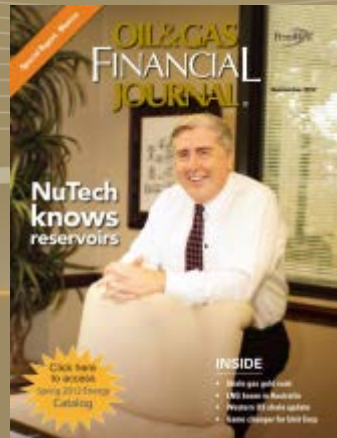


THE HYDROCARBON PROCESSING INDUSTRY IN A CHANGED GLOBAL ENVIRONMENT

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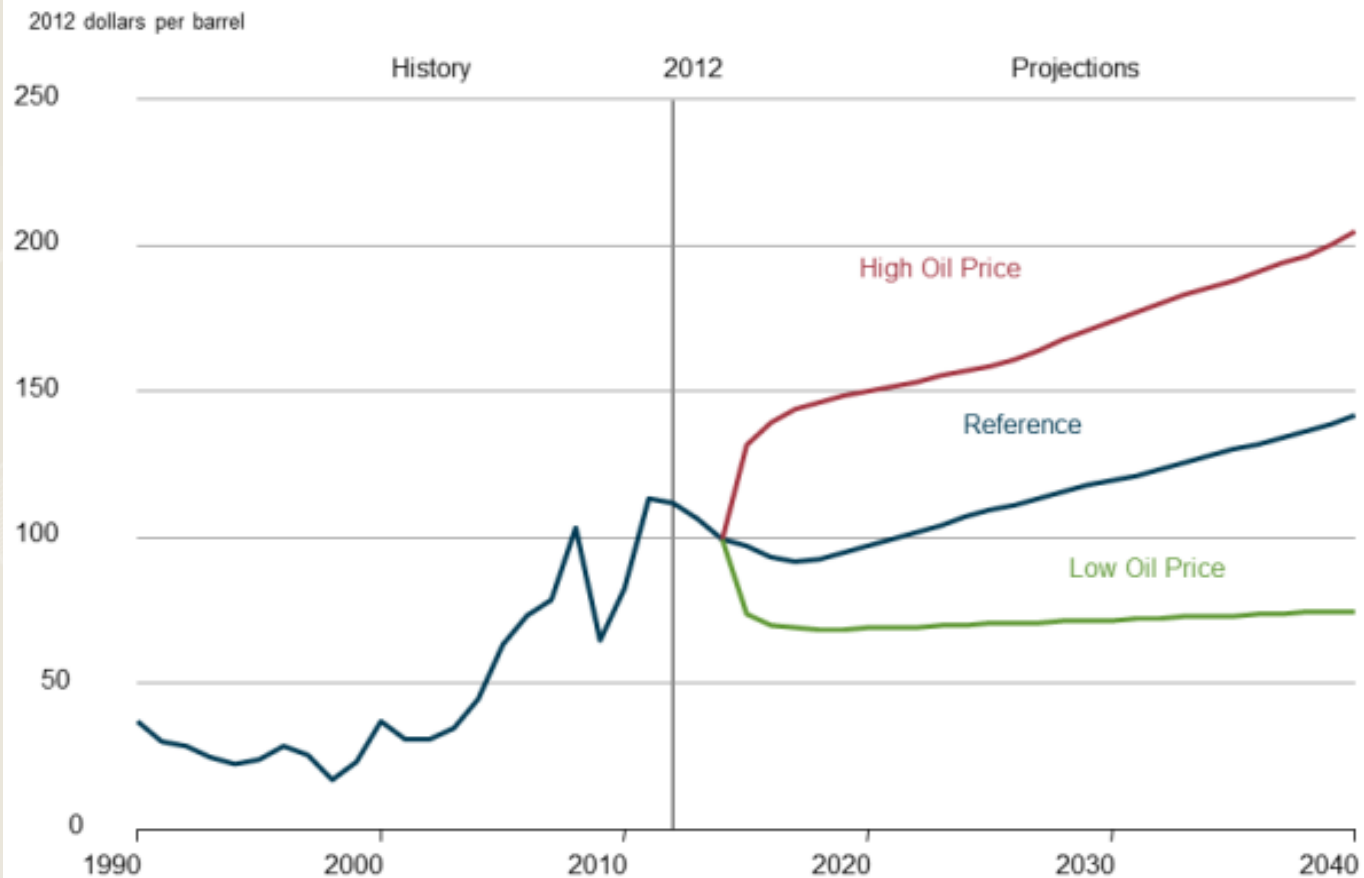
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JOURNAL

FACTORS SHAPING ENERGY EXPANSION FOR THE NEXT DECADE:

- Shale Oil and Gas
- Increased need for Gas Processing
- Climate Change
- US exporting LNG
- US increased Petrochemical production
- Growth in World Population driving energy demand
- Changes in pipeline capacity
- Geopolitical Changes
- Energy Security

