

Energy Exports



for

Benposium 2015

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by

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Key Takeaways

- In most of EIA's current projection cases, U.S. net energy imports, including all fuels, decline and ultimately end for the first time since the 1950s
 - Strong growth in domestic production of crude oil from tight formations through 2020 and limited growth in domestic demand after 2020 leads to a decline in net petroleum and other liquids imports. With high prices or high resources, the United States becomes a net exporter of petroleum and other liquids.
 - The United States transitions from being a net importer of natural gas to a net exporter by 2017 in all cases
- Exports, both net and gross, have been rising rapidly. Key drivers in the export outlook vary across fuels and timeframes
- Natural gas exports – drivers looking forward:
 - U.S. resource and technology scenario (a key driver of domestic gas prices); global energy market prices (which along with domestic prices defines the “gap” that determines the incentive for investment in natural gas export facilities and their use
 - Environmental and energy policies that significantly affect domestic natural gas demand, such as the final Clean Power Plan
 - Mexico demand (pipeline exports)

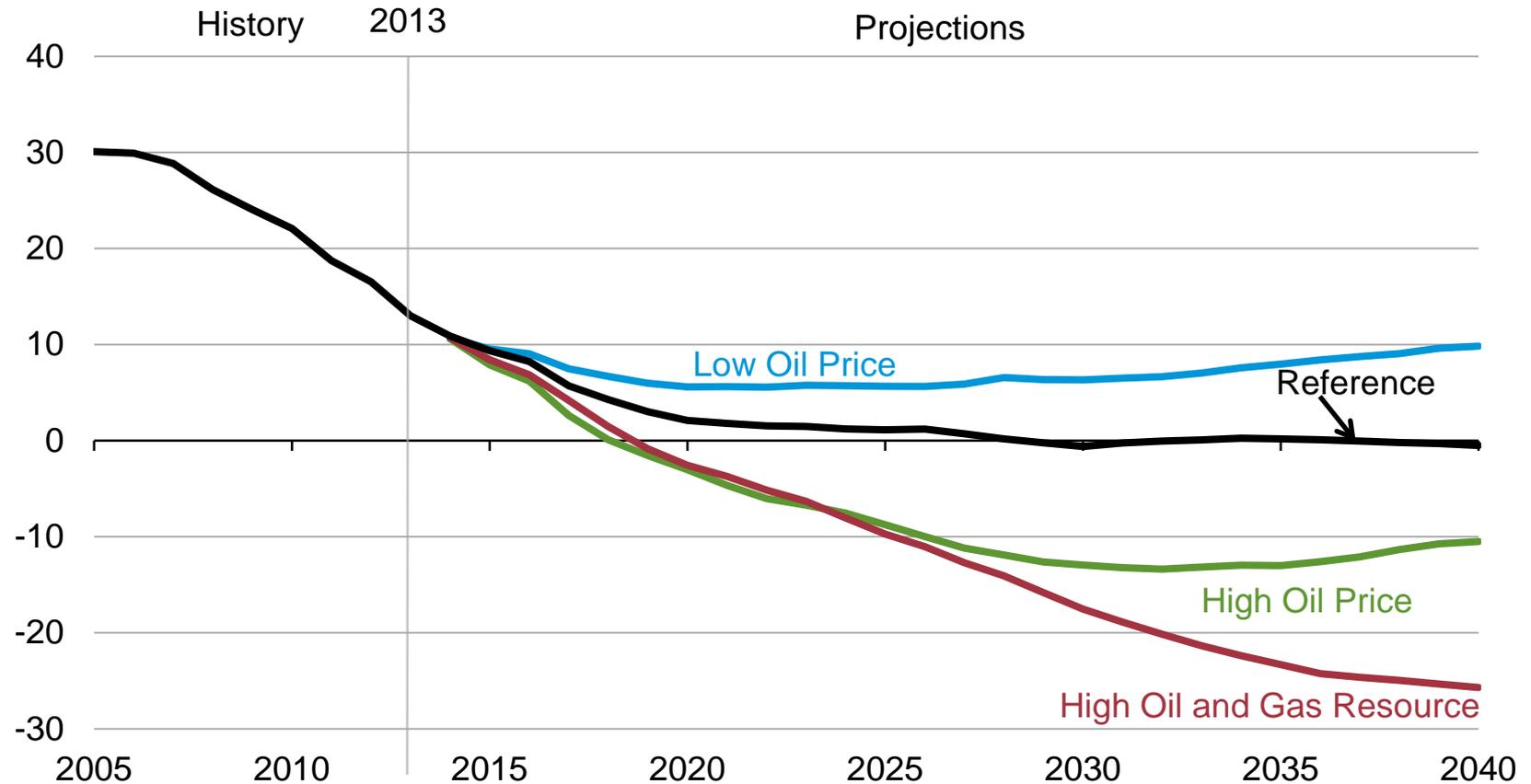
Key takeaways

- HGL exports – drivers looking forward
 - production of HGLs, primarily linked to natural gas production
 - domestic consumption of HGL feedstock
 - spreads between domestic and global prices
 - economics of ethane rejection
- Crude oil and non-HGL petroleum product exports – drivers looking forward
 - With fuel efficiency policies moderating the domestic consumption response to price and economic changes, domestic crude oil production growth, reflecting resources, technology, and prices, is key driver of combined crude oil and non-HGL product exports.
 - In high production scenarios under current laws and policies that allow unrestricted exports of processed petroleum products but restrict crude exports, product exports grow significantly
 - Without restrictions on crude exports, crude export growth would displace a portion of product export growth in high production scenarios

How we got here and where we might be going

U.S. net energy imports continue to decline in the near term, reflecting increased oil and natural gas production coupled with slow demand growth

U.S. net energy imports
quadrillion Btu

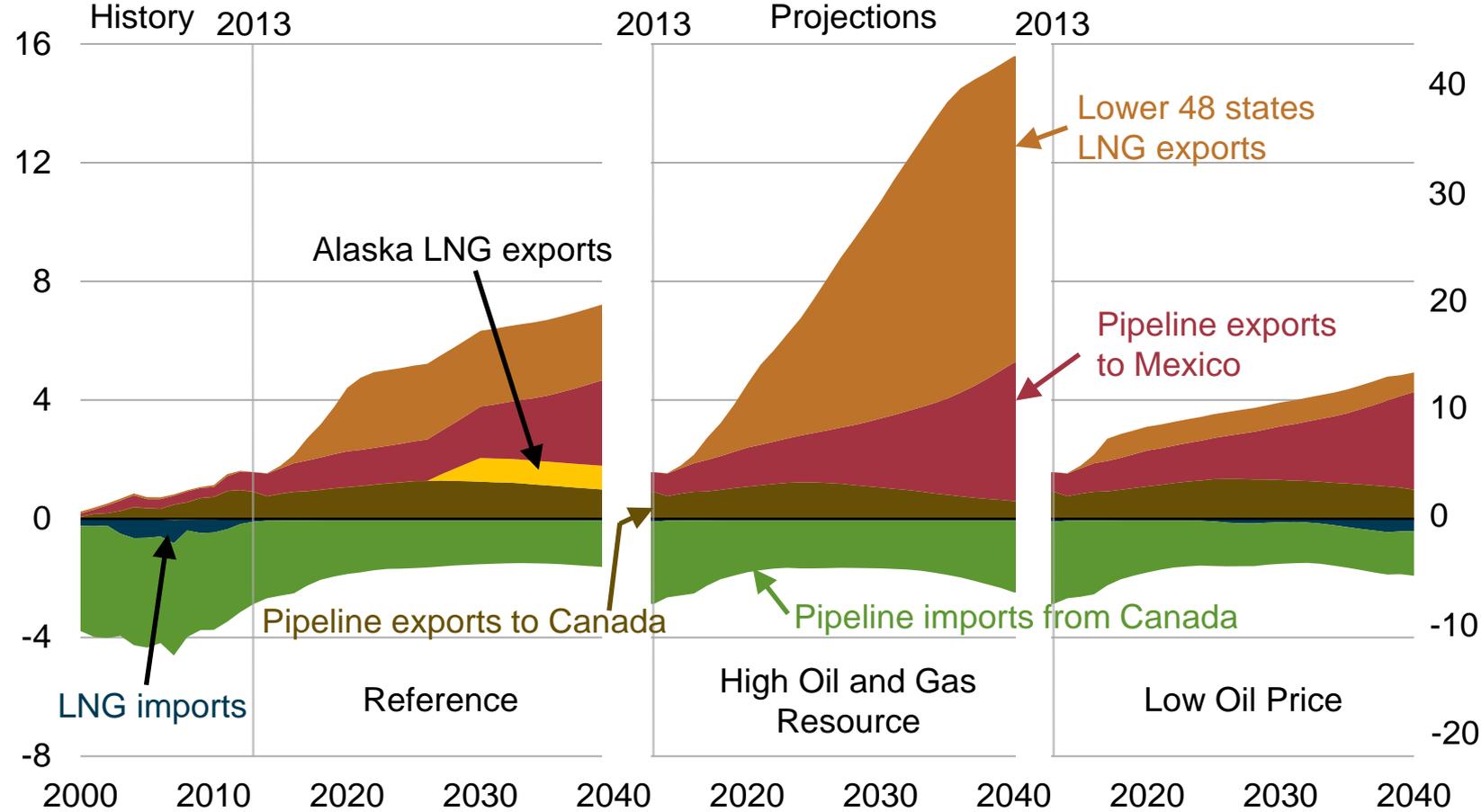


Source: EIA, Annual Energy Outlook 2015

Projected U.S. natural gas exports reflect the spread between domestic natural gas prices and world energy prices

