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Enterprise Products Partners L.P.

***NGL and Pipeline Fundamentals***

*Presented to*  
Midwestern Governors Association

# Enterprise Products Perspective



- Enterprise (NYSE: EPD) is one of the largest U.S. integrated midstream energy companies
- EPD serves producers and consumers of natural gas, NGLs (including propane), crude oil, petrochemicals and refined products
- In 2013, our 51,000-mile pipeline system transported
  - 13 billion cubic feet per day of natural gas,
  - 2.9 million barrels per day of NGLs, and
  - 2.3 million barrels per day of crude oil, refined products and petrochemicals
- From 2008 through 2013, we invested \$21 billion to build and maintain energy infrastructure to support growing U.S. shale production and new markets (expansion of U.S. industries as well as exports)
- From 2014 through 2016, we will invest another \$7 billion to build additional U.S. energy infrastructure

# Enterprise Assets: Natural Gas, NGLs, Crude Oil and Petrochemicals

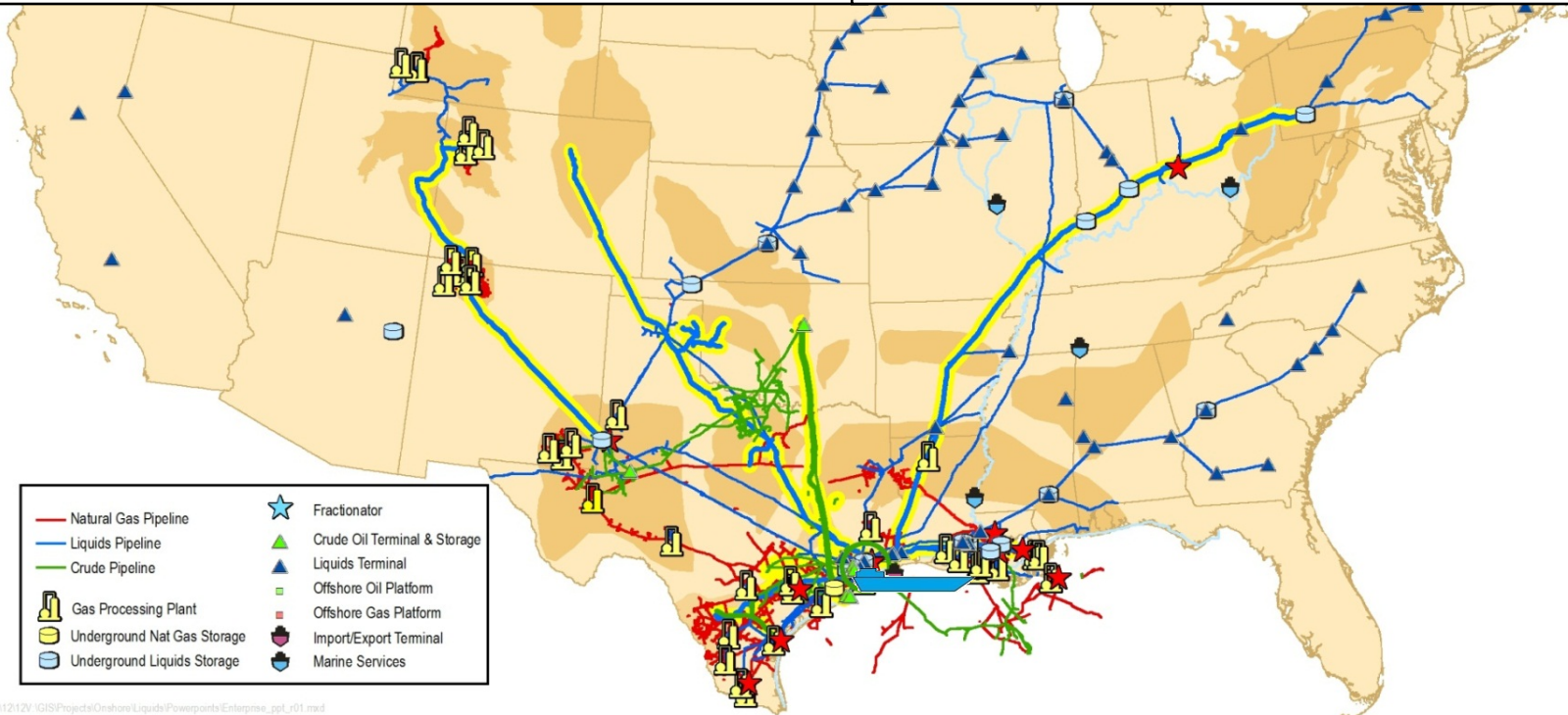


## Asset Overview

- **Pipelines:** 51,000 miles of natural gas, NGL, crude oil, refined products and petrochemical pipelines
- **Storage:** 200 MMBbls of NGL, refined products, petrochemical and crude oil, and 14 Bcf of natural gas storage capacity
- **Processing:** 24 natural gas processing plants; 22 fractionators
- **Exports:** added refined products export terminal; expanding World Scale LPG export facilities and adding ethane exports 2016

## Connectivity

- Connected to U.S. major shale basins
- Connected to every U.S. ethylene cracker
- Connected to ≈90% of refineries East of Rockies
- Pipeline connected to 22 Gulf Coast PGP customers
- Connected to the “First and Last Mile” for supplies and markets through extensive marine and trucking fleets