QUICK LOOK AT OIL PRICES

Figure MT-4. North Sea Brent crude oil spot prices in three cases, 1990-2040

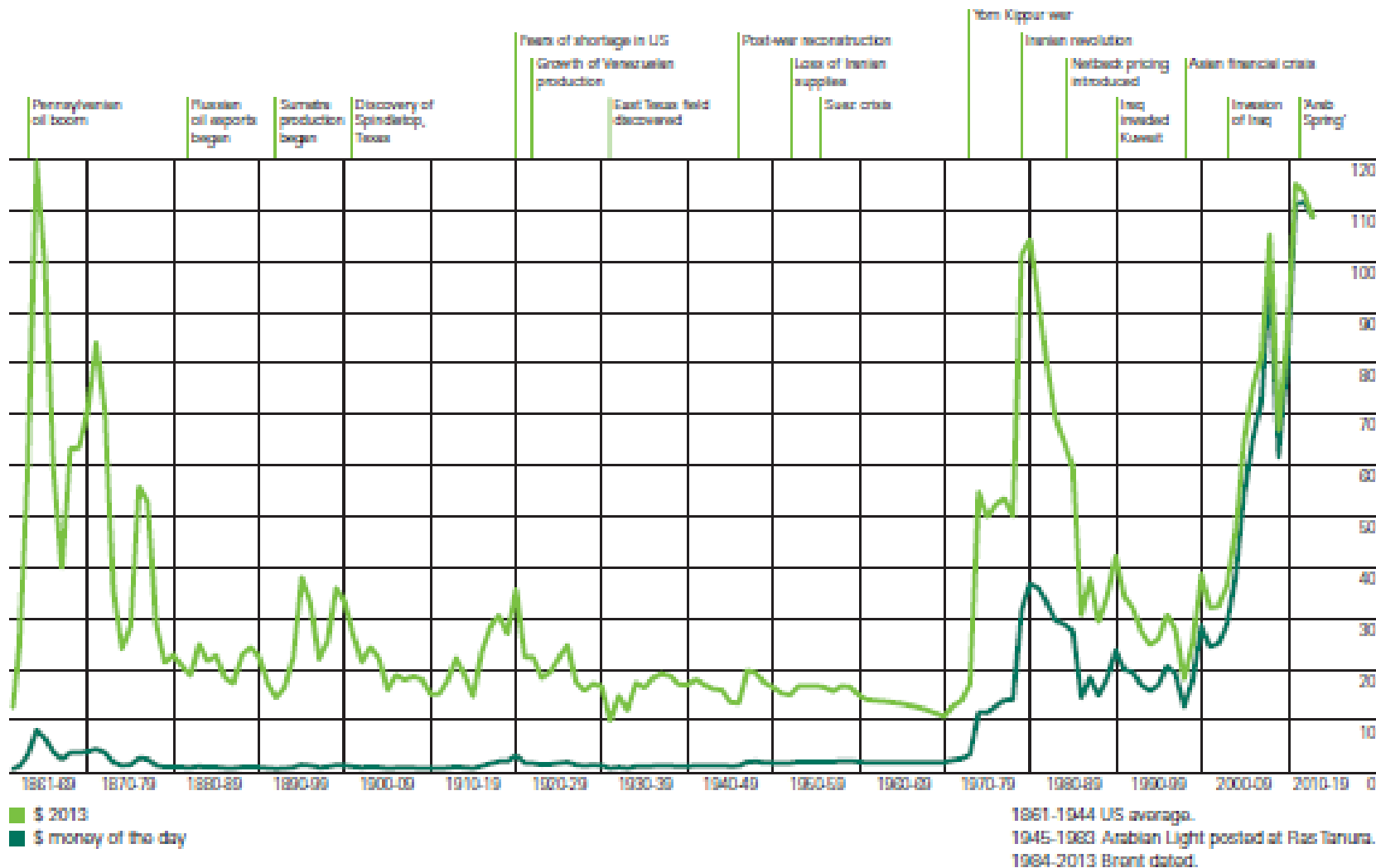


QUICK LOOK AT OIL PRICES

Crude oil prices 1861-2013

US dollars per barrel

World events



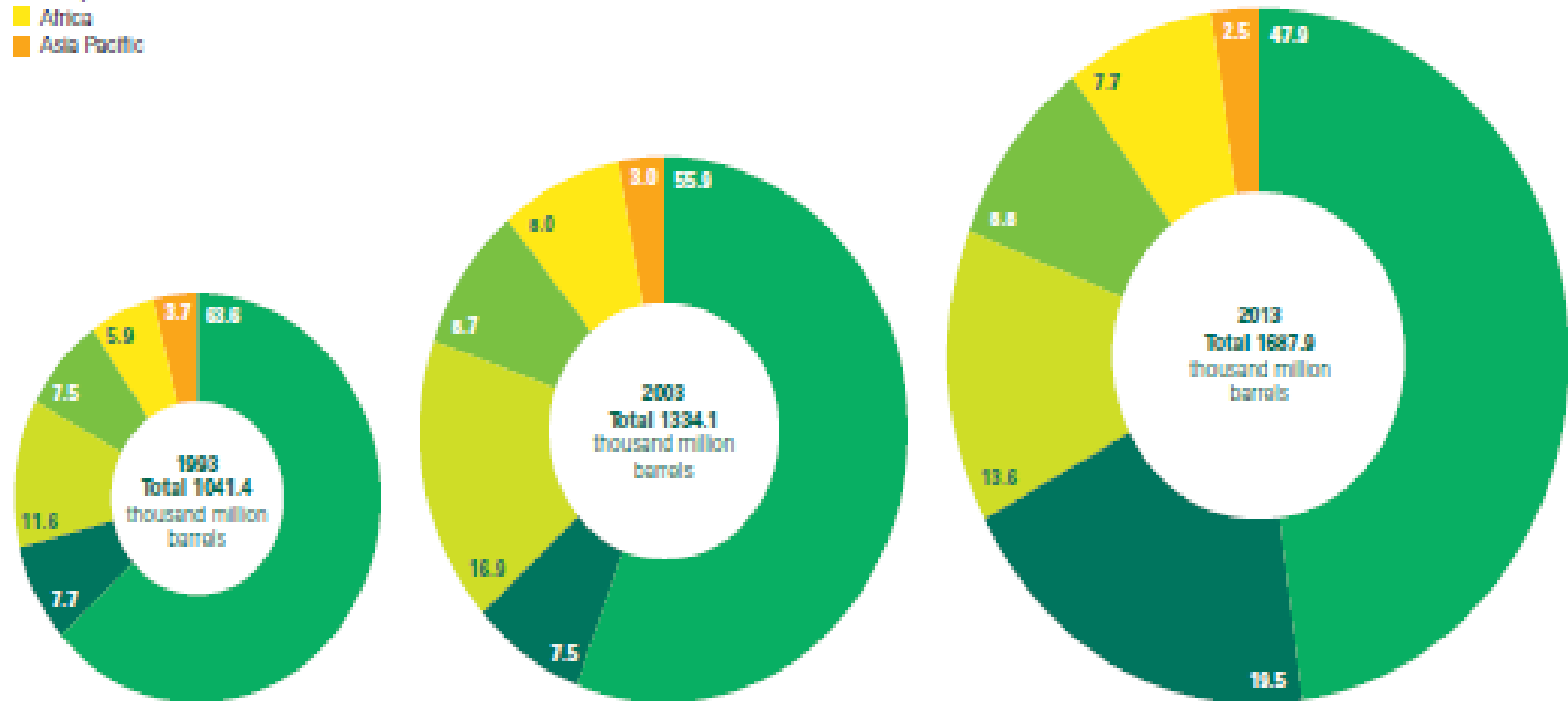
Source: BP Statistical Review 2014

CHANGES IN WORLD PRODUCTION

Distribution of proved reserves In 1993, 2003 and 2013

Percentage

- Middle East
- S. & Cent. America
- North America
- Europe & Eurasia
- Africa
- Asia Pacific



Source: BP Statistical Review , 2014

CHANGES IN US OIL & GAS

- U.S. Reversing 40 Years of oil production declines
- Recovery from Macondo spill has occurred with deepwater activity in the Gulf of Mexico increasing
- Oil Prices appear to be range-bound between \$100 to \$120
- U.S. natural gas poised for long-term recovery
- Texas oil production will surpass 1972 all-time high by 2017
- U.S. already surpassed Russia as largest gas producer and Saudia Arabia as largest oil producer
- Big impact on global refining, LNG, pipeline capacity and petrochemical activity

THE GAME CHANGER - SHALE

- Decreased carbon emissions as cheap gas in U.S. shifts power production from coal to natural gas
- Increased US production of petrochemicals
- Increased use of natural gas for automotive fuel starting with fleets
- U.S. production increasing both oil and natural gas due to shale

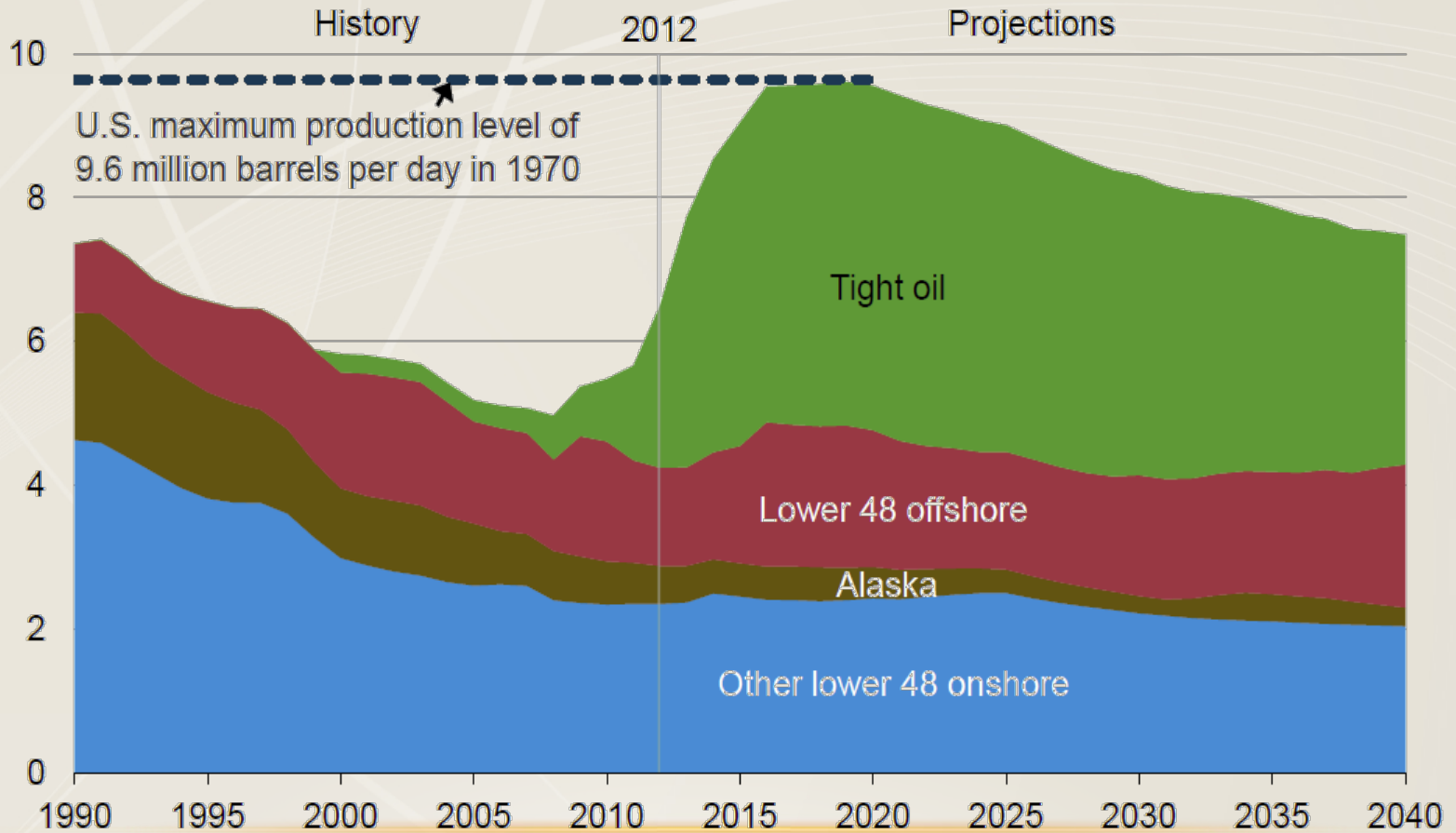
GEOLOGY AND MARKET STRUCTURE NECESSARY FOR SHALE SUCCESS