U.S. natural gas imports and exports
trillion cubic feet

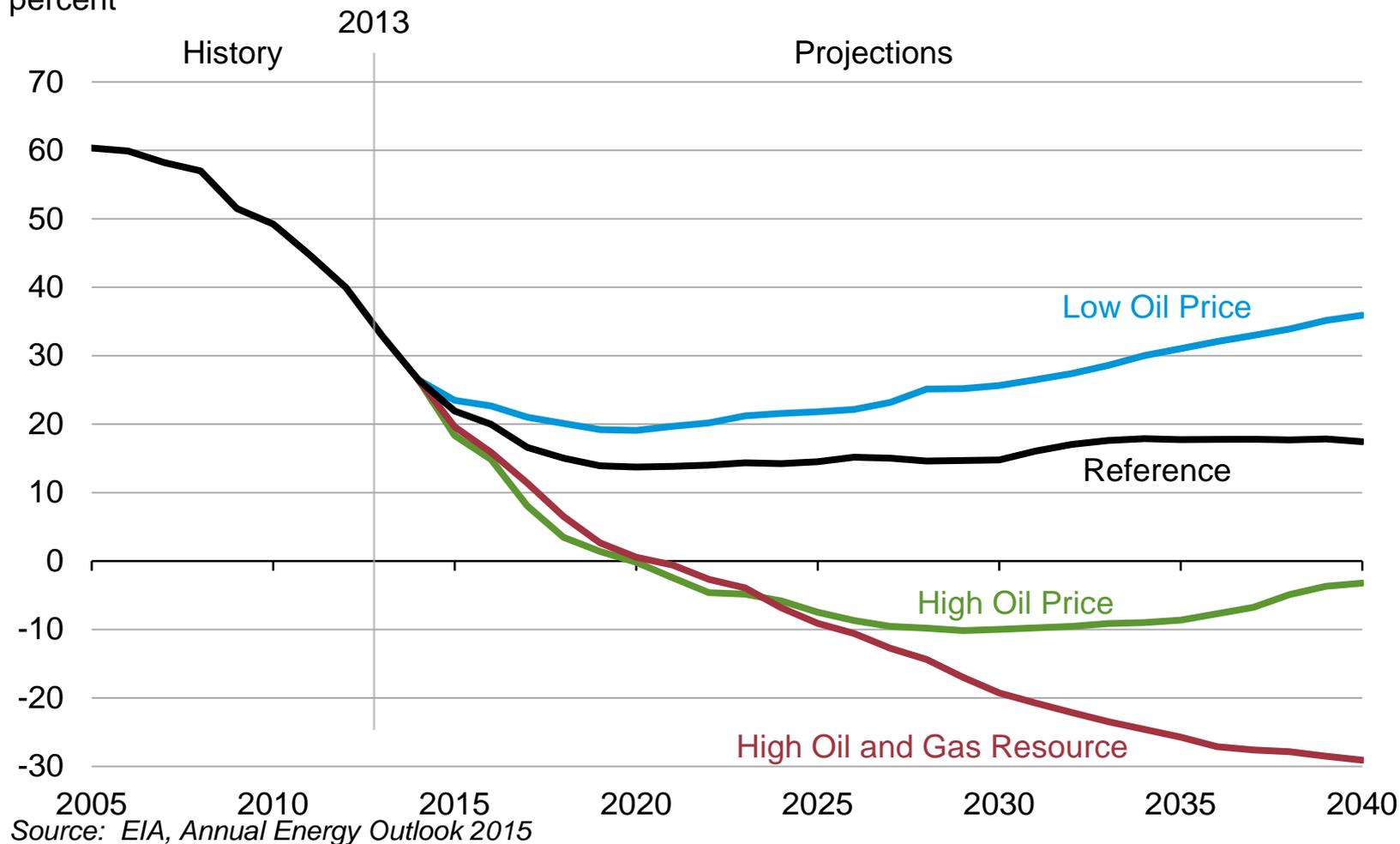
billion cubic feet per day



Source: EIA, Annual Energy Outlook 2015

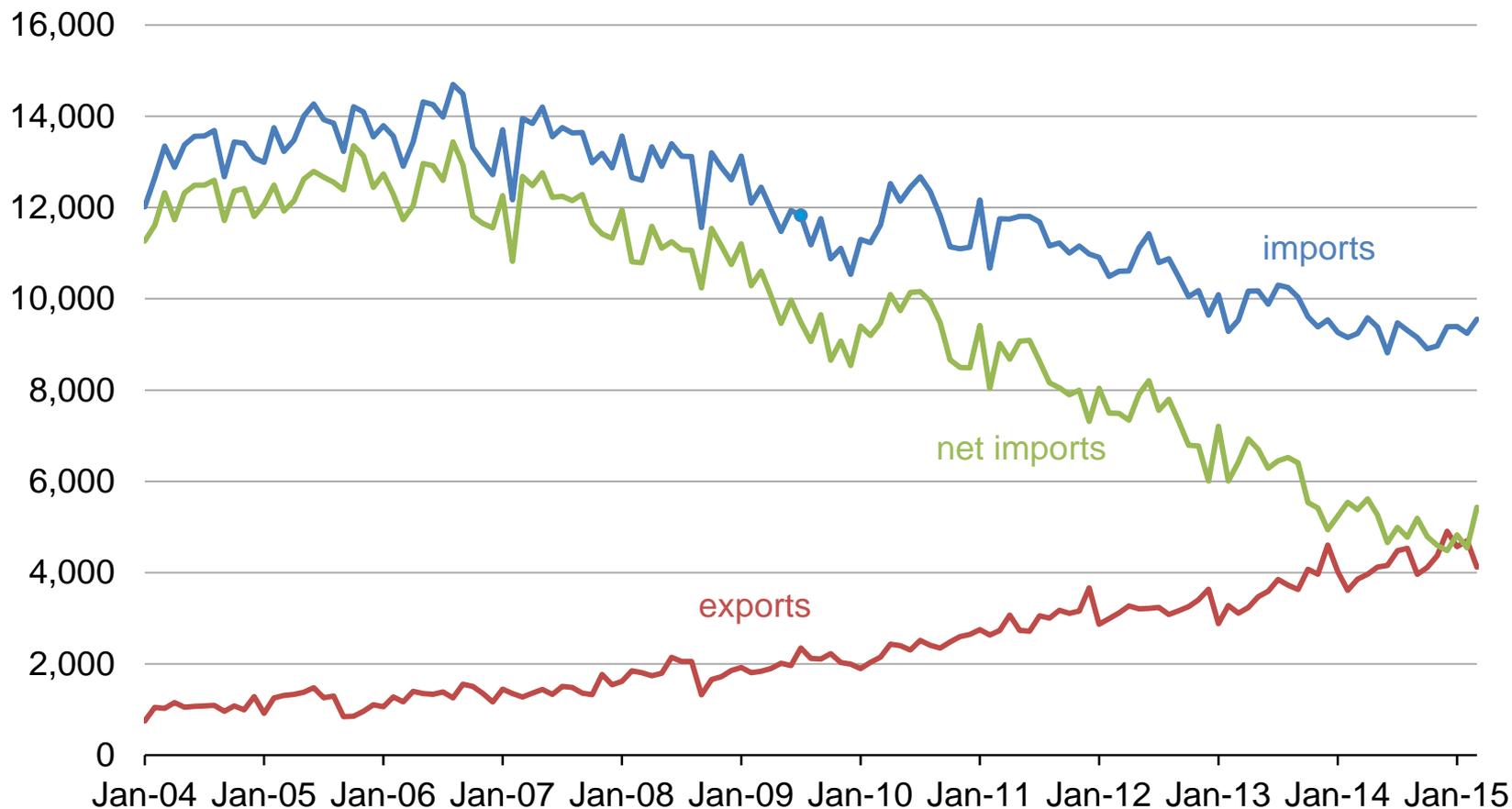
Net liquid imports are a declining share of U.S. liquid fuels use in most AEO2015 cases; in two cases the nation becomes a net liquids exporter

net crude oil and petroleum product imports as a percentage of total U.S. supply
percent



U.S. net imports of crude oil and petroleum products declined by more than 7 million b/d over the past decade

U.S. imports and exports of crude oil and petroleum products
thousand barrels per day

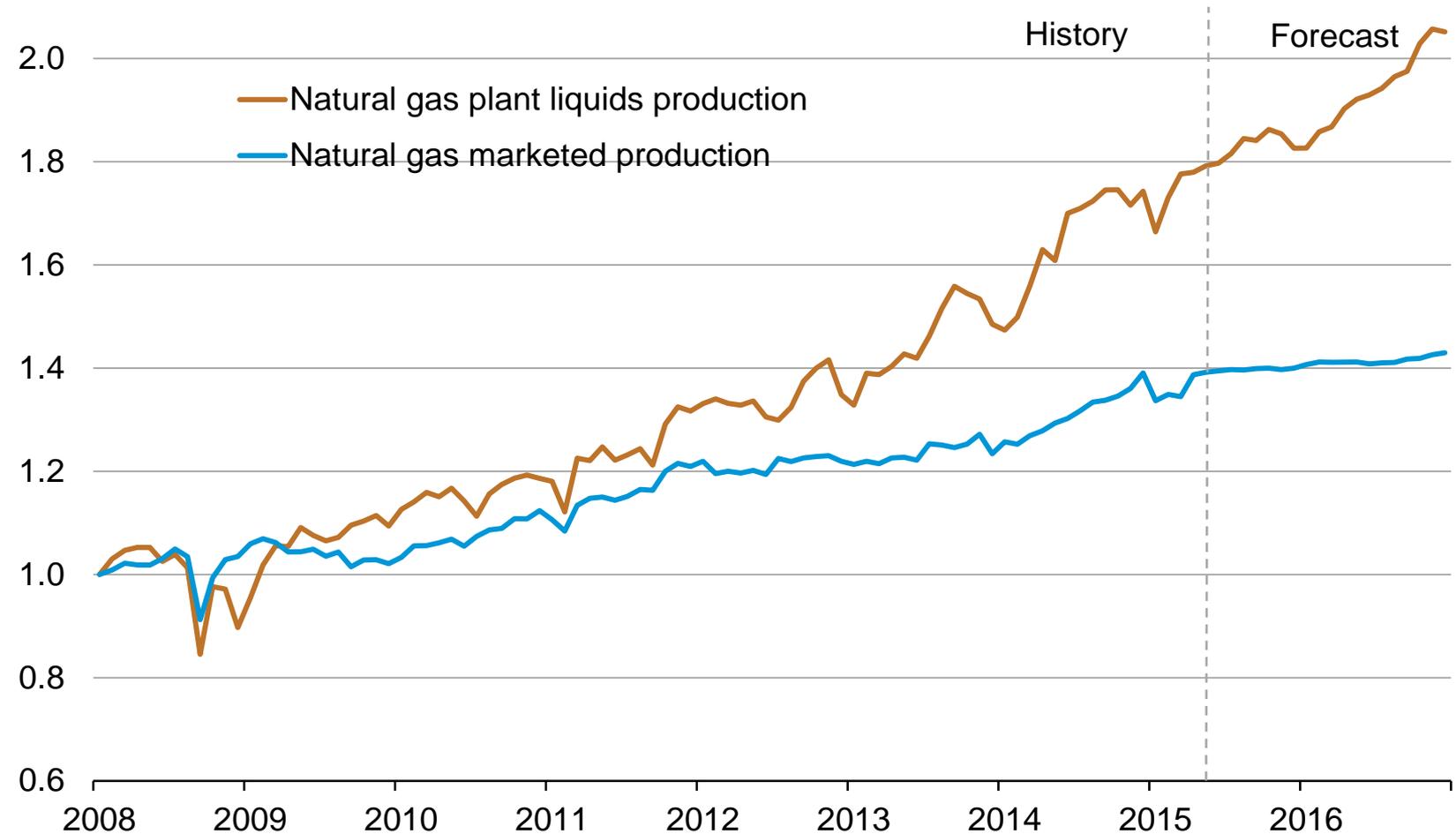


Source: EIA, Petroleum Supply Monthly

Hydrocarbon Gas Liquids

Growth in U.S. HGL production from natural gas plants is outpacing marketed gas production growth