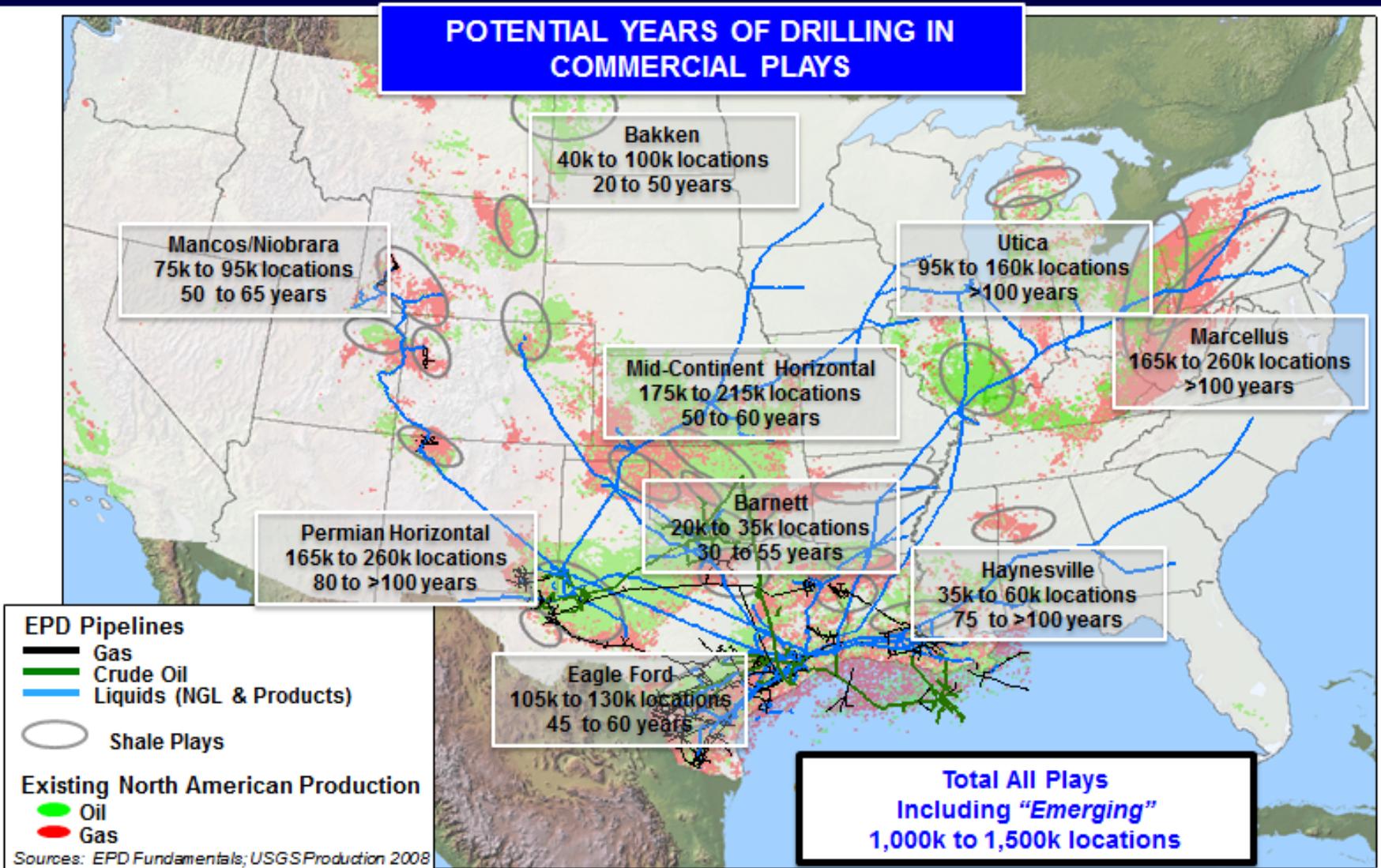




# U.S. Shale Development Success

# Unconventional/Shale