- U.S. having success due to geological structures and unique advantages compared to other countries
- Shale structures are found around the world but since the U.S. is only country that gives landowners mineral rights will be slow to develop
- U.S. has fully developed service industry to handle the shale plays
- Success builds success with successful producers chasing more plays

GEOLOGY AND MARKET STRUCTURE NECESSARY FOR SHALE SUCCESS

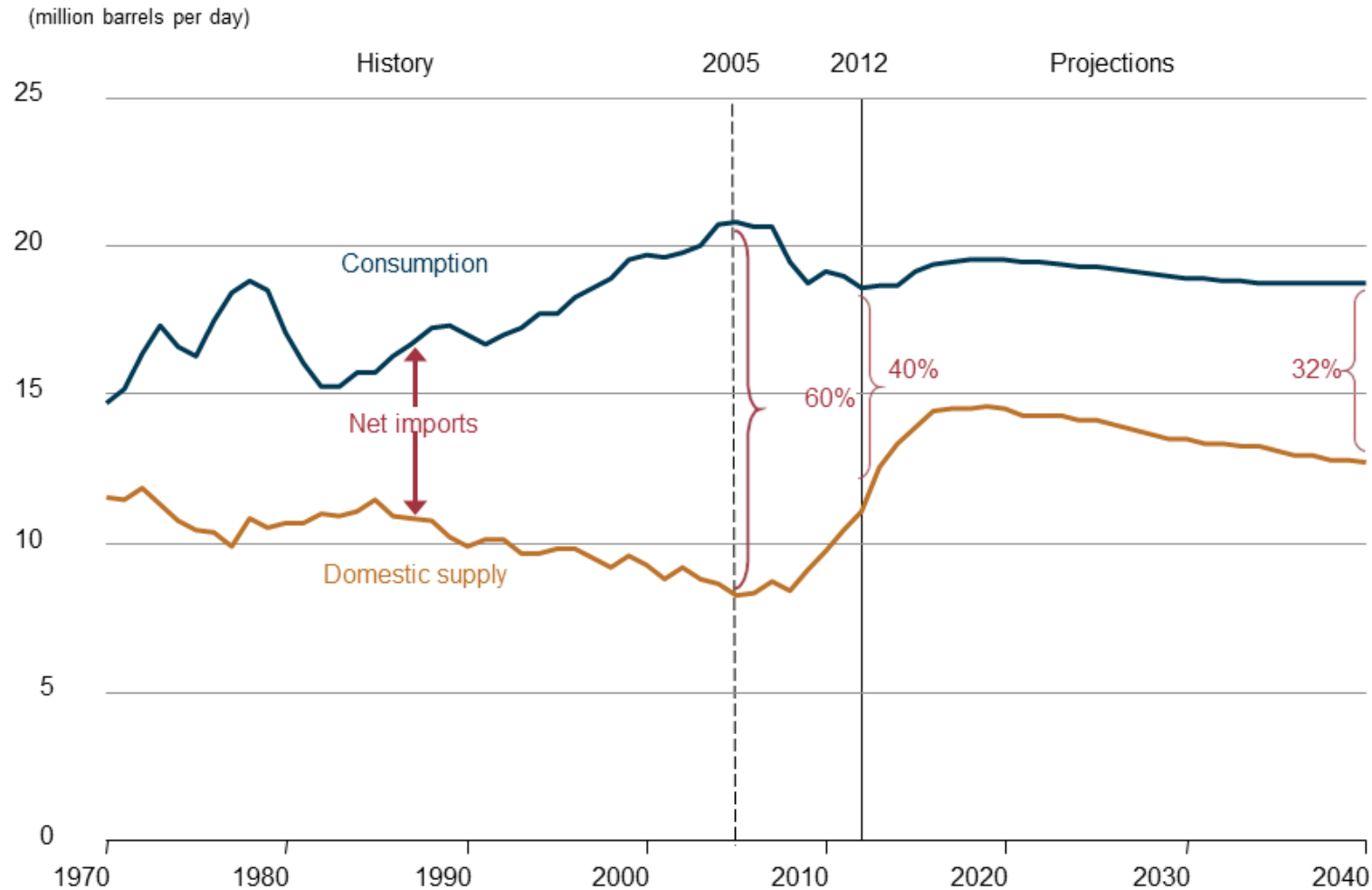
- U.S. has well developed pipeline and gas processing facilities allowing the natural gas to get to market
- Recent changes in regulatory policy by the EPA in their “war on coal” will cause a switch to natural gas by power generators spurring demand
- U.S. is developing export facilities to allow the export of natural gas to the rest of the world in the form of LNG