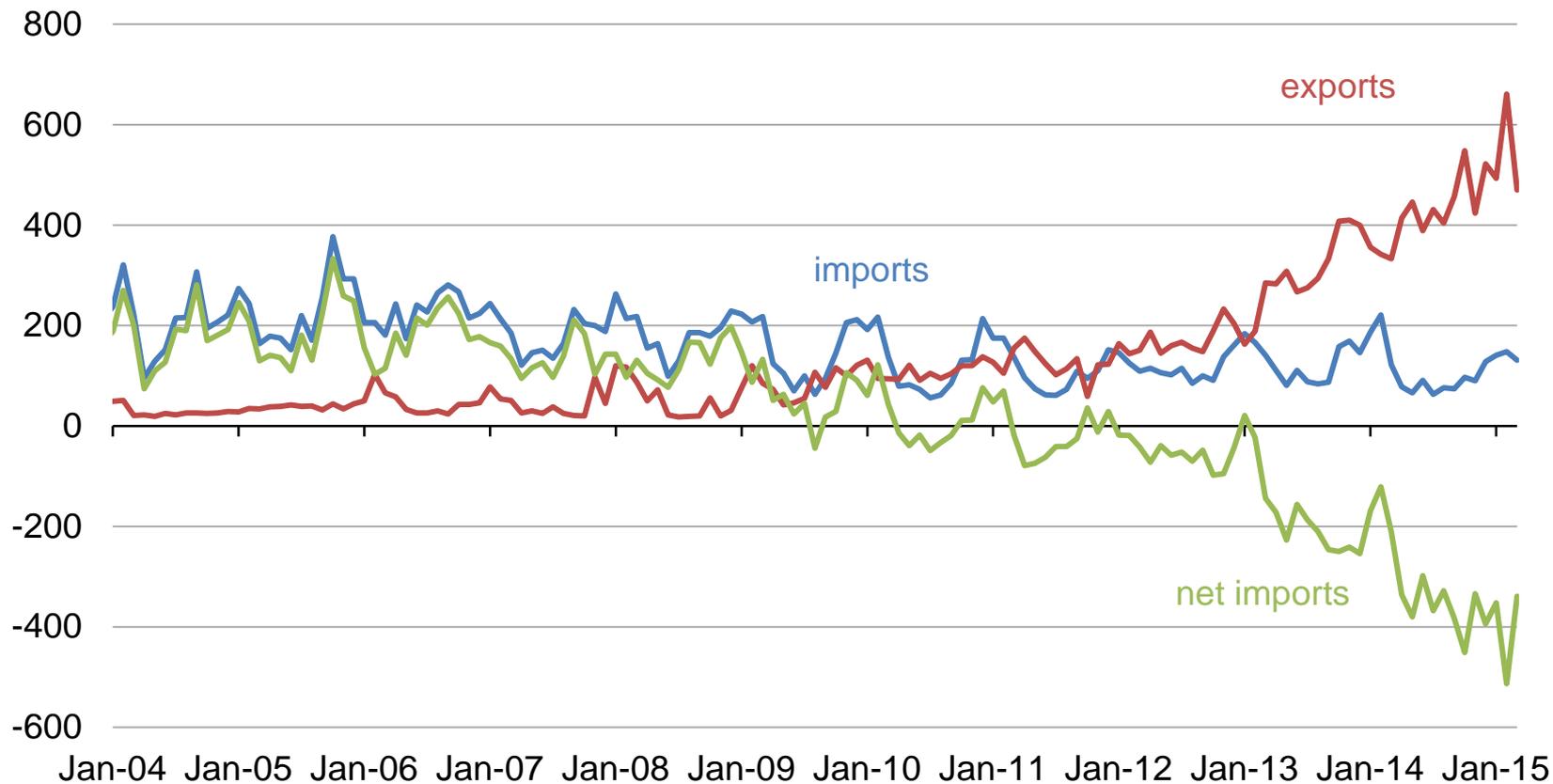
Production indexed to Jan. 2008



Source: EIA

U.S. propane exports have grown in the past few years; exports averaged over 500 kb/d in the first quarter of 2015

U.S. imports and exports of propane
thousand barrels per day

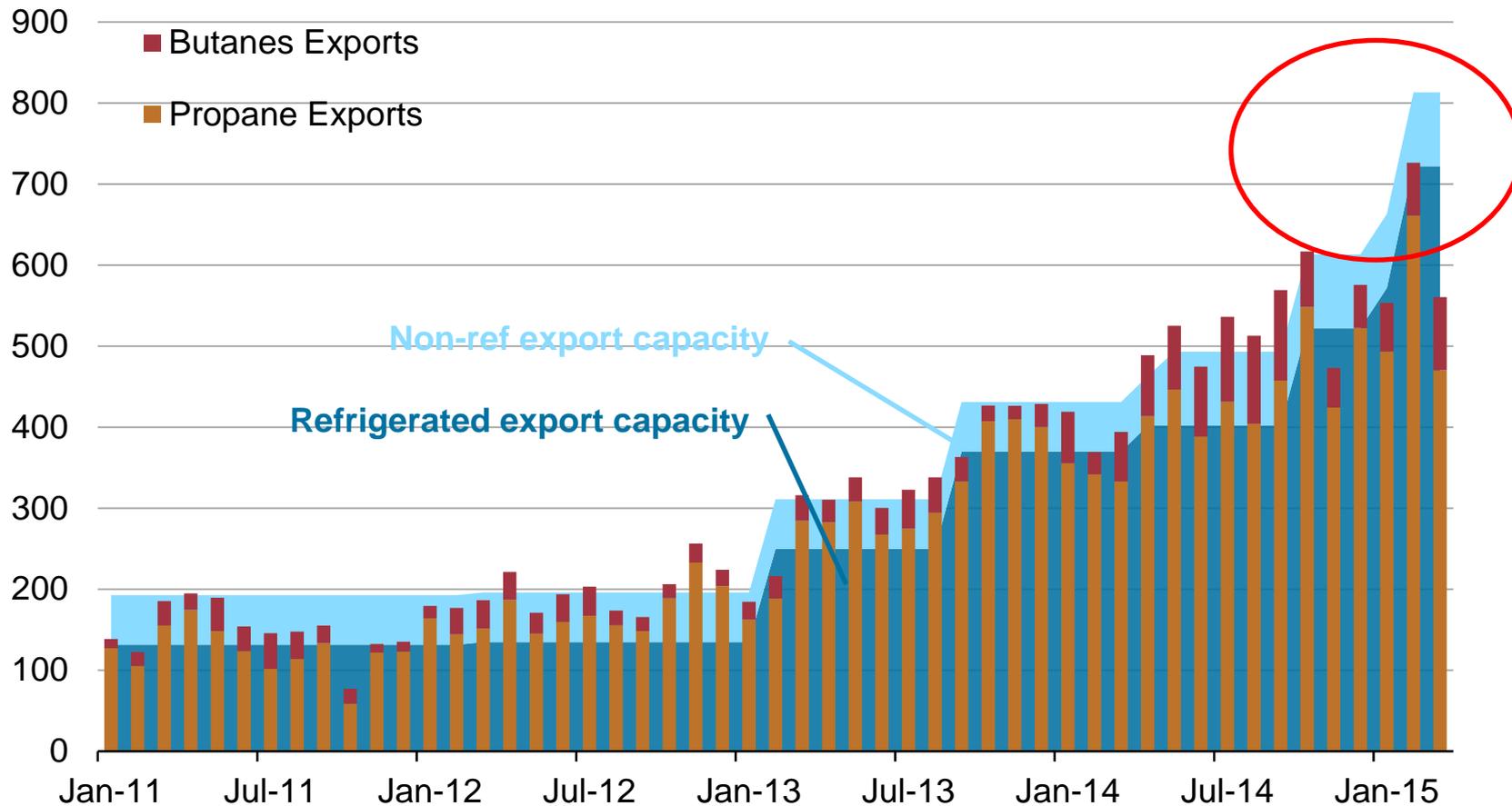


Source: EIA, Petroleum Supply Monthly

Current U.S. propane/butane export capacity is fully utilized as exports continue to rise

Monthly exports

thousand barrels per day

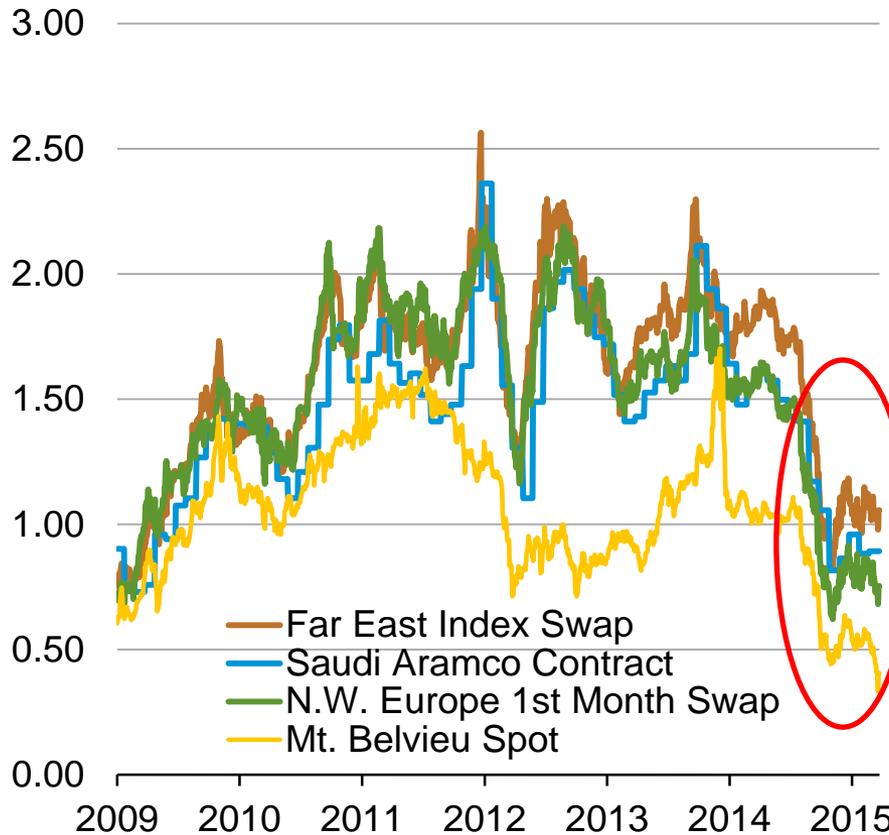


Note: Monthly throughput can exceed annualized nameplate export capacity.

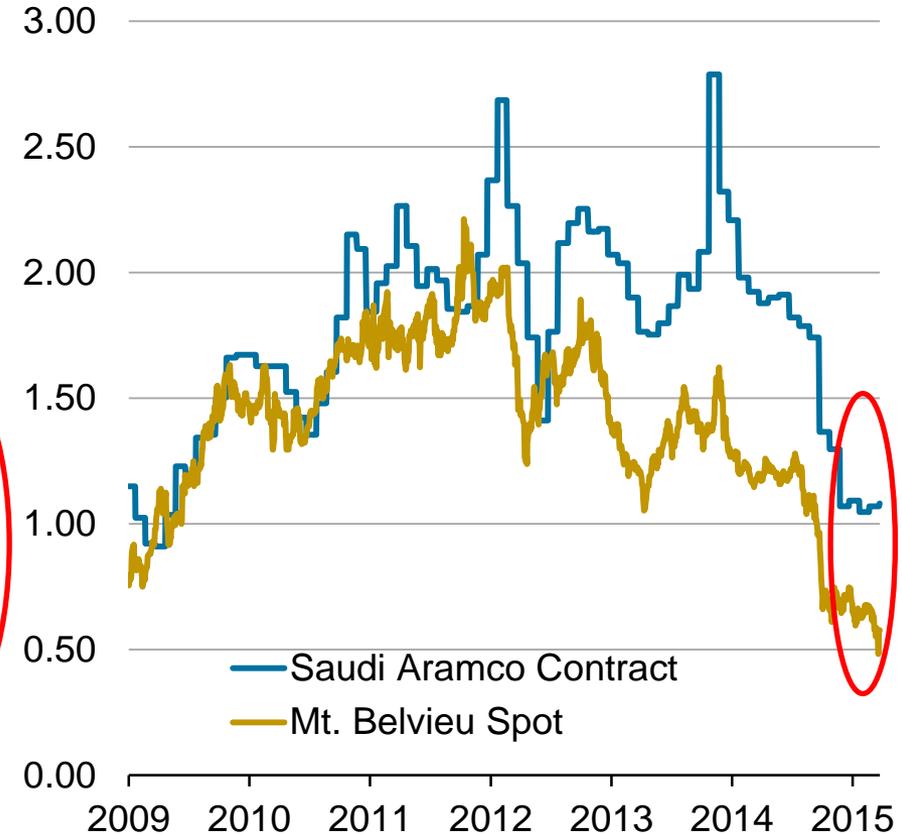
Source: Export data from EIA; Capacity calculated from company and news reports