Plays

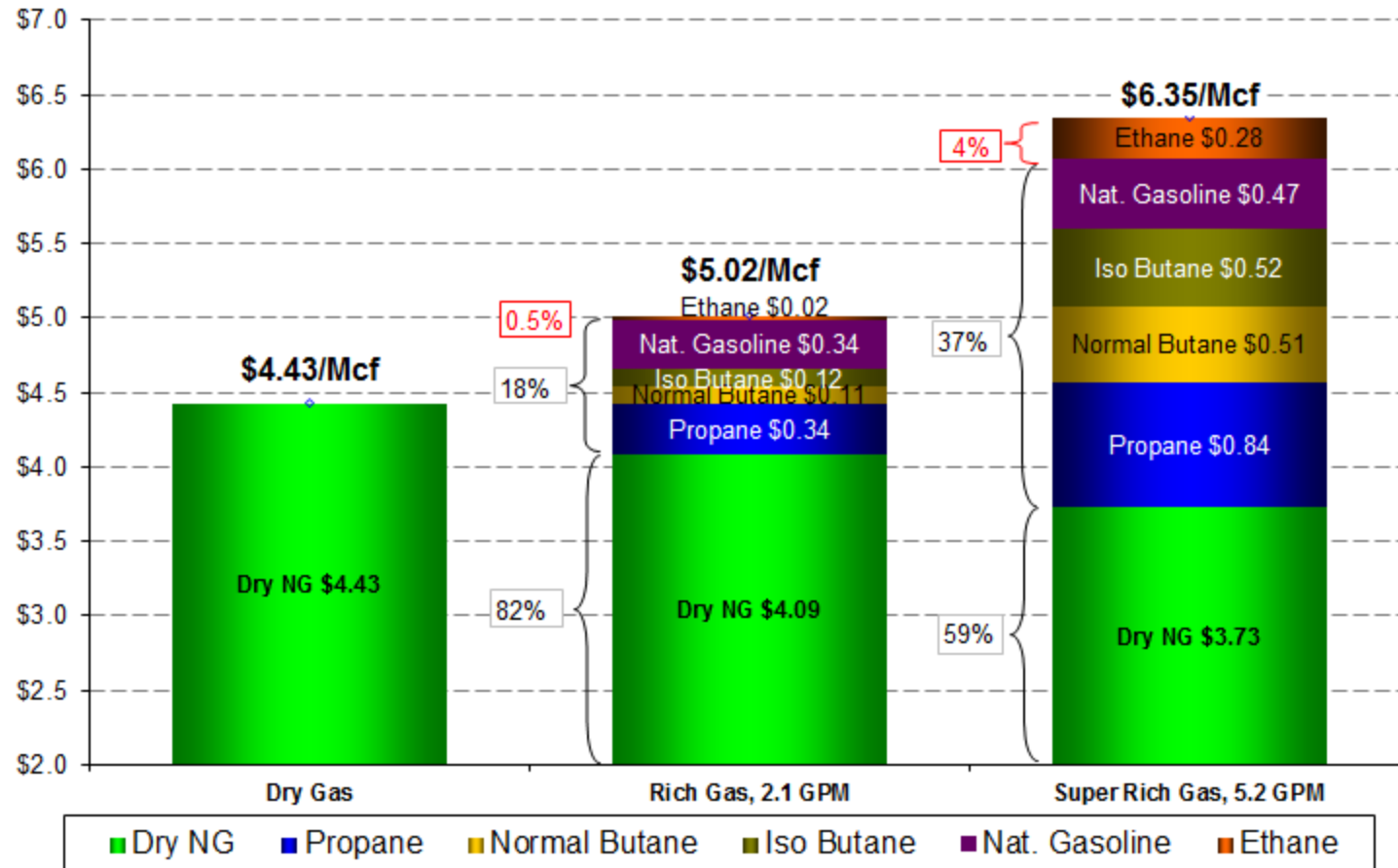
## Decades of Drilling... Decades of Production