SHALE OIL IS RAPIDLY CHANGING THE US OIL INDUSTRY

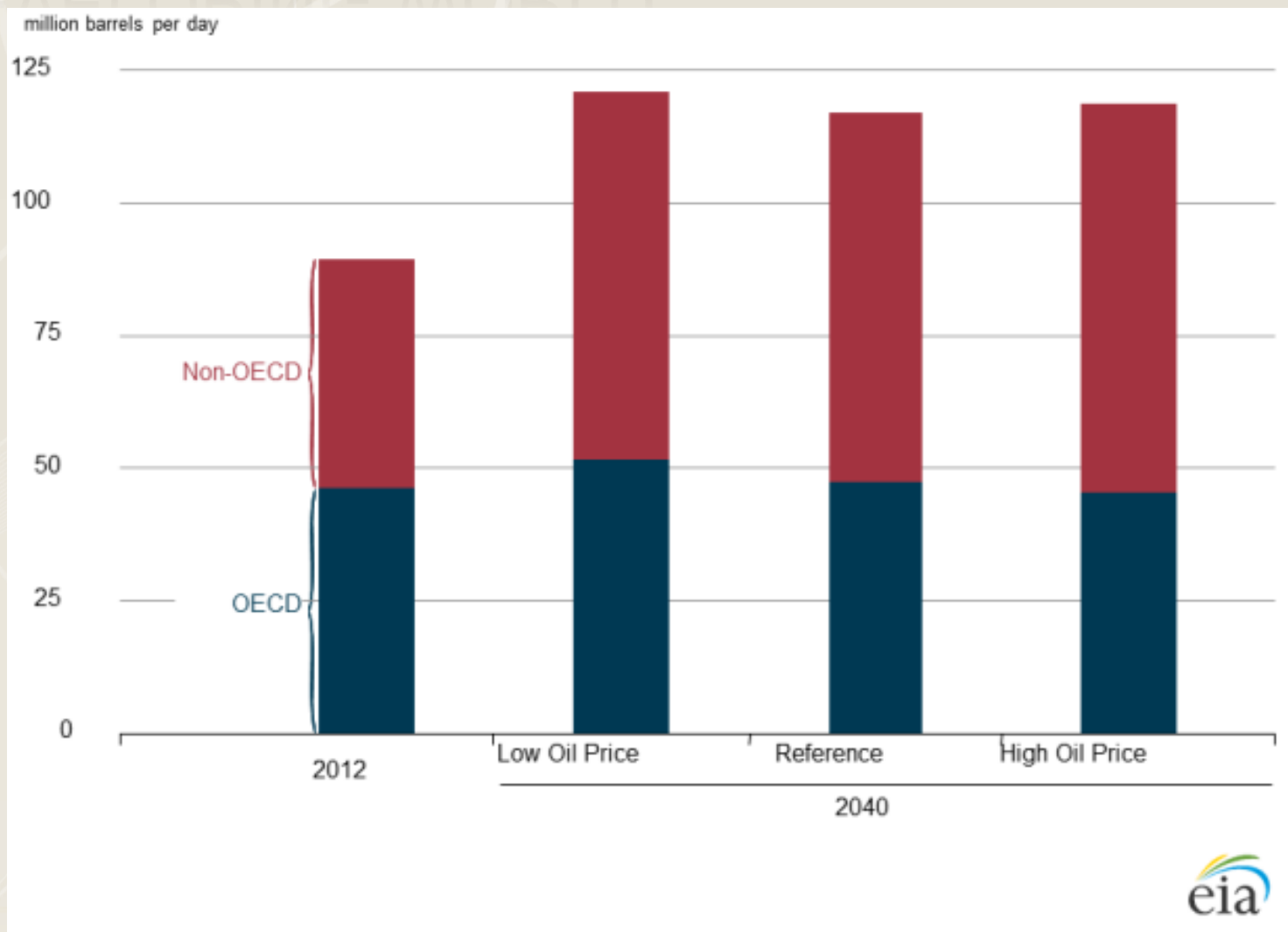


Source: EIA

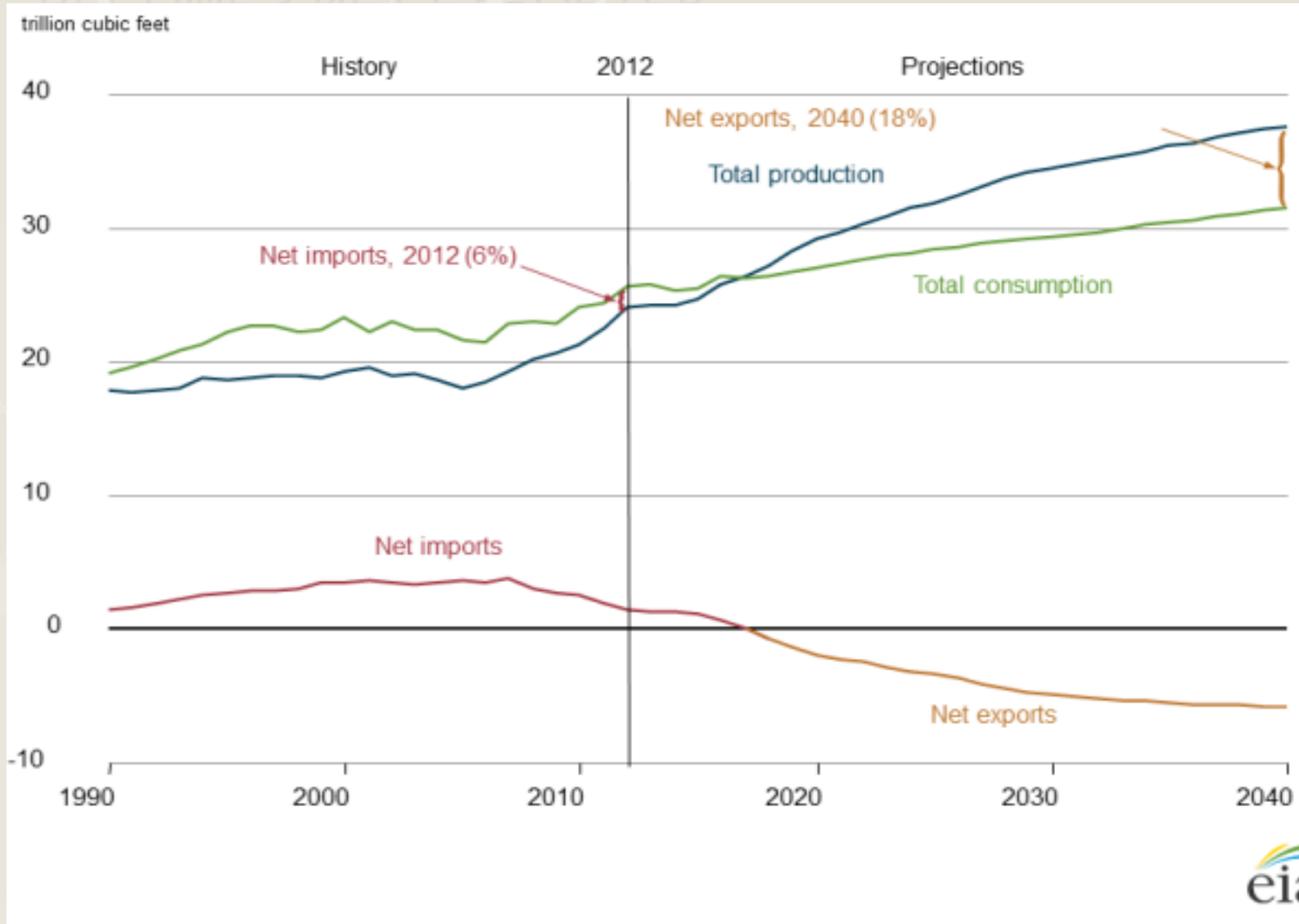
US DEPENDENCE ON IMPORTED LIQUIDS DECLINES



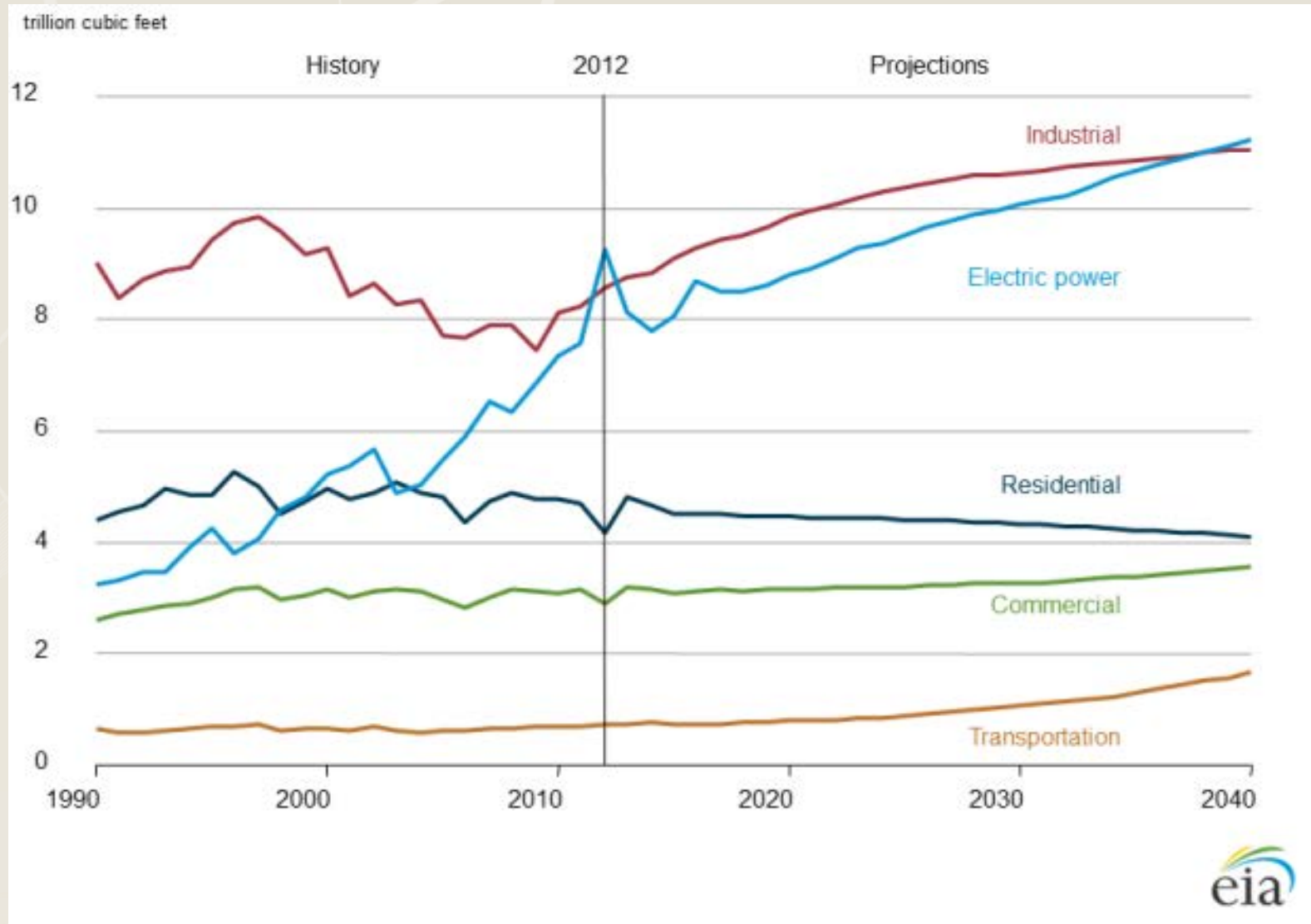
LIQUID CONSUMPTION DRIVEN BY DEVELOPING WORLD