Significant discounting of HGL prices in North American markets persists

International propane prices
U.S. dollars per gallon



International butane prices
U.S. dollars per gallon

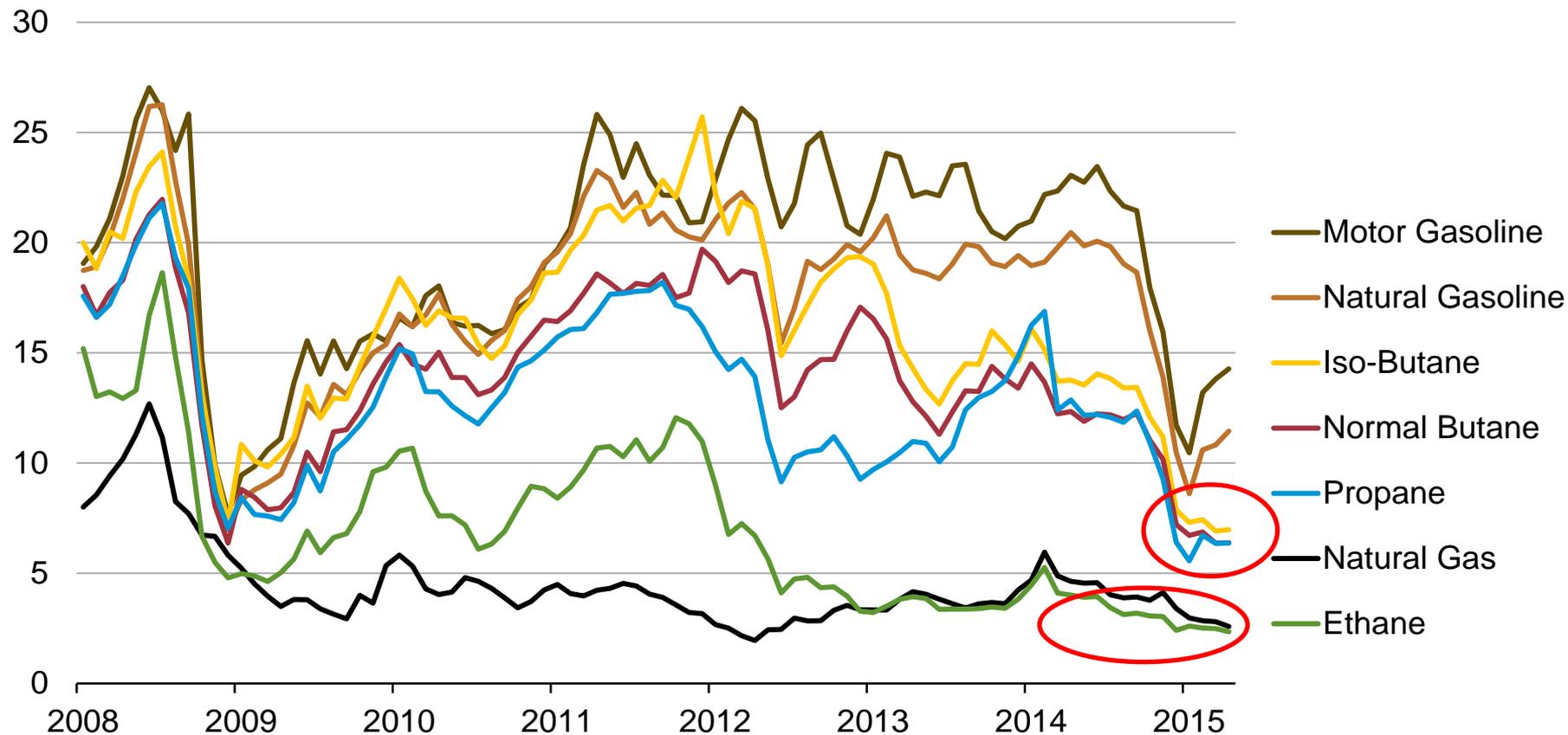


Note: All prices through 06/01/2015 are close-of-day prices except for Aramco (monthly posted).

Source: EIA via Bloomberg

Domestic HGL prices have broken from historical linkage to refined petroleum product prices

Gulf Coast spot prices
dollars per million Btu



Note: All prices through 06/01/2015 are monthly average close-of-day spot prices; natural gas is Henry Hub, motor gasoline is Gulf Coast, and NGL components are Mt. Belvieu non-LST.

Source: EIA via Bloomberg.

U.S. and Canadian petrochemical industry is responding with significant cracking capacity expansion using ethane feedstock

Company	Location	Ethane throughput ¹ (1,000 bbl/d)		Status ²
		2013	2018	
Existing, restarts, and capacity expansions		1,085	1,137	C/U
Feedstock conversions		19	132	C/U
New Plants				
ExxonMobil Chemical Co.	Baytown, TX		90	U
Formosa Plastics Corp.	Point Comfort, TX		63	U
Chevron Phillips Chemical	Baytown, TX		90	U
Dow Chemical Co.	Freeport, TX		95	U
OxyChem/Mexichem	Ingleside, TX		33	U
Sasol Chemicals	Lake Charles, LA		90	U
Shin-Etsu	Plaquemine, LA		30	P
New 2014-18 plants			491	
Total		1,105	1,760	

¹ Ethane throughput calculated based on plant nameplate ethylene production capacity and stated feed type

² Status: Proposed (Q), FEED (F), Permitted (P), Under Construction (U), Completed (C)

Source: EIA based on news reports and company filings.

U.S. petrochemical industry is also responding with significant propane dehydrogenation capacity build out

Company	Location	Propane throughput ¹ (1000 b/d)		Status ²
		2013	2018	
Existing	Houston, TX	30	30	C
New Plants				
Dow Chemical	Freeport, TX		35	U
Enterprise	Mont Belvieu, TX		35	U
Formosa Plastics	Point Comfort, TX		34	U
C3 (Ascend) Petrochemicals	Alvin, TX		47	P
REXtac	Odessa, TX		14	F
Dow Chemical	Freeport, TX		25	Q
Total		30	220	

¹ Propane throughput calculated based on plant nameplate propylene production capacity and historical reported propane consumption at existing plant

² Status: Proposed (Q), FEED (F), Permitted (P), Under Construction (U), Completed (C)

Source: EIA based on news reports and company filings.

U.S. HGL export capacity is expanding rapidly

Company	Facility Type	Product ¹	Capacity ('000 bbl/d)	Location	Est. Cost ² (\$ million)	Completion	Status ³
Enterprise	Refrigerated	C3+C4	135	Channelview, TX	-	Pre-2012	C
Targa Resources	Semi-Refrigerated	C3+C4	50	Galena Park, TX	-	Pre-2012	C
Other	Pressurized	C3+C4	10	FL, VA, NY, LA	-	Pre-2012	C
Enterprise	Refrigerated	C3+C4	115	Channelview, TX	-	2013, Q1	C
Targa Resources	Refrigerated	C3+C4	120	Galena Park, TX	240	2013, Q3	C
Petrogas Energy	Pressurized	C3+C4	30	Ferndale, WA	242	2014, Q2	C
Sunoco Logistics LP	Refrigerated	C3+C4	40	Marcus Hook, PA	270	2014, Q2	C
Targa Resources	Refrigerated	C3+C4	120	Galena Park, TX	240	2014, Q3	C
Sunoco Logistics LP	Refrigerated	C3+C4	197	Nederland, TX	400	2015, Q1	C
Enterprise	Refrigerated	C3+C4	49	Channelview, TX	100	2015, Q1	C
Total existing as of 3Q 2014			870				
Occidental	Refrigerated	C3+C4	75	Corpus Christi, TX	400	2015, Q2	U
Sunoco Logistics LP	Refrigerated	C2	35	Marcus Hook, PA	250	2015, Q3	U
Enterprise	Refrigerated	C3+C4	227	Channelview, TX	500	2015, Q4	U
Phillips66	Refrigerated	C3+C4	145	Freeport, TX	1,000	2016, Q3	U
Enterprise	Refrigerated	C2	200	Morgan's Point, TX	1,200	2016, Q3	U
Pembina Pipeline Co.	Refrigerated	C3+C4	37	Portland, OR	500	2018	Q
Total planned 4Q 2014 – 4Q 2018			720		\$3.85 bil.		

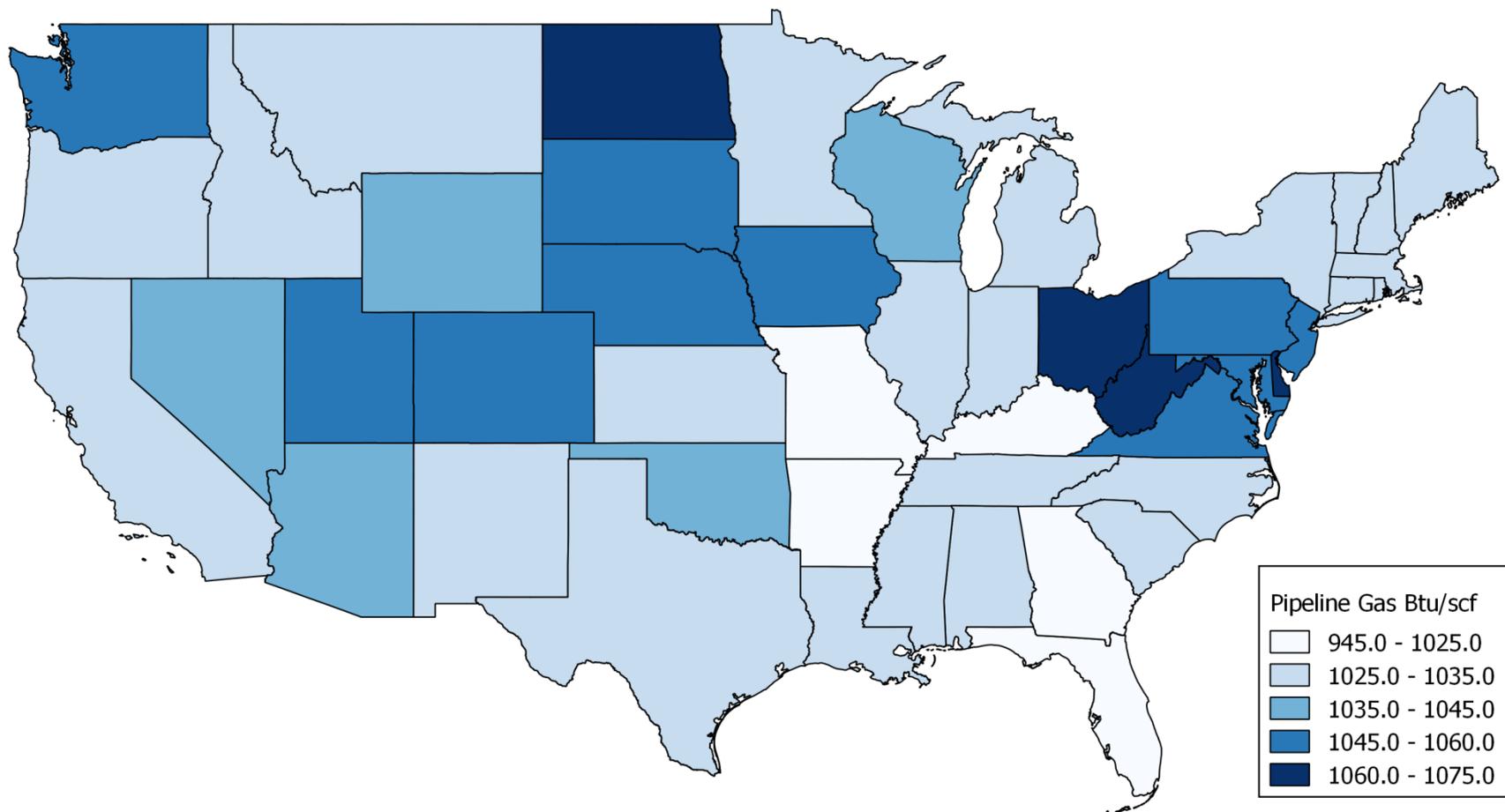
¹ C2 = ethane, C3+C4 = propane + butanes

² Costs estimates based on publicly available reported data on some of the planned terminals

³ Status: Proposed (Q), FEED (F), Under Construction (U), Completed (C)

Source: EIA based on news reports and company filings.