# Producer Economics: Two-Thirds of U.S. Natural Gas Now Comes from Rich Plays

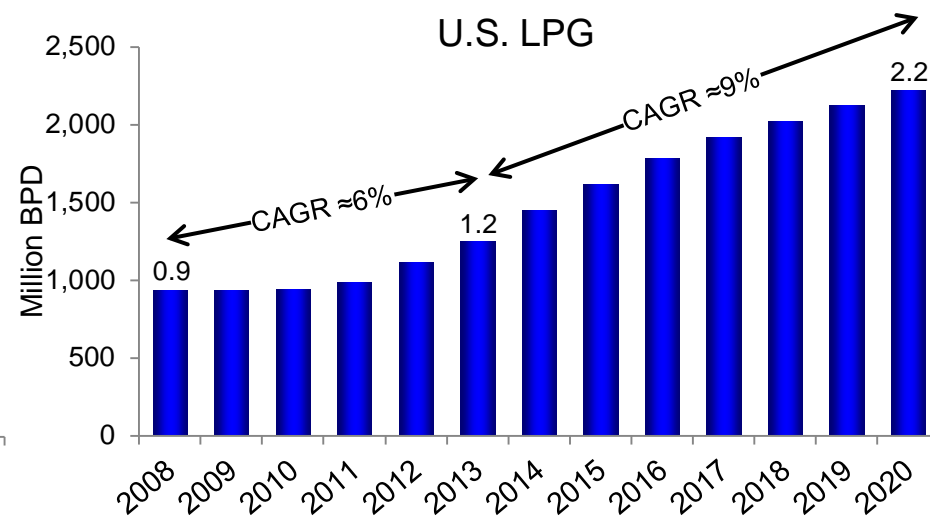
