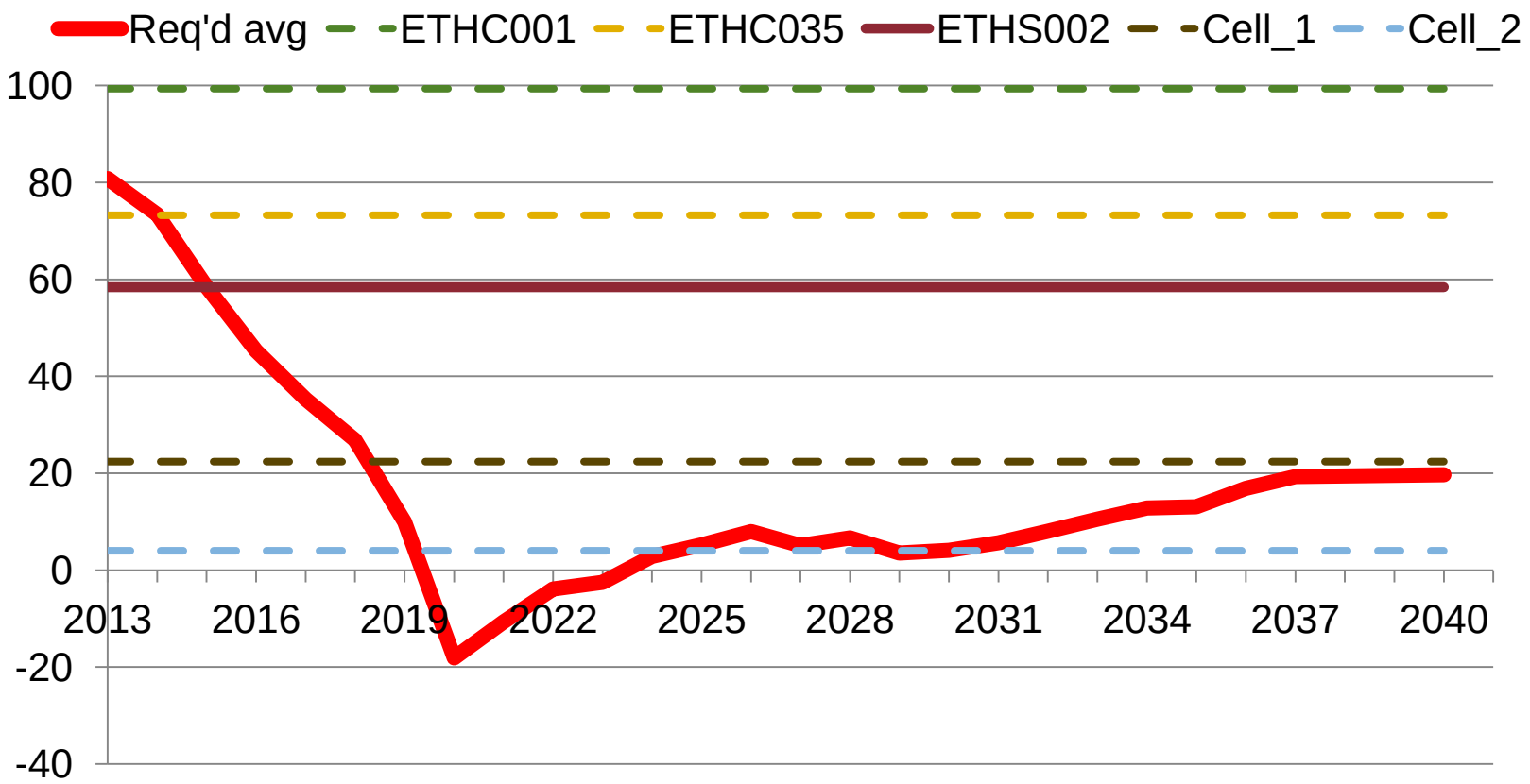
Grams CO2e per Megajoule



The *average* Carbon Intensity of ethanol in E10/E85 required to meet LCFS targets is much lower than conventional corn ethanol