Average heat content of gas delivered to U.S. consumers in March 2015 was 1,036 Btu/scf; hot gas is a potential source of more ethane for both domestic and export markets

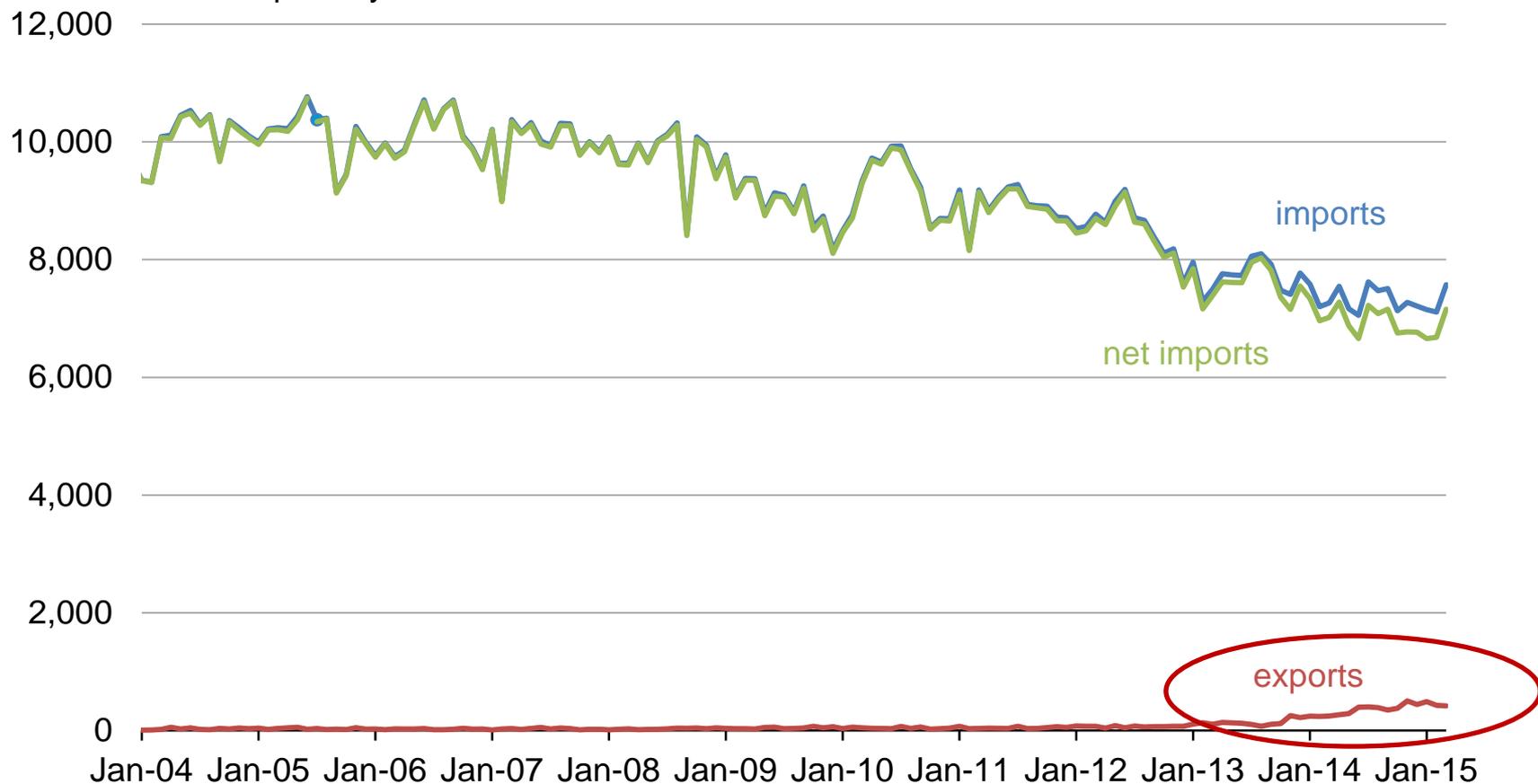


Source: EIA

Non-HGL Petroleum Products and Crude Oil

U.S. net imports of crude oil decreased roughly 2.2 million b/d from 2004 to 2015; crude exports have risen steadily since mid-2013

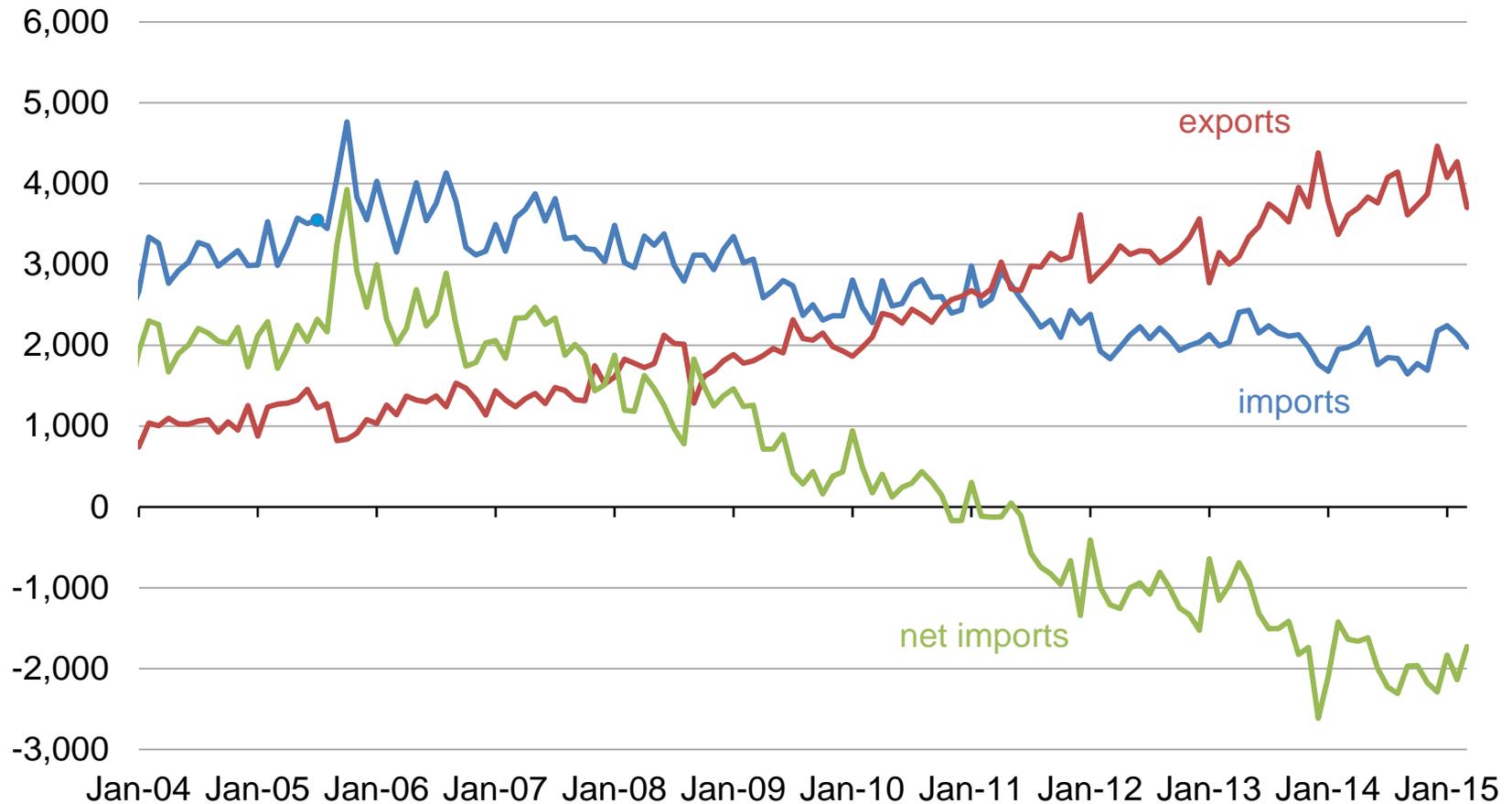
U.S. imports and exports of crude oil
thousand barrels per day



Source: EIA, Petroleum Supply Monthly

“Swing” in U.S. petroleum products trade from 2 million b/d net imports to 2 million b/d net exports over 2004-15 period

U.S. imports and exports of petroleum products
thousand barrels per day

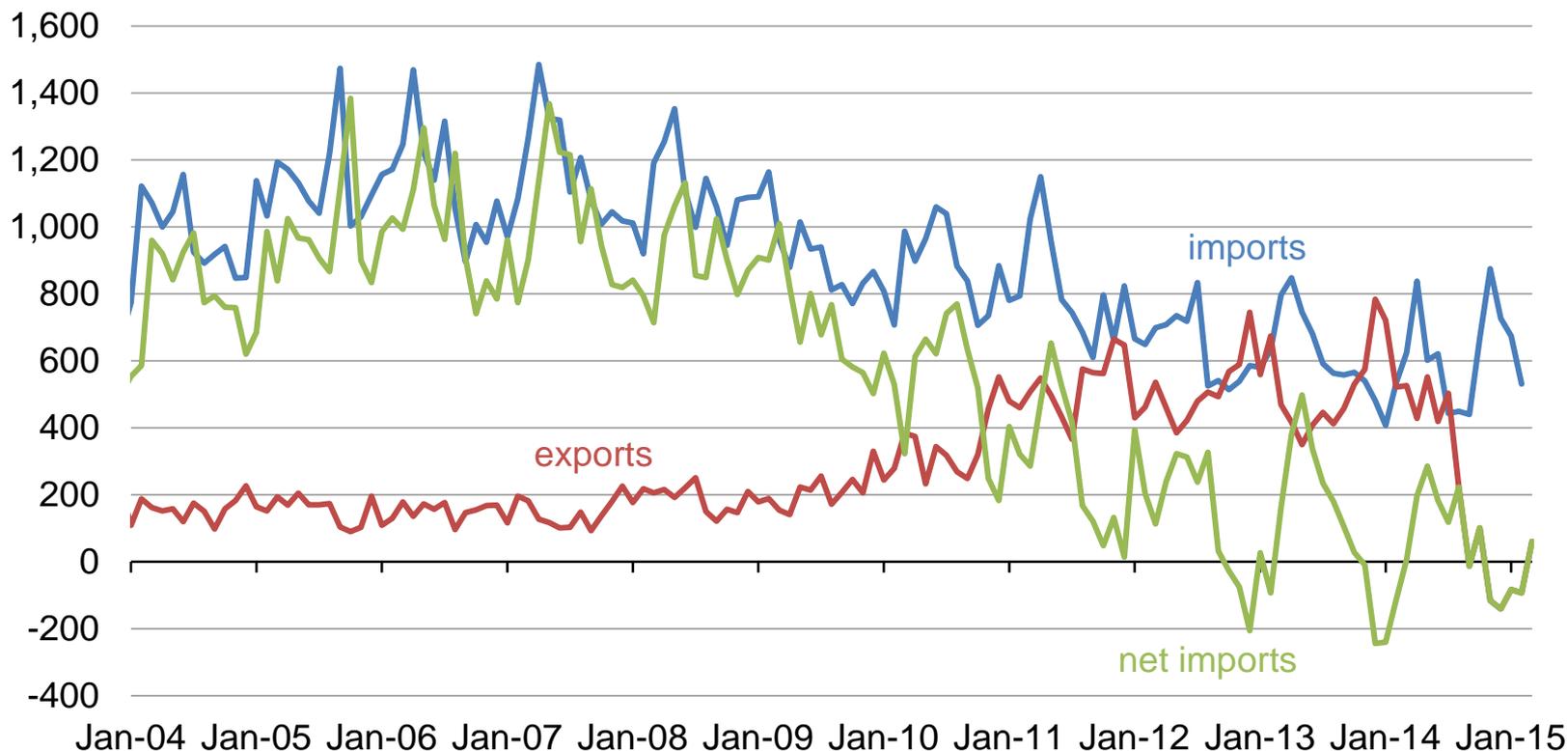


Source: EIA, Petroleum Supply Monthly

U.S. net imports of gasoline decreased by roughly 900 kb/d over the 2004-15 period; the United States is now a net gasoline exporter in winter months