NATURAL GAS PRODUCTION GROWS AND US BECOMES NET EXPORTER

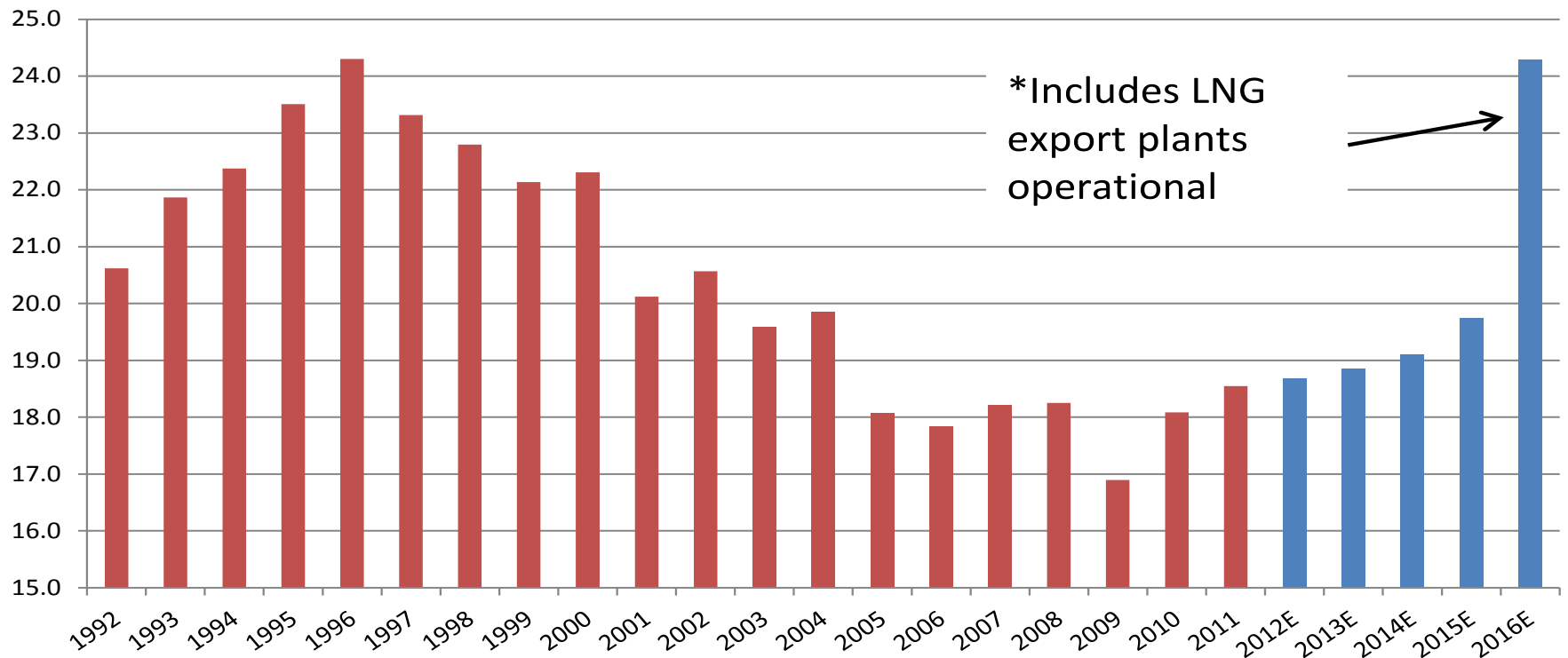


GAS WILL HELP DRIVE INDUSTRIAL REJUVENATION IN US



NATURAL GAS SUPPLY BOOMING

Average Annual Industrial Demand



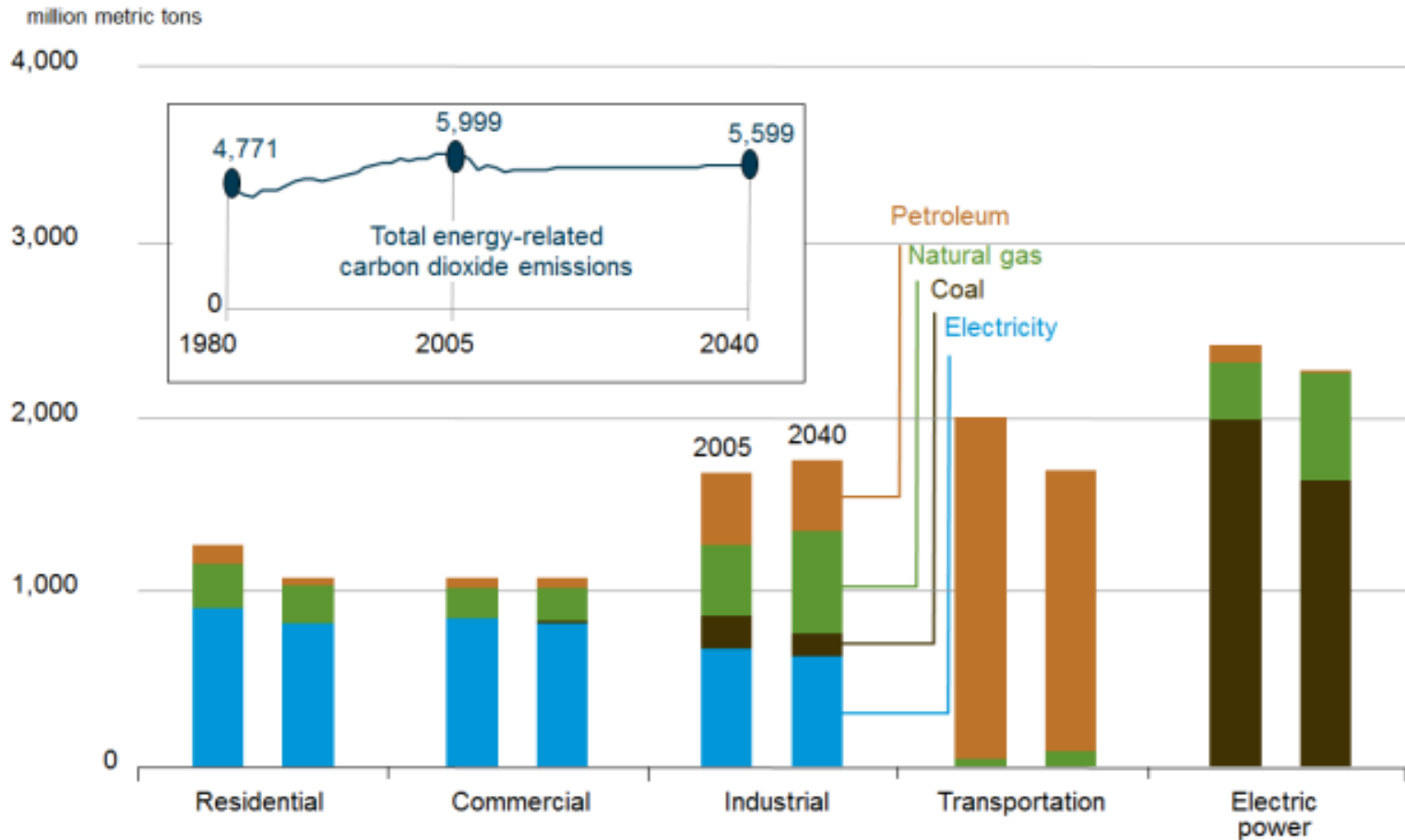
Source: Energy Information Administration May 2012 & RJ Estimates

CLIMATE CHANGE

- EPA regulations recently announced will force the power generation industry to close coal fired plants and move to natural gas
- Fracking still regulated by states though the EPA is trying to make a national regulatory issue
- Greater use of natural gas and the slow growth in the Obama economy has lowered CO2 emissions to the early 1990's level
- Australia recently repealing their strong climate change taxes and rules due to damage to their economy will have an impact on other developed countries as they look at their climate change programs
- Germany, since phasing out nuclear after Fukushima, is turning increasingly to coal, much of it mined in the US, so their emissions are increasing throwing the EU emissions plans in to jeopardy