Carbon intensity

Grams CO2e per Megajoule



AEO2013 Technology Parameters

Parameter	Units of measure	Gas to liquids	Coal to liquids	Corn ethanol	Fame Biodiesel	Renewable Diesel	Cellulosic ethanol	Biomass pyrolysis unit	Biomass to liquids
Design location		Gulf	Mountain	Midwest	Midwest	Gulf	Midwest	Great Lakes	Midwest
Nameplate capacity	b/d	34,000	50,000	6,523	1,305	2,000	3,700	1,374	3,143
Overnight capital cost	$/bd	$90,723	$160,301	$34,777	$31,933	$36,132	$148,189	$126,806	$263,068
Thermal efficiency	Percent	55	46	53	95	99	49	40	51
Process yield	bbl/unit	0.10	1.57	0.07	0.99	0.99	2.22	1.22	1.55
Capacity factor	Percent	85	85	90	90	90	90	90	90
Economic lifetime	Years	15	15	15	15	15	15	15	15
Construction lead time	Years	4	4	4	4	4	4	4	4

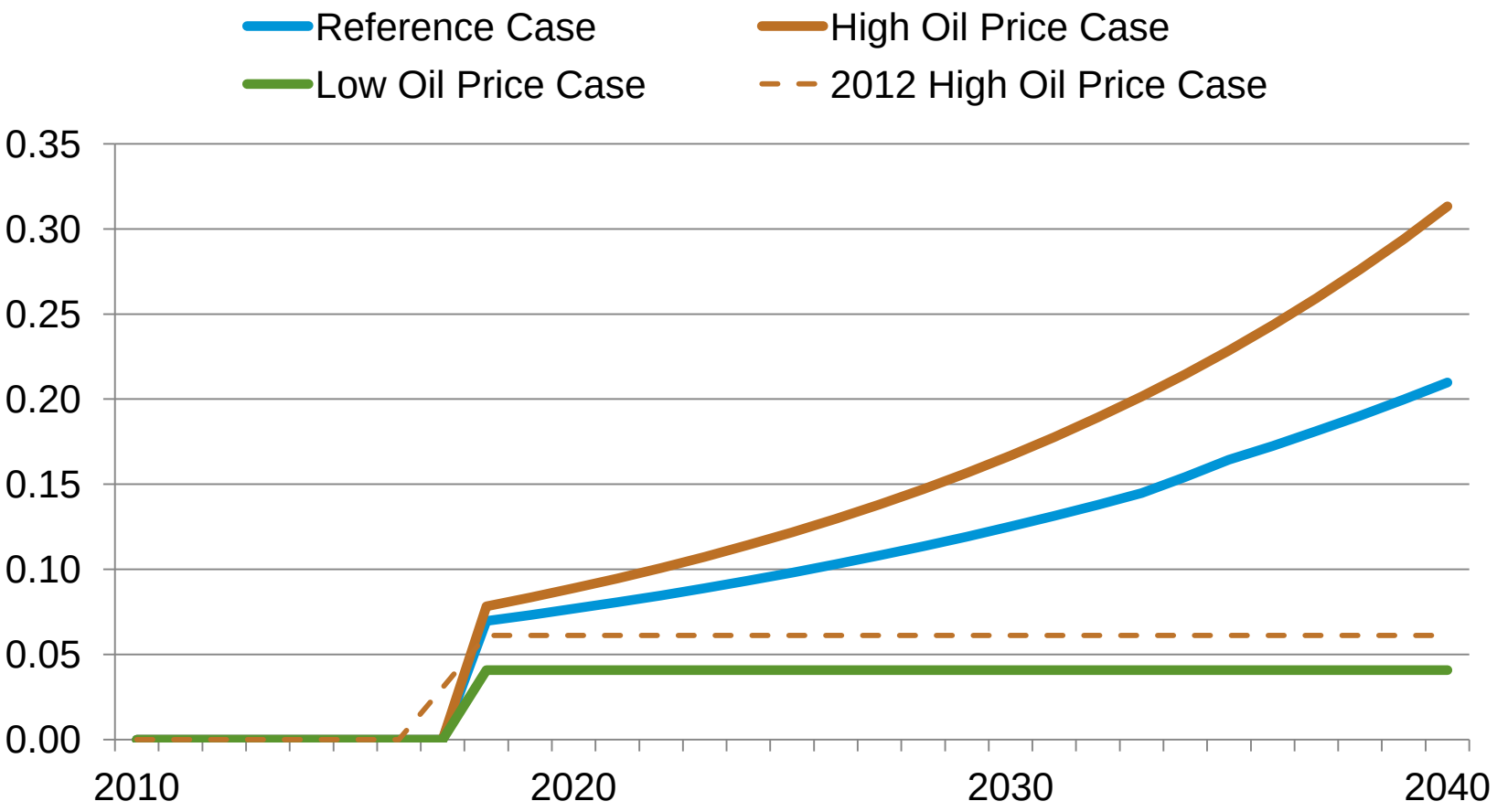
GTL Technology Parameters

Parameter	Units of measure	AEO2012	Bechtel (2002)	Korea study (2009)[2]	RW Beck (2010)	AEO2013
Nameplate capacity	b/d	34,000	44,900	32,293	50,000	34,000
Overnight capital cost[1]	$/bd	$76,610	$60,738	$88,013	$96,043	$90,000
Thermal efficiency	%	54	55	84	58	55
Capacity factor	%	85	ND	ND	90	85
Economic lifetime	Years	15	-	-	-	15
Construction lead time	Years	4	-	-	-	4
Feedstock						
Natural gas	MM scf/day	300	412	200	470	333
Raw water	gal/minute		13	ND	ND	
N-Butane	lb/h		3	ND	ND	
Products						
Gasoline	b/d	9,690	17,000	3,958	15,176	10,320
Diesel	b/d	24,310	26,200	28,240	32,656	22,206
Propane	lb/h	-	1,700	0	2,168	1,474
CO2	tons/day	-	4,084	-	-	
Net Power	kWh/bbl	-	0.14	0	0.07	0.13

1. All costs escalated to 2011$ using CEPCI and U.S. labor costs.
2. Korea study overnight capital cost adjusted to reflect US construction labor conditions.
3. ND = no data