U.S. imports and exports of gasoline*

thousand barrels per day

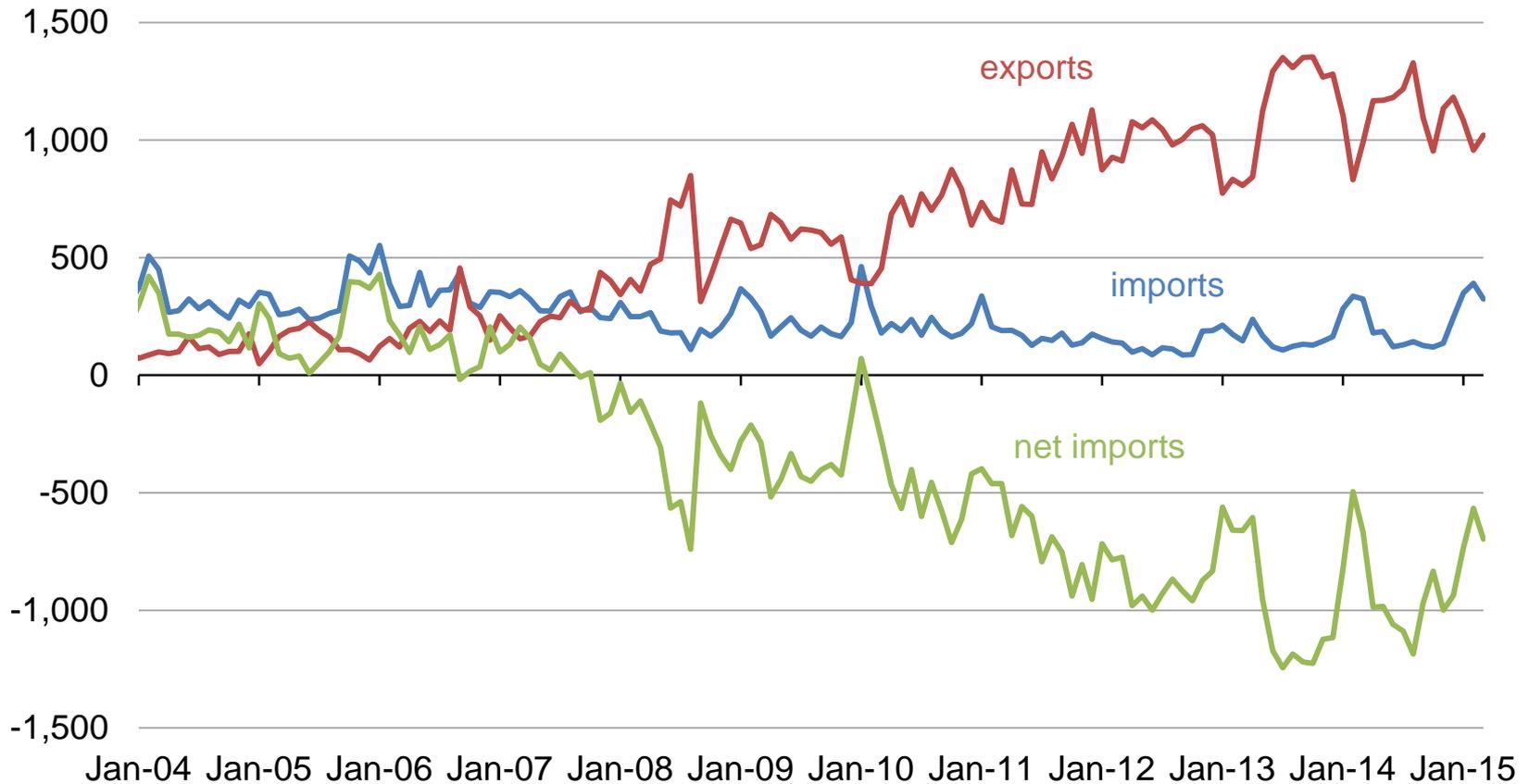


*Note: Series represents sum of finished gasoline and blending components

Source: EIA, Petroleum Supply Monthly

U.S. distillate exports grew steadily since 2004, with monthly exports in the range of 900 kb/d to 1,400 kb/d since early 2012

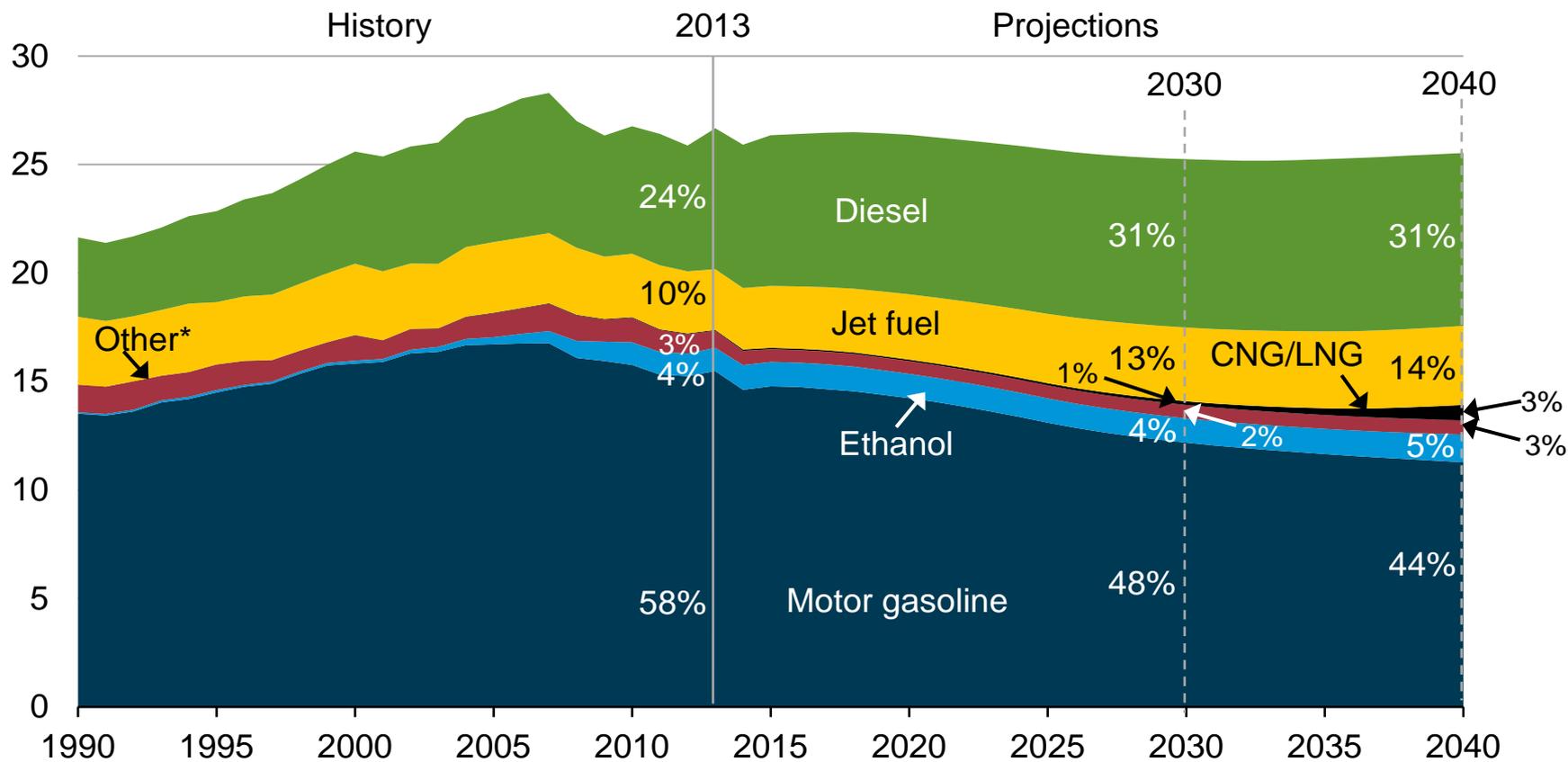
U.S. imports and exports of distillate
thousand barrels per day



Source: EIA, Petroleum Supply Monthly

In the transportation sector, motor gasoline use declines are driven by fuel economy policies; diesel and jet fuel use grows, but future policies could lower their use

transportation energy consumption by fuel
quadrillion Btu

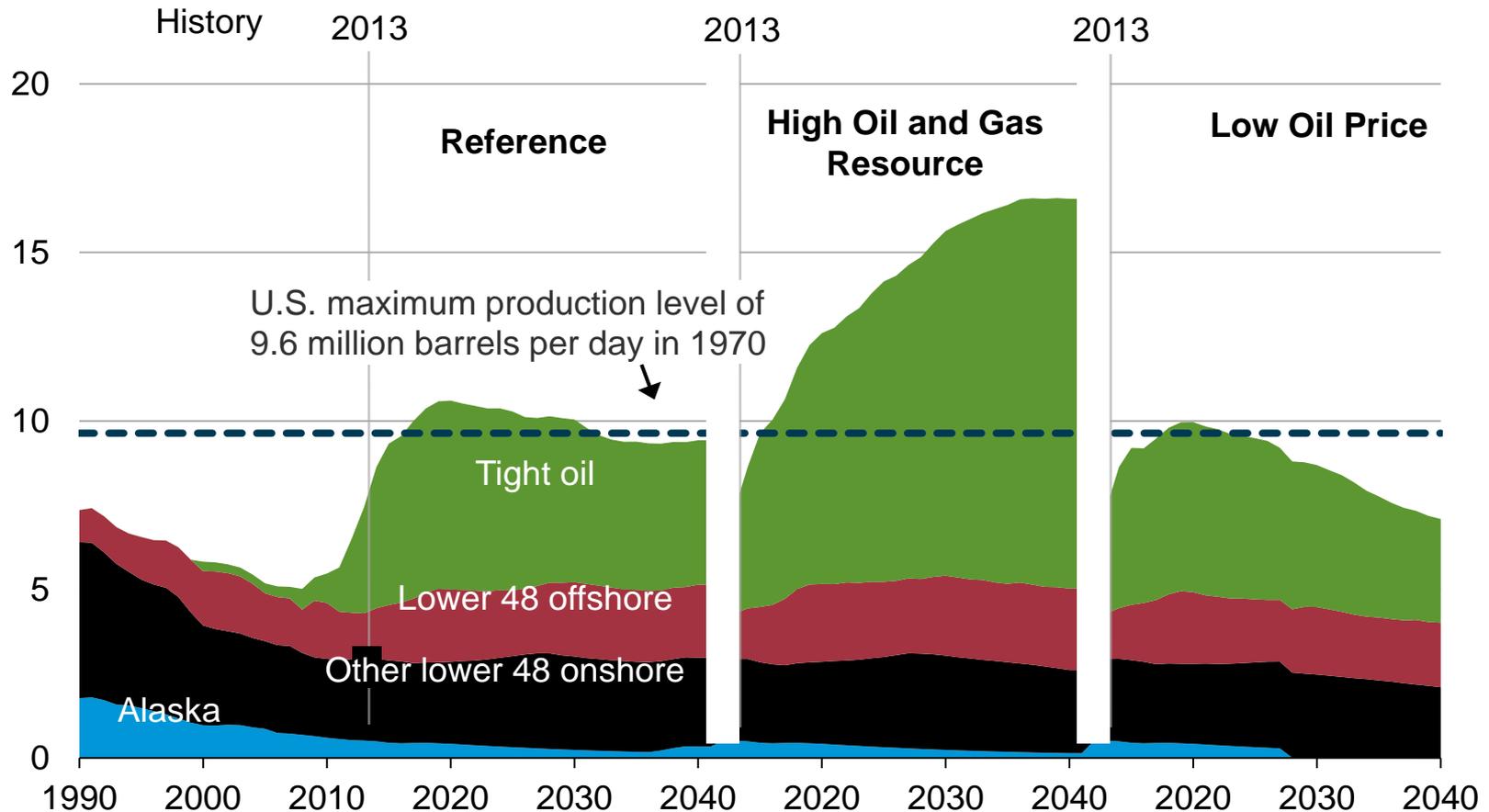


Source: EIA, Annual Energy Outlook 2015 Reference case

*Includes aviation gasoline, propane, residual fuel oil, lubricants, electricity, and liquid hydrogen