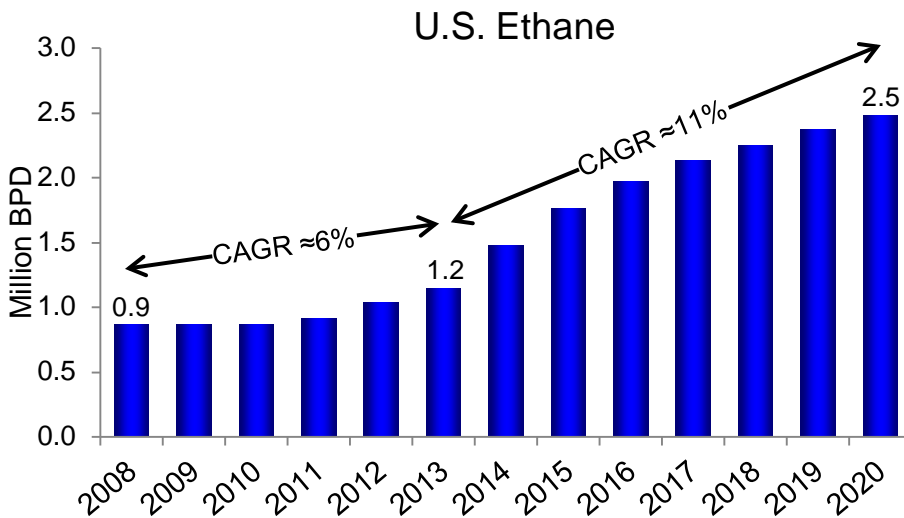
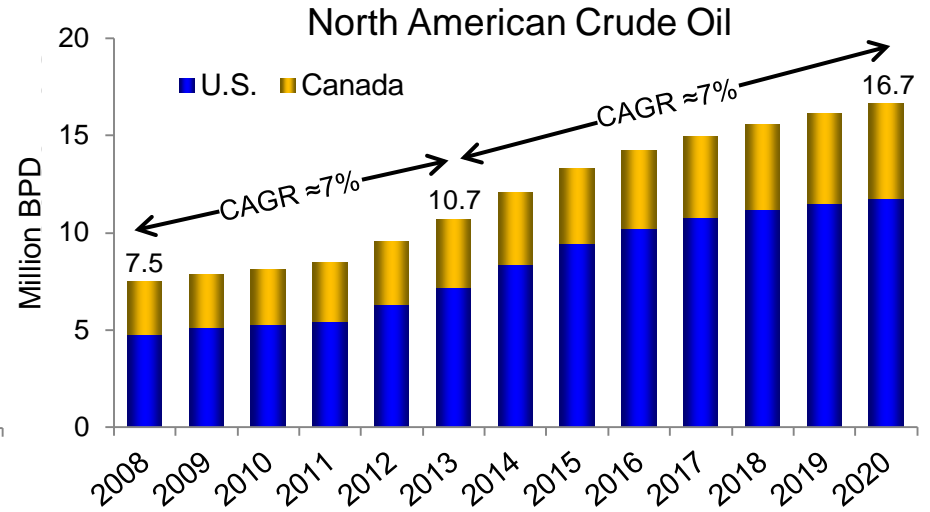
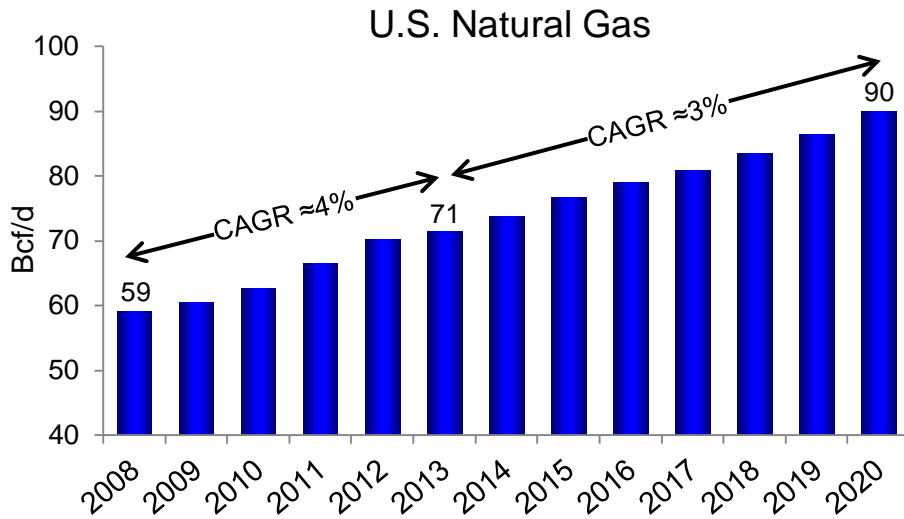