GTL Production

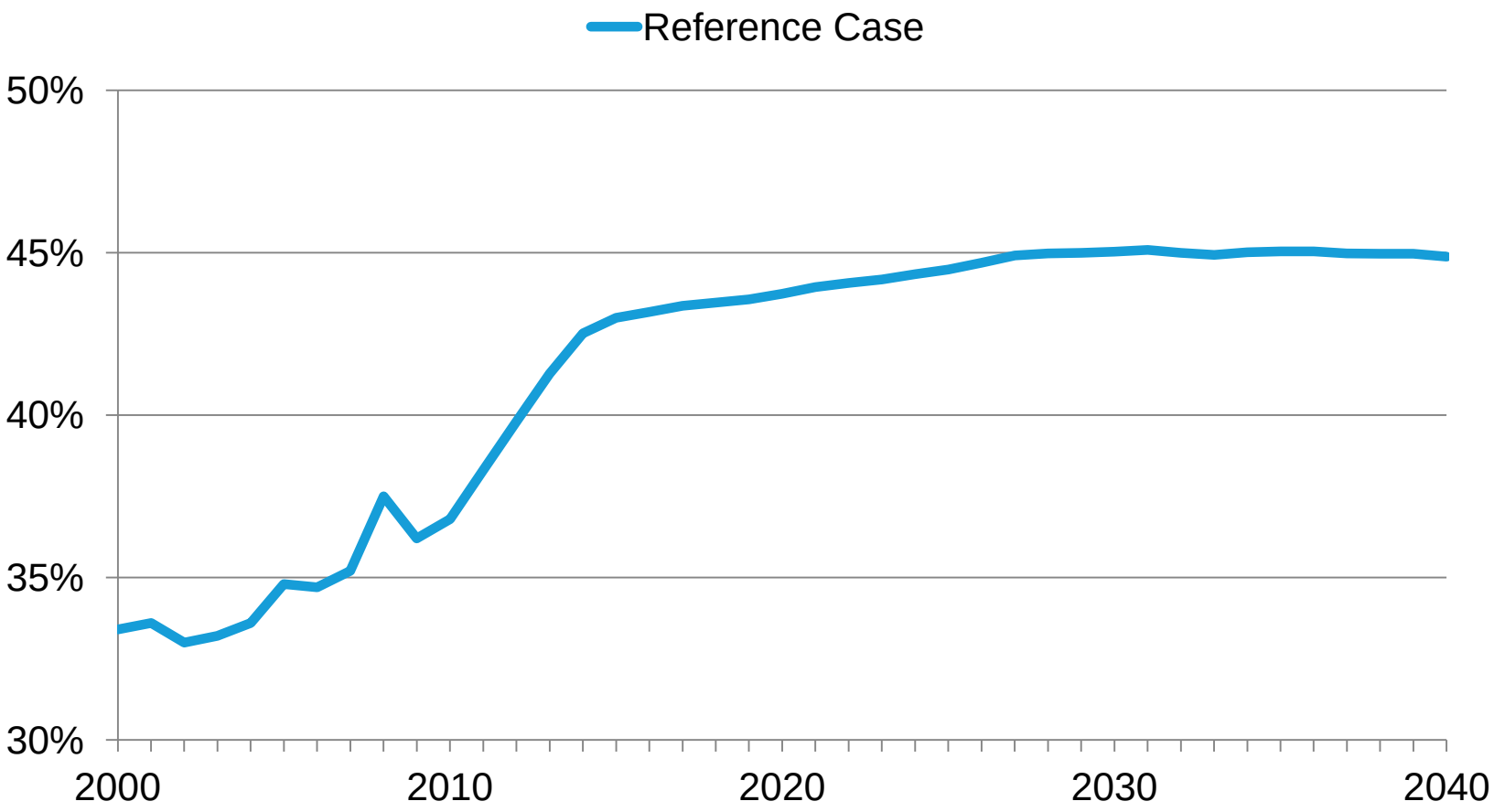
Million barrels per day



Source: Preliminary AEO2013 runs, dated as of 10/1/12