U.S. crude oil production rises above previous historical highs before 2020 in all AEO2015 cases, with a range of longer-term outcomes

U.S. crude oil production
million barrels per day

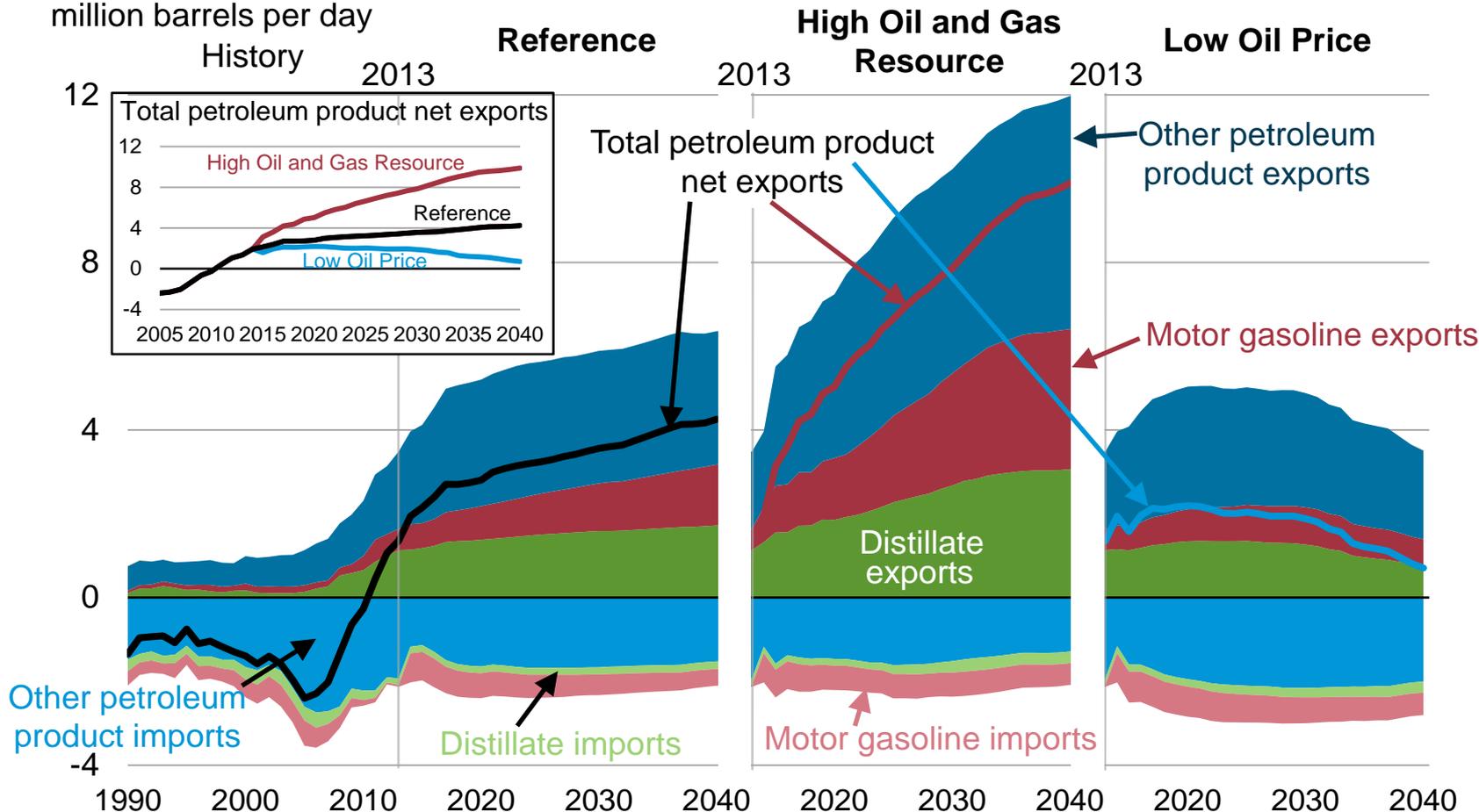


Source: EIA, Annual Energy Outlook 2015

U.S. net exports of petroleum products vary with the level of domestic oil production given current limits on U.S. crude oil exports

U.S. petroleum product imports and exports

million barrels per day



Source: EIA, Annual Energy Outlook 2015

Further thoughts on crude oil and petroleum product exports

- Future exports of crude oil and petroleum products taken together tend to rise with higher domestic production and decline with higher domestic consumption
- In high production scenarios under current laws and policies that allow unrestricted exports of processed petroleum products but restrict crude exports, product exports grow significantly
- Without restrictions on crude exports, crude export growth would displace a portion of product export growth in high production scenarios
- EIA has prepared several analyses related to this topic, and expects to provide an additional integrated analysis this summer
- With changing and volatile export markets, EIA is working to improve its export data through an agreement with Customs and Border Protection. This high-priority effort will enable EIA sharpen its closely watched weekly petroleum balances

For more information

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

Annual Energy Outlook | www.eia.gov/forecasts/aeo

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

International Energy Outlook | www.eia.gov/forecasts/ieo

Today In Energy | www.eia.gov/todayinenergy

Monthly Energy Review | www.eia.gov/totalenergy/data/monthly

State Energy Portal | www.eia.gov/state

Drilling Productivity Report | www.eia.gov/petroleum/drilling

Propane and ethane production growth has driven the steady increase in U.S. HGL production

- Propane remains the largest-volume and highest-revenue HGL purity product
- Ethane production levels are increasing because of continuing investments in de-ethanization facilities, and ethane pipelines and export terminals.

million bbl/d	2008	2009	2010	2011	2012	2013	2014	2015 Q1	change 2008-14
Ethane	0.71	0.78	0.88	0.94	0.99	0.98	1.08	1.06	51%
Propane	0.82	0.84	0.87	0.90	0.99	1.11	1.28	1.35	55%
Normal butane	0.22	0.21	0.24	0.21	0.24	0.28	0.35	0.25	56%
Isobutane	0.18	0.19	0.18	0.21	0.23	0.24	0.26	0.26	44%
Natural gasoline	0.26	0.27	0.28	0.29	0.32	0.35	0.39	0.39	47%
Propylene & other refinery olefins	0.21	0.25	0.28	0.29	0.28	0.28	0.28	0.25	35%
HGL total	2.41	2.53	2.73	2.84	3.04	3.23	3.63	3.57	50%

Note: 2015 Q1 includes January to March data.

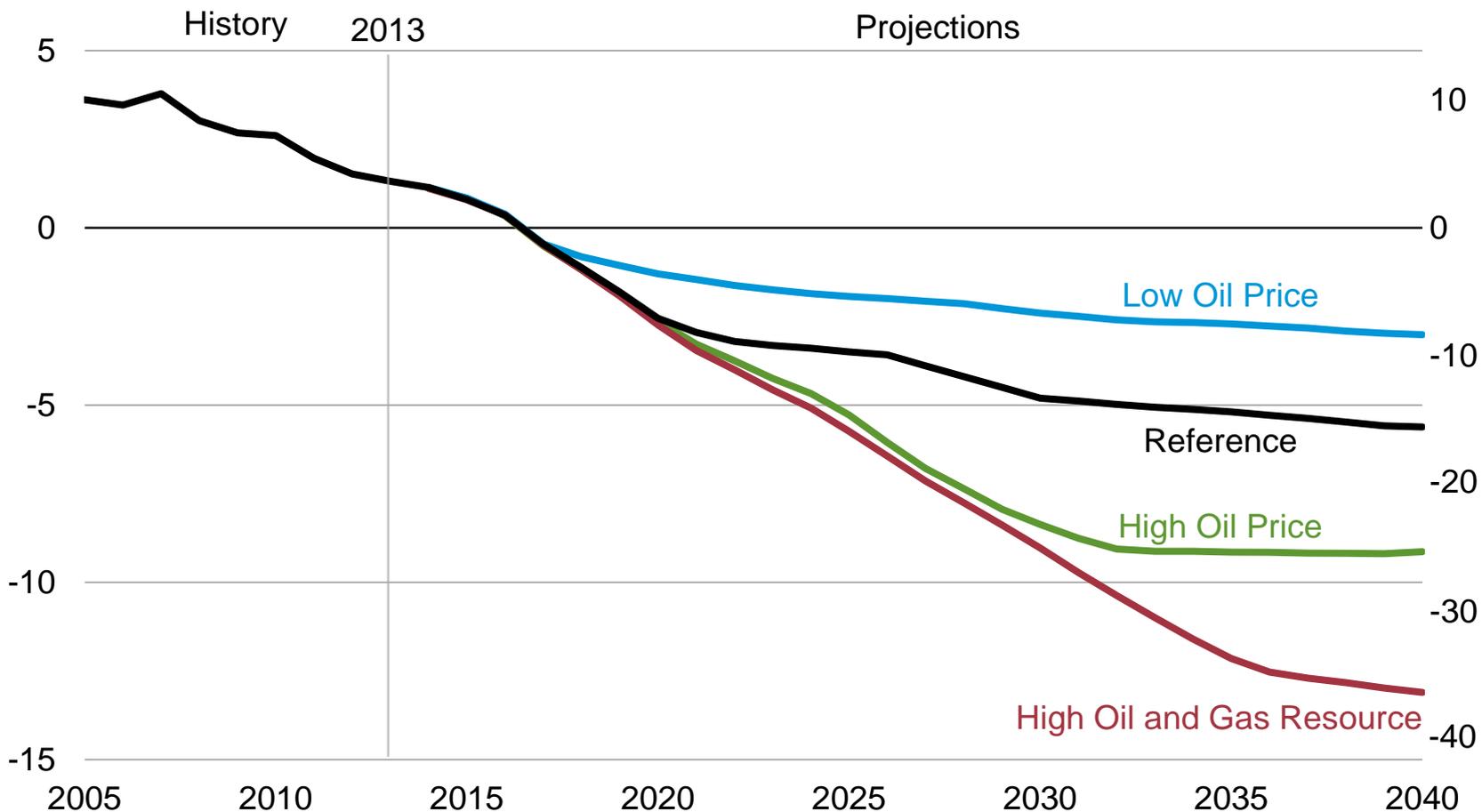
Source: EIA [U.S. Refiner & Blender Production](#) and [U.S. Natural Gas Plant Field Production](#).