Rich Gas Value per Mcf of Gas  
Forward 12 Month Strip as of 5/23/14



Source: EPD Fundamentals

# Potential Energy Production Growth



Source: EPD Fundamentals

# U.S. NGLs – Demand Matrix



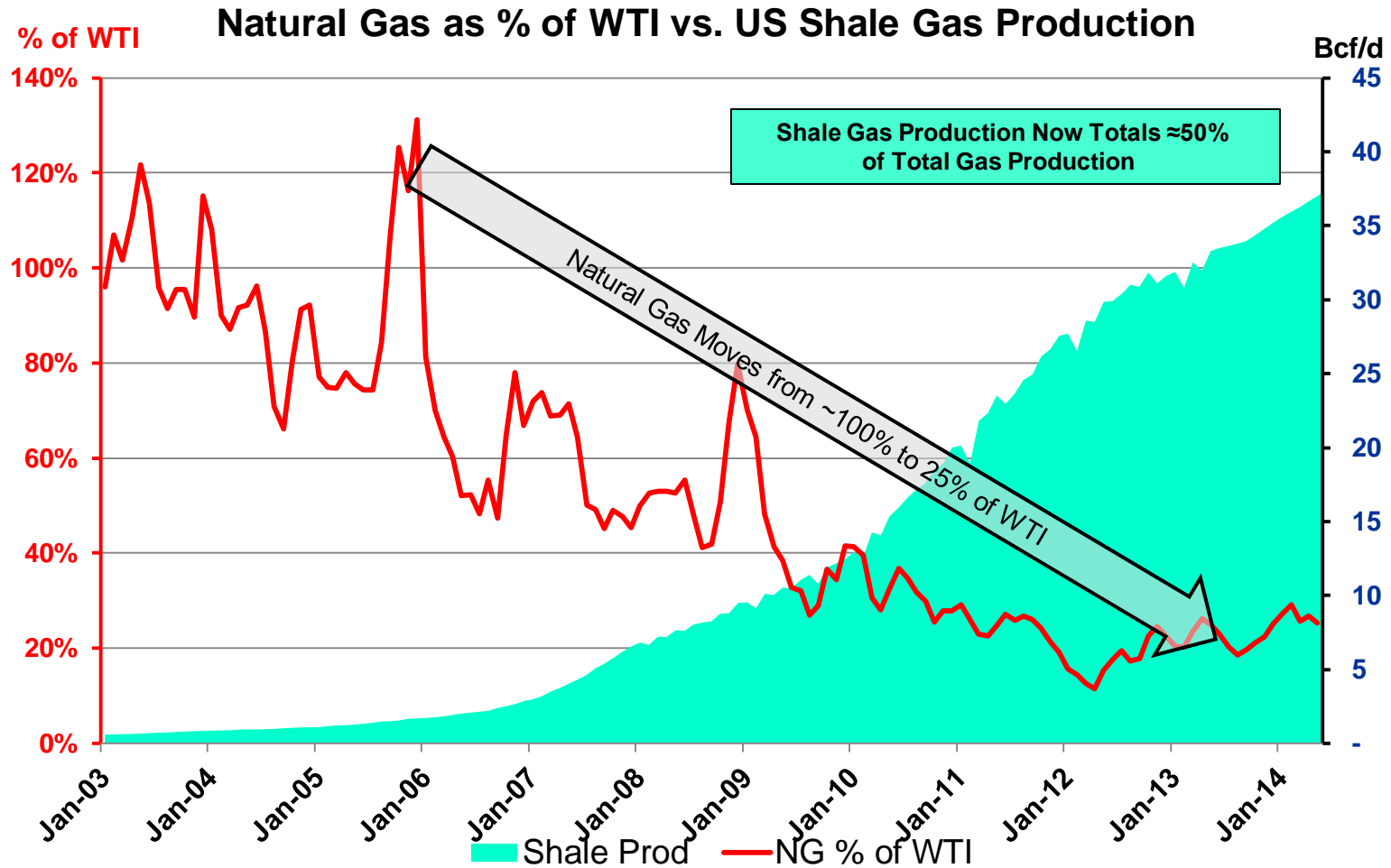
NGL	Ethane	Propane	Normal Butane	Iso-Butane	Natural Gasoline
Approx. Percent of NGL Bbl	40%	30%	8%	10%	12%
<b>Petrochemicals</b>	✓	✓	✓		✓
<b>Heating, Crop Drying, Fuels</b>		✓			
<b>Motor Fuels</b>			✓	✓	✓
<b>Export</b>	★	✓	✓	✓	✓