CO2 EMISSIONS DECLINE

Figure MT-64. U.S. energy-related carbon dioxide emissions by sector and fuel in the Reference case, 2005 and 2040



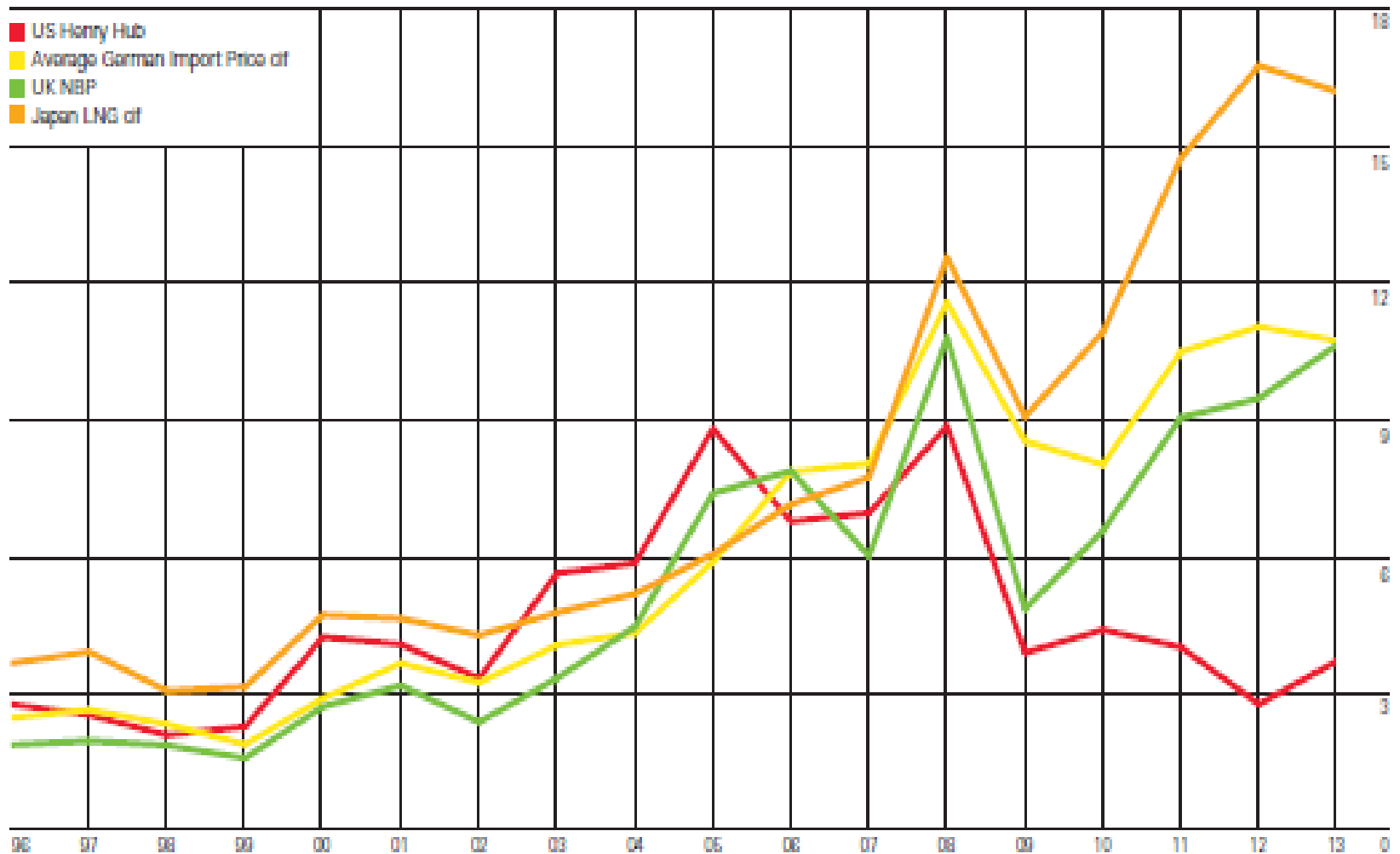
US LNG EXPORT CAPACITY GROWS

Projects currently approved

- Jordan Cove in Oregon will export 800 million cubic feet to Asia
- Sempra Energy's Cameron project for 1.7 billion cubic feet
- Lake Charles Exports in Lake Charles, La.
- Dominion Resources in Cove Point, Md.
- Cheniere Energy Sabine Pass, Tx. Trains 1 to 4 under construction, first two trains to cost approximately \$3.6 billion
- An additional 30 billion cubic feet of proposals are before the Department of Energy
- Growth in US LNG export capacity driven by differentials in gas prices around the world