Level of net natural gas trade, including LNG exports, depends largely on resource levels and world energy prices

U.S. total net natural gas imports

trillion cubic feet

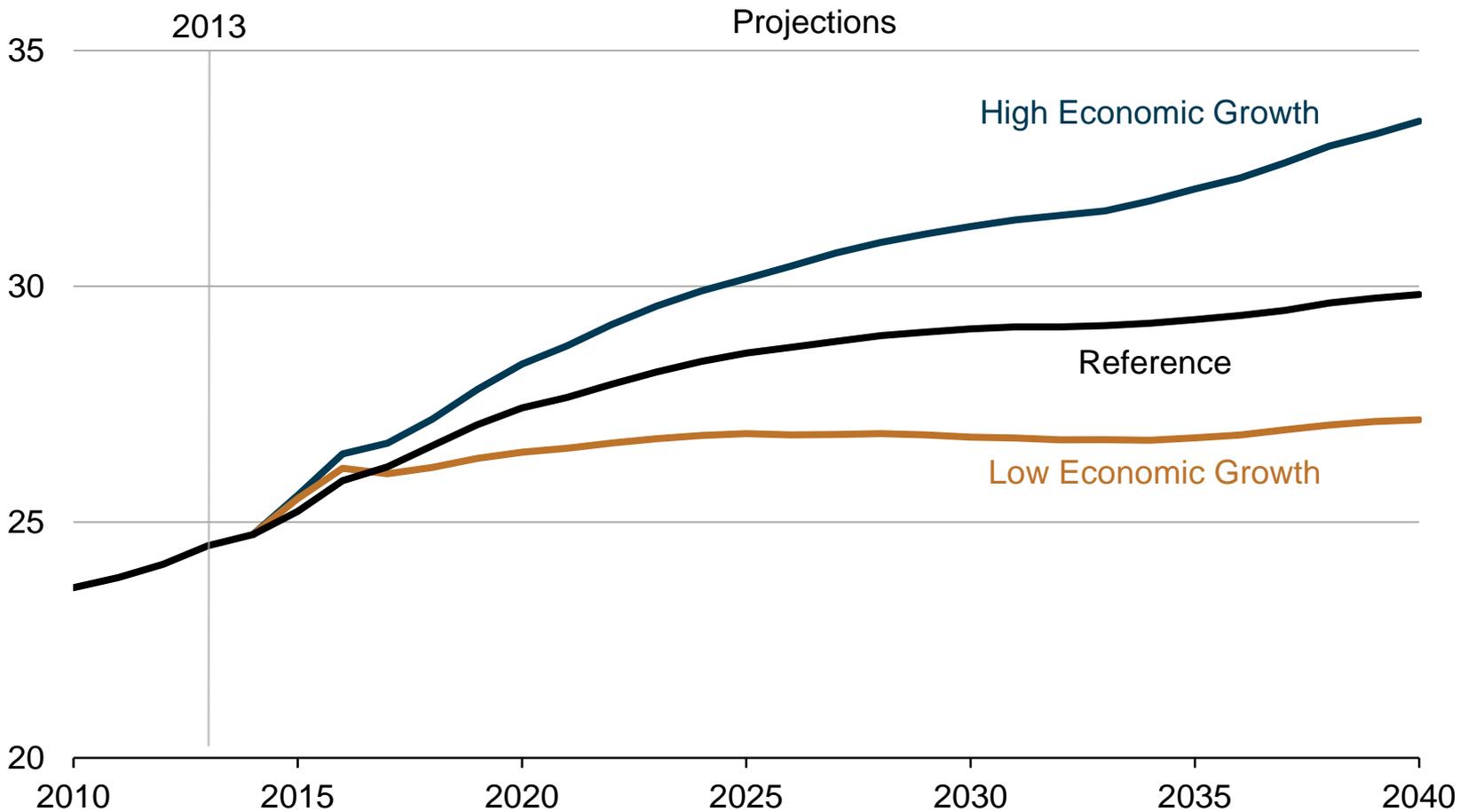
billion cubic feet per day



Source: EIA, Annual Energy Outlook 2015

Industrial energy use rises with growth of shale gas supply

industrial sector total delivered energy consumption
quadrillion Btu

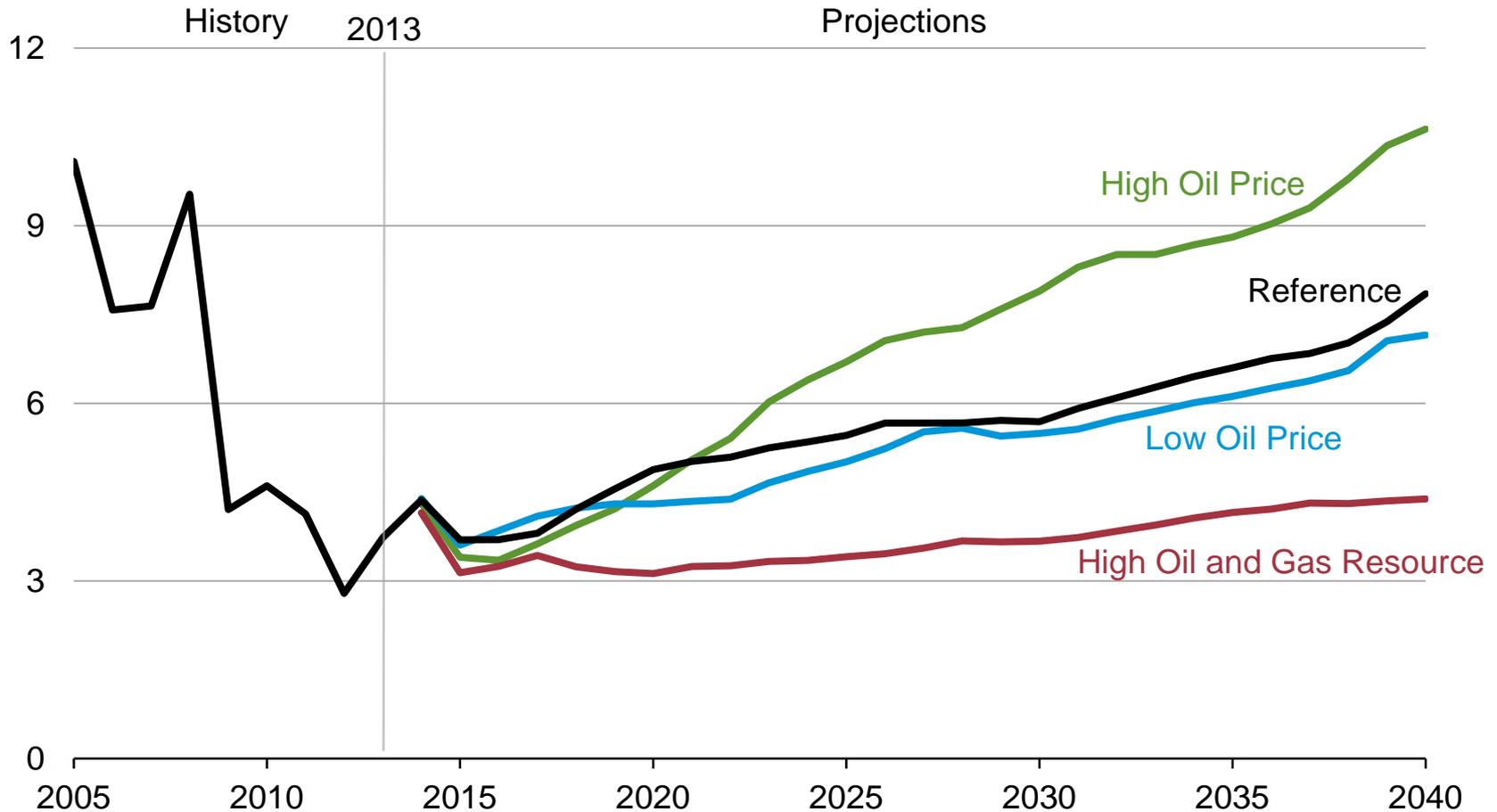


Source: EIA, Annual Energy Outlook 2015

Future domestic natural gas prices depend on both domestic resource availability and world energy prices

average Henry Hub spot prices for natural gas

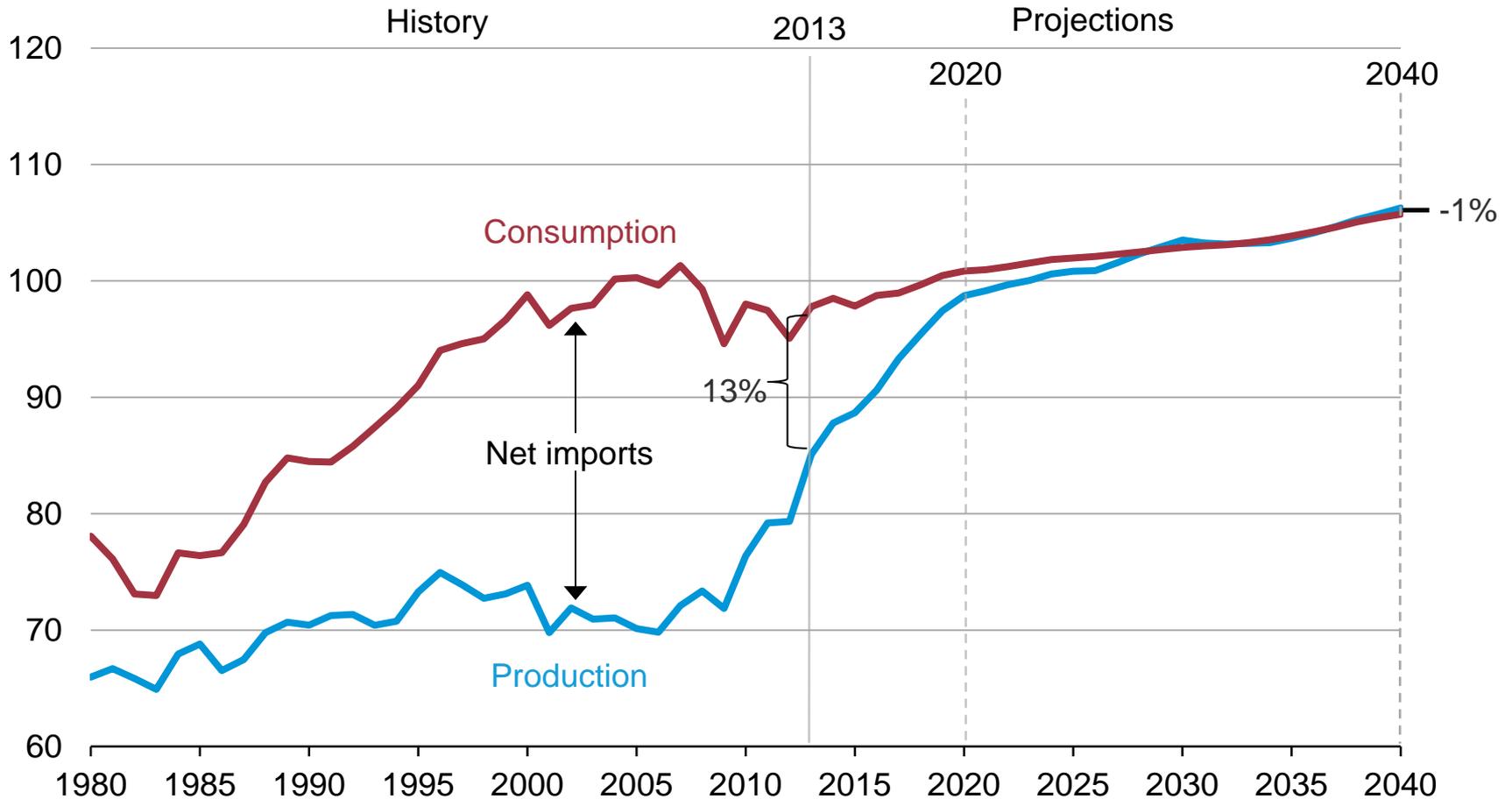
2013 dollars per million Btu



Source: EIA, Annual Energy Outlook 2015

Growth in U.S. energy production outstrips consumption leading to a balance in United States energy imports and exports

U.S. energy production and consumption
quadrillion Btu



Source: EIA, Annual Energy Outlook 2015 Reference case