U.S. Petroleum Refinery Distillate Yields

Percent of total feedstock throughput



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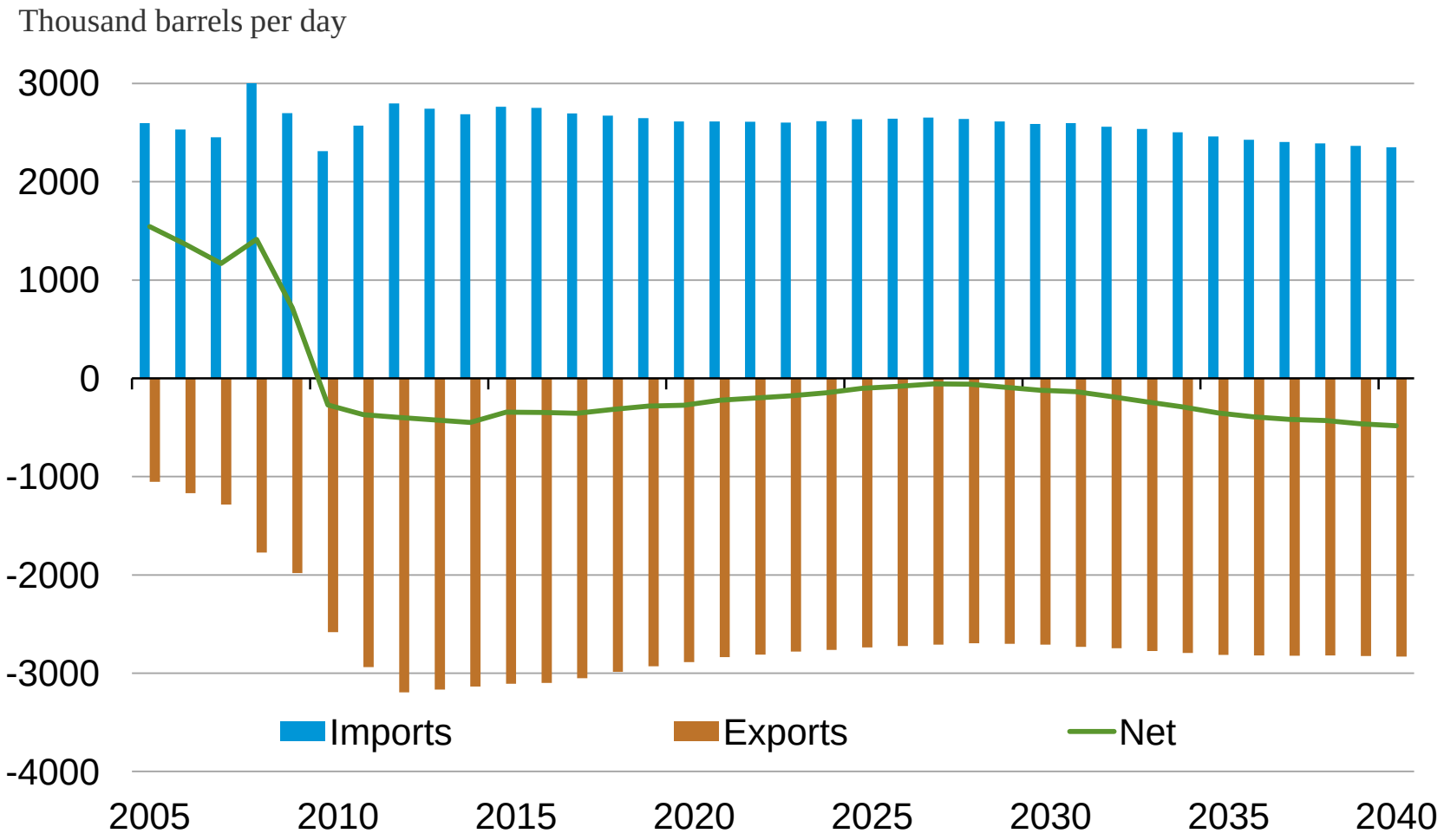
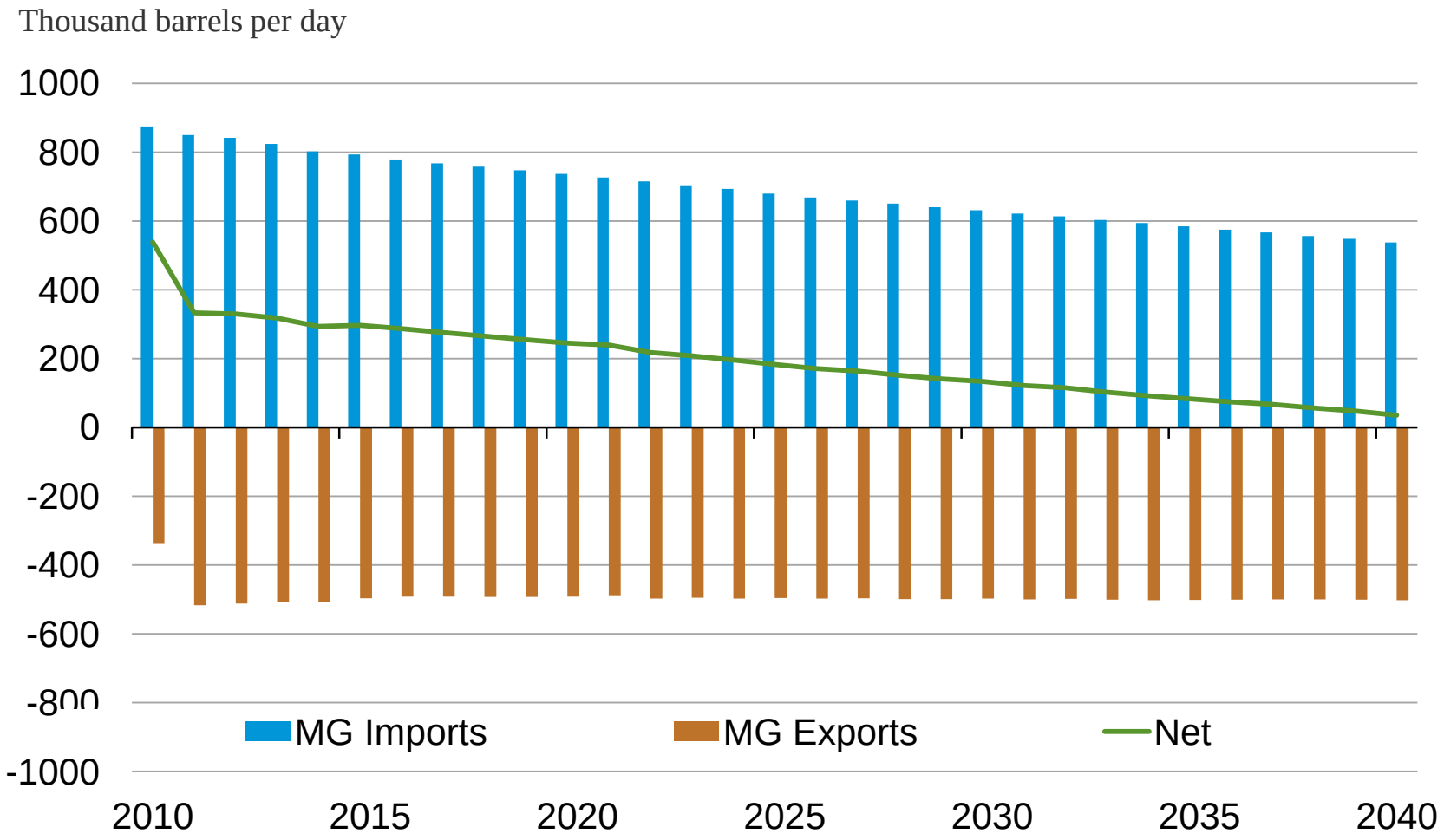
U.S. Liquid Fuels Product Exports and Imports