GLOBAL DIFFERENCES IN GAS PRICES

Prices by million btu's

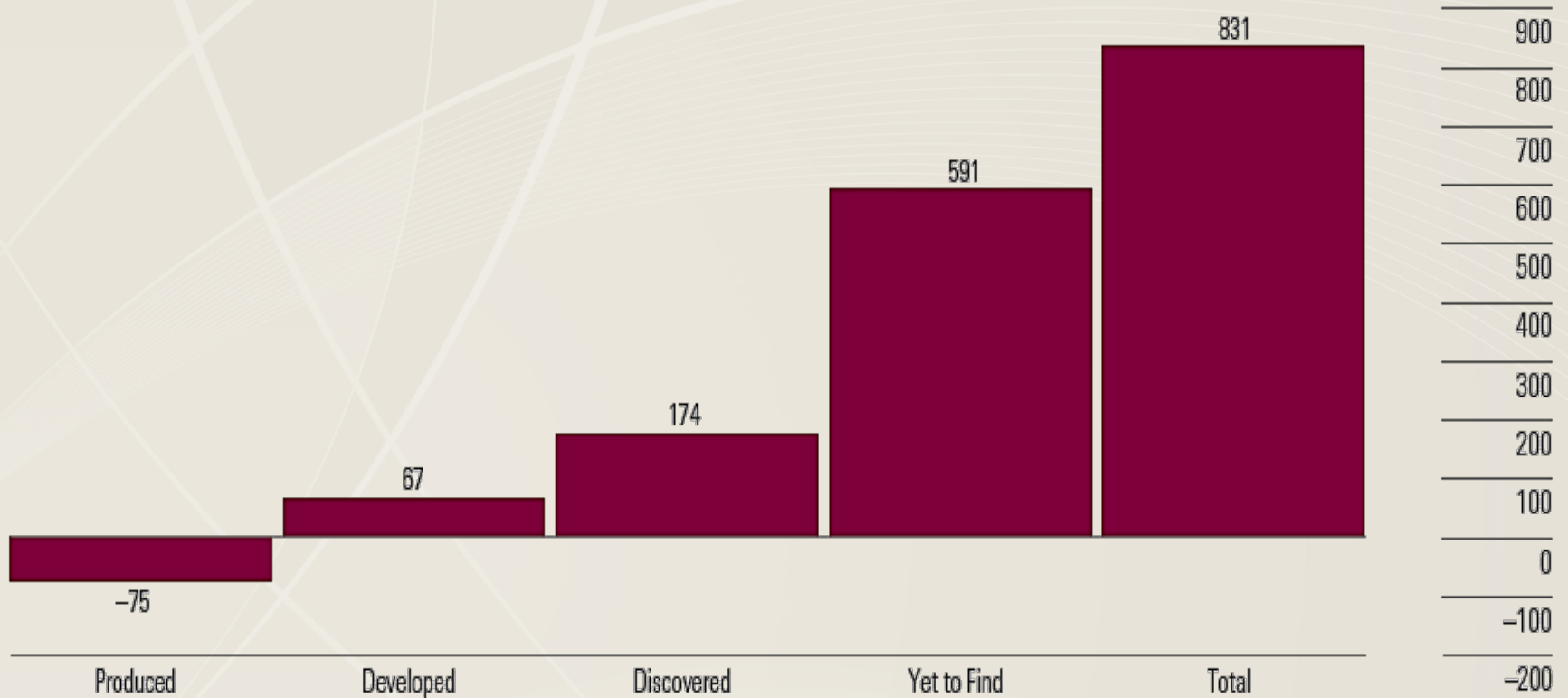


Source: BP Statistical Review , 2014

GAS PROCESSING FACILITIES AND PIPELINE CONSTRUCTION WILL BE DRIVEN BY CHANGED PRODUCTION LOCATIONS

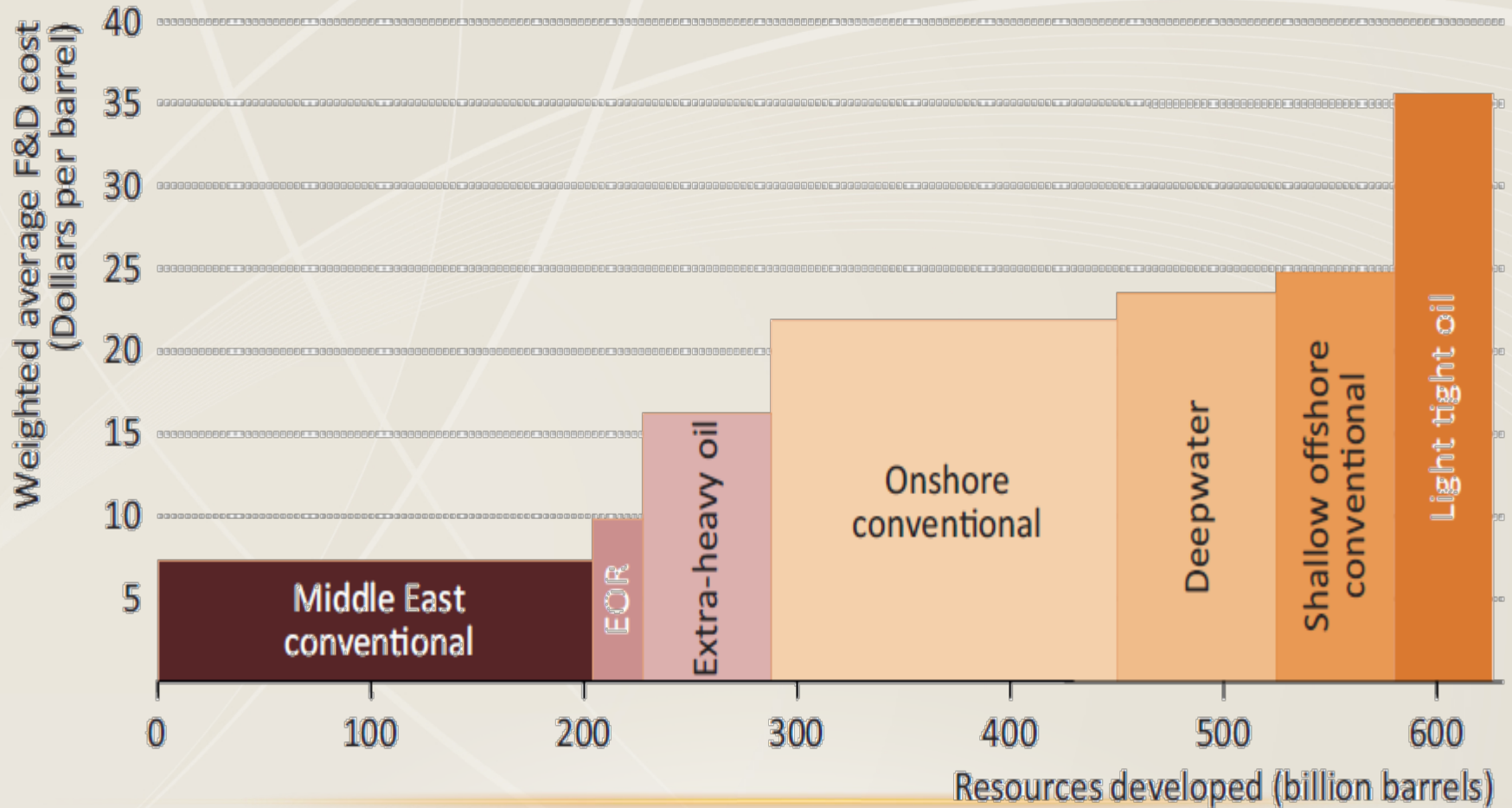
- LNG export facilities being added for export to Asia and Europe
- Additional Gas export will drive global prices down
- Rail transport being used currently for oil but recent spate of derailments will force increased pipeline construction
- Gas processing facilities located near production to prepare gas for pipeline transport
- Shell considering gas to liquids facility in US for export of diesel to South America
- Oil & Gas Journal for US pipeline capital spending in 2014 to be \$15.6 billion

GLOBAL DEEPWATER INVENTORY (BBOE)



Source: Morningstar Energy Observer, Rystad Energy

GLOBAL ENERGY DEMANDS WILL SEE SIGNIFICANT GROWTH OVER THE NEXT 10 YEARS AND WILL REQUIRE ALL OPTIONS



Source: IEA 2014 World Energy Investment Outlook

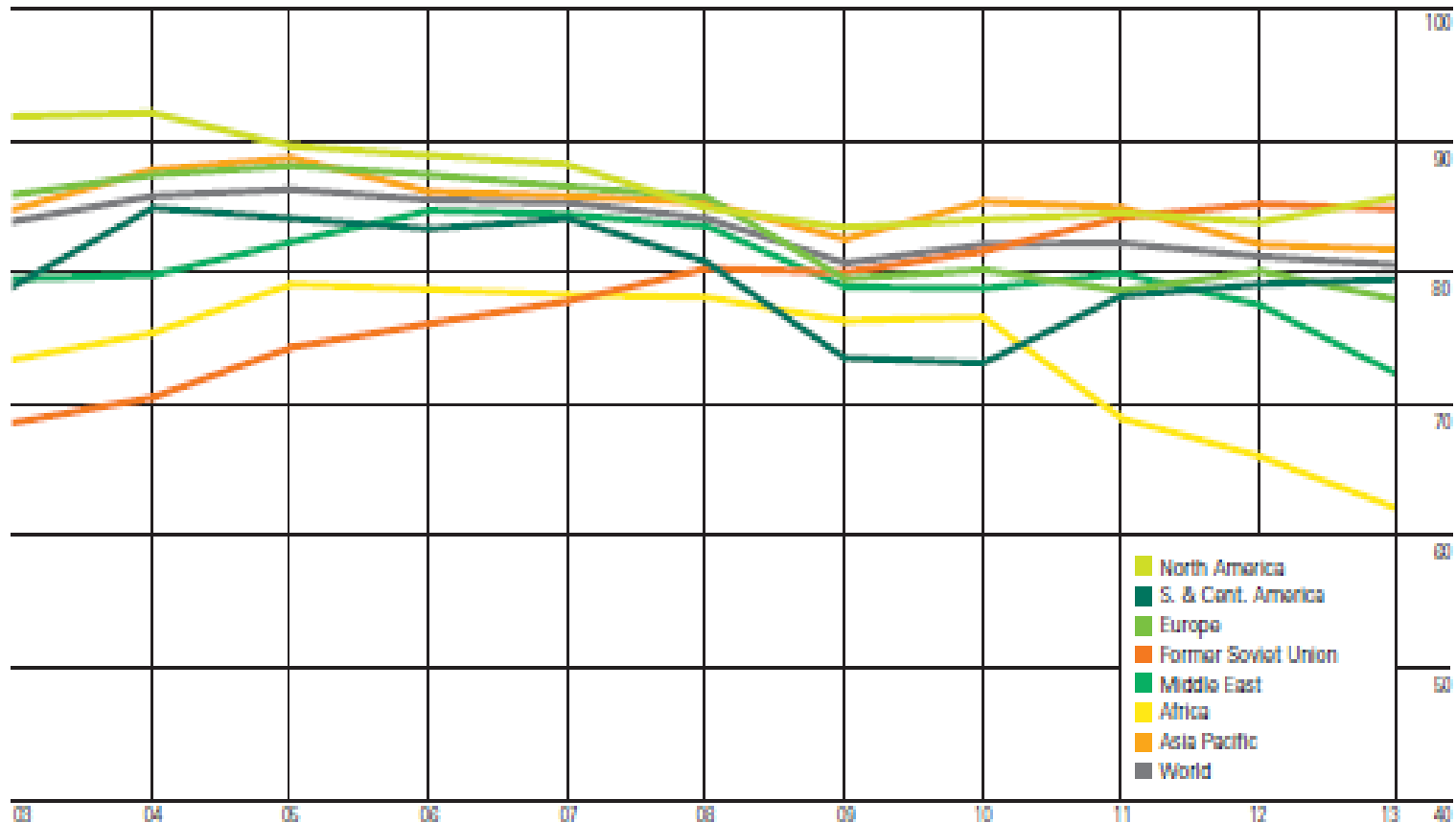
REFINING CAPACITY NEEDS TO CHANGE

Capacity additions in US as units restarted and expanded in 2012 and 2013 for:

- Vacuum distillation
- Thermal cracking
- Catalytic hydrocracking
- Catalytic reforming
- Hydrotreating
- If Keystone pipeline approved additional units in Gulf Coast refineries will be needed to handle
- Gasoline as a motor fuel continues to decline as ethanol takes an increasing share of the market
- Oil & Gas Journal forecast for capital spending in refining to equal \$12.9 billion in 2014 an increase of 0.8%

REFINERY UTILIZATION RATES

Refinery utilization Percentage

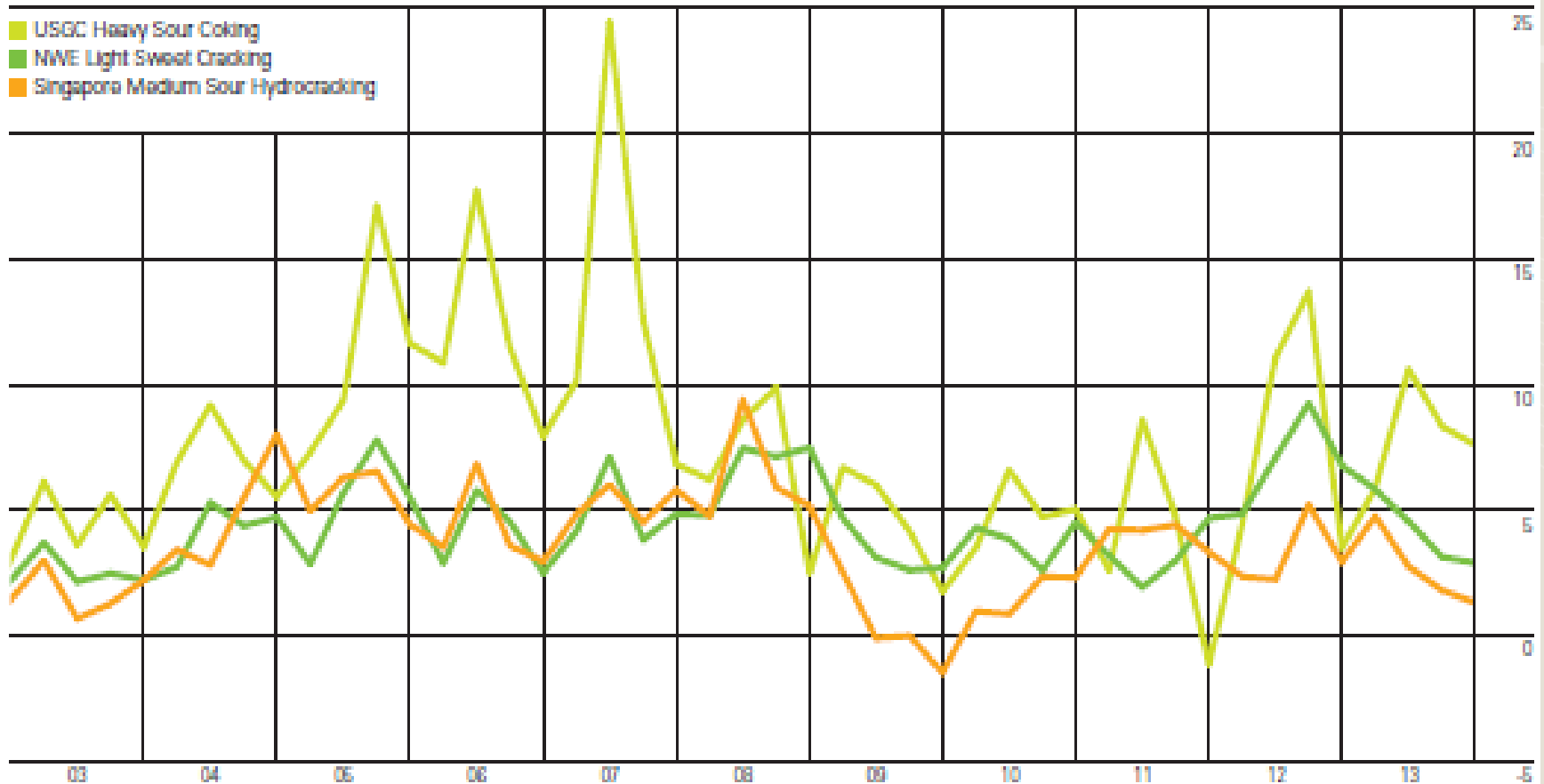


Global crude runs grew by 0.4 million b/d in 2013, with increases in China, India and the US more than offsetting declines in Europe and Other Asia Pacific. Global refining capacity grew by 1.4 million b/d, led by additions in China and the Middle East. Global average refinery utilization slipped to 80.4%, the lowest since 1987.

REFINERY MARGINS

Regional refining margins

US dollars per barrel



Note: The refining margins presented are benchmark margins for three major global refining centres: US Gulf Coast (USGC), North West Europe (NWE – Rotterdam) and Singapore. In each case they are based on a single crude oil appropriate for that region and have optimized product yields based on a generic refinery configuration (cracking, hydrocracking or coking), again appropriate for that region. The margins are on a semi-variable basis, i.e. the margin after all variable costs and fixed energy costs.

PETROCHEMICAL EXPANSIONS GROWING DUE TO INCREASE IN INEXPENSIVE NATURAL GAS

Current valuation of US chemical projects between now and 2020 is \$71.7 billion

- Valero a US refiner will build a \$700 million 270,000 bpd methanol plant at a Louisiana refinery
- ExxonMobil planning a multibillion dollar petrochemical expansion in Baytown, Tx.
- ChevronPhillips planning \$5 billion in chemical plant expansions along the US Gulf Coast
- Global ethylene capacity in 2013 increased by 2.6 million tons per year to 146 million tons per year
- Oil & Gas Journal forecast for US capital spending in petrochemicals to total \$5.6 billion in 2014 an increase of 51% from 2013

GAS INTENSIVE PETROCHEMICALS WILL SEE STRONG GROWTH

"Gas-intensive consumers have said they are going to spend \$85 billion-\$90 billion developing new facilities over the next three to five years. There is a funding gap on the horizon for drilling, so it all comes back to the buyers of the commodity."

TERI VISWANATH

Director of Commodity Strategy, BNP Paribas Corporate & Investment Banking

- Chesapeake has a 10 year deal to supply Methanex with natural gas in Geismar, LA for a methanol plant
- Chesapeake is supplying Sinopec with natural gas for methanol production
- G@X to build a methanol plant in Pampa, TX
- Fund Connell USA Energy & Chemical may spend as much as \$4.5 billion for a 7.2 million-metric-ton-per-year methanol plant in Texas City
- Yuhngang Chemical planning a \$1.9 billion methanol project in St. James Parish
- Another Chinese company looking at building two \$1 billion dollar methanol plants in Oregon

INFRASTRUCTURE CHANGES:

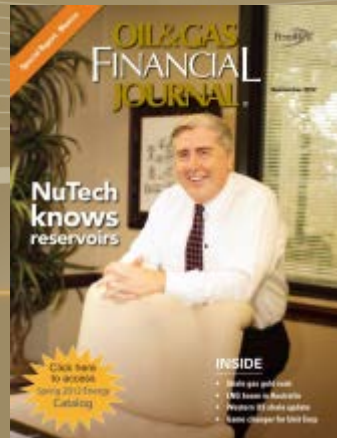
- More refining capacity will be added to handle increased oil production and potential for export
- Additional pipelines and gas processing facilities will be needed to handle changes in the flow of raw material and finished products
- Potential GTL and LNG export from U.S.
- Petrochemical facilities upgraded and expanded and potential for new plants in U.S. Northeast
- US economy will benefit from lowered trade deficit and increase in manufacturing base
- US \$ Goes Higher
- All the above will require more valves

GEOPOLITICAL CONSIDERATIONS OF THE US GROWTH IN ENERGY PRODUCTION

- Counterbalance to Russia in Europe
- Lessened US Involvement in the Middle East
- Increased US economic strength
- Stronger trade relations with Asia
- More secure energy supply for North America

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