- The U.S. is expected to remain a net exporter of product liquid fuels for the entire projection period
- Due to delays in completing new refining capacity in Latin America, U.S. product exports are expected to grow in the near future
- Net motor gasoline imports will reflect a gradual decline, as higher efficiency vehicles begin to lead to lower gasoline consumption

EIA Projected Liquid Fuels Product Trade Balance (excluding biofuels)



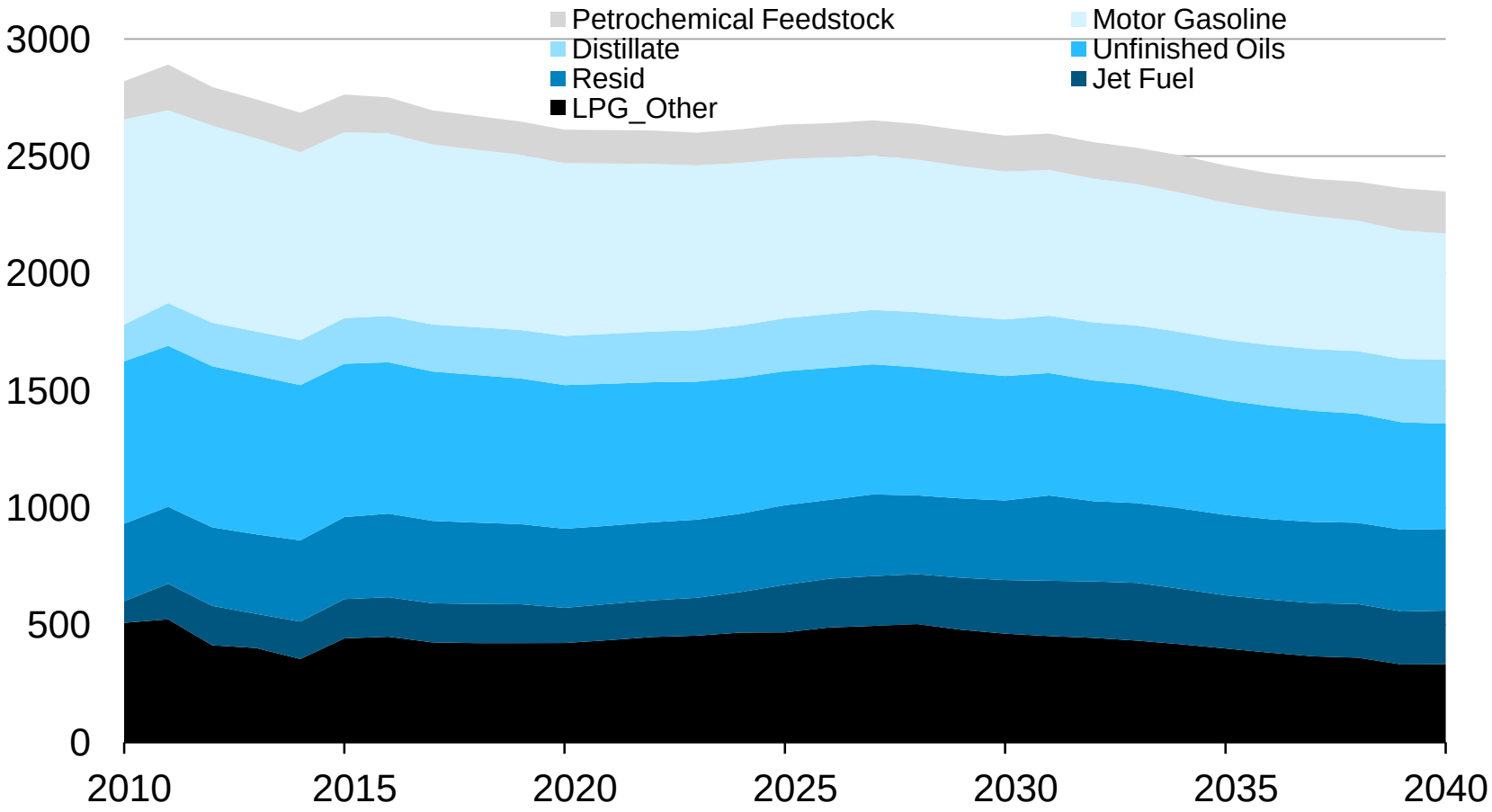
EIA Projected Motor Gasoline Exports and Imports



U.S. Liquid Fuel Products Imports (excluding biofuels)

Imported Petroleum Products

Thousands barrels per day



For more information

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