★ Pending, Facilities Under Development

Source: EPD Fundamentals

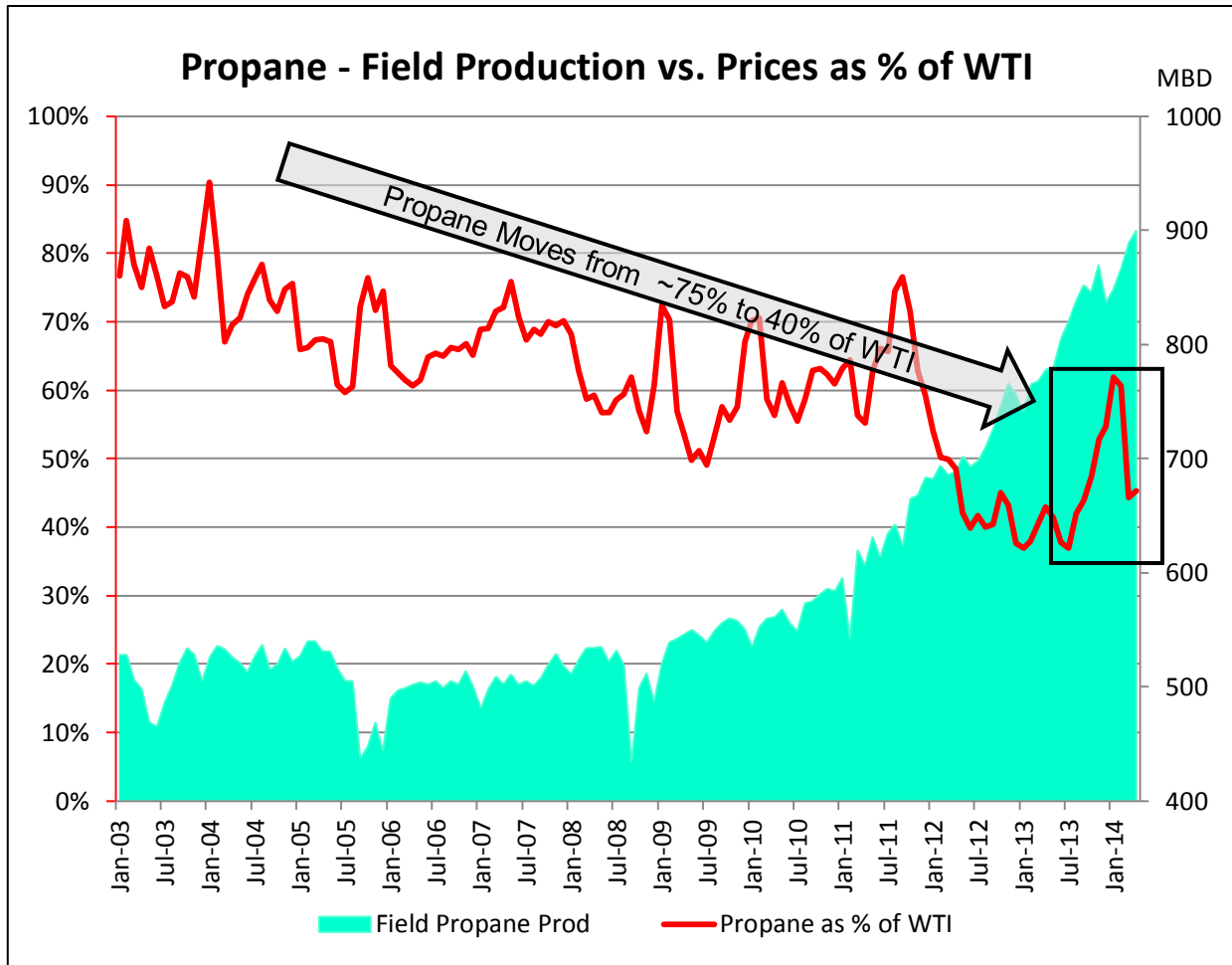


# Gas Prices Have Decreased as Shale Production Has Increased



Sources: NYMEX and EPD Fundamentals

# Propane Prices Have Decreased as Shale Production Has Increased



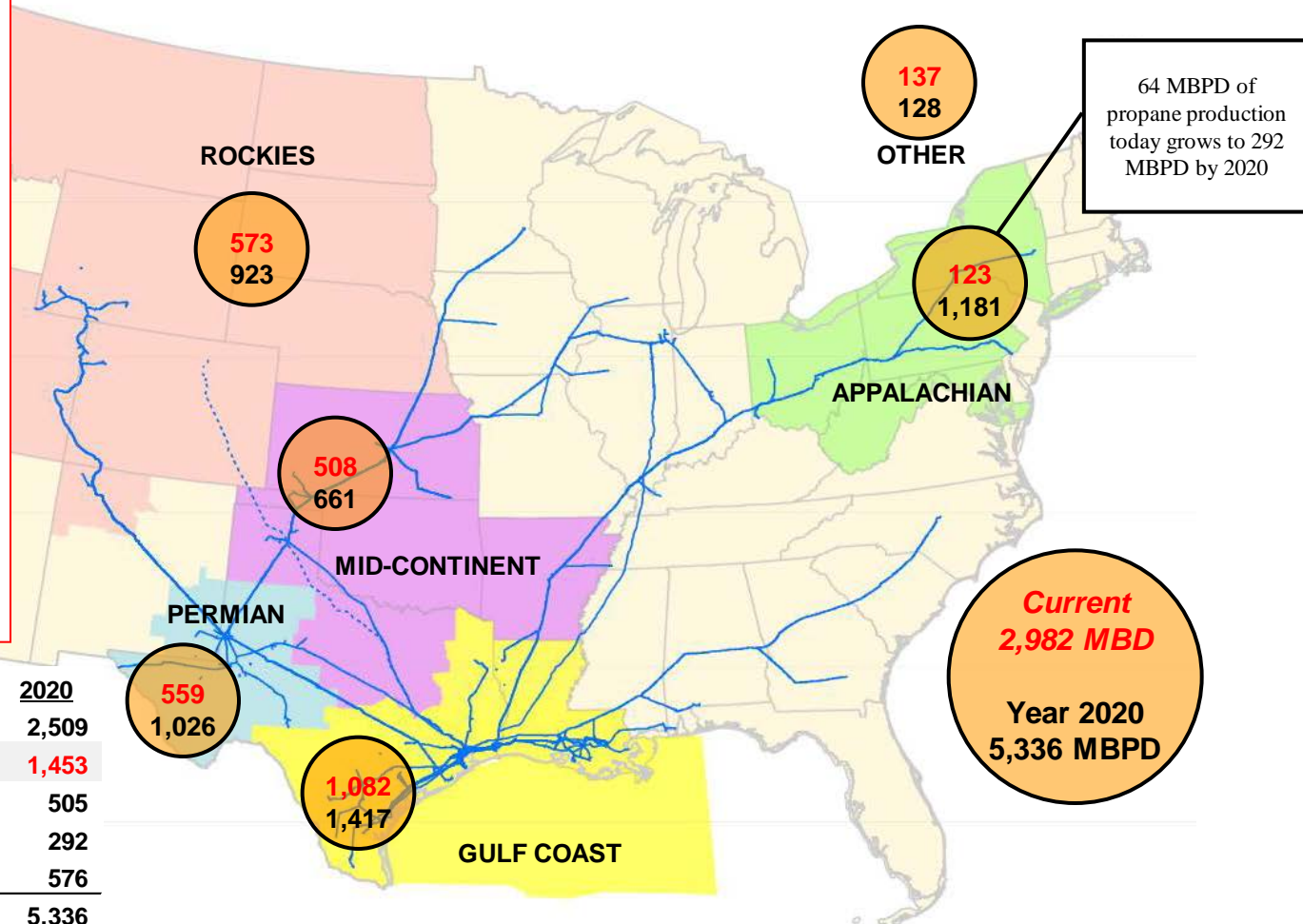
- Historically, propane prices were  $\approx 75\%$  of the price of crude oil
- Increasing shale production led to propane prices falling to  $\approx 40\%$  of crude oil in 2012 thru Fall 2013
- For a short period in Jan/Feb 2014, propane prices reverted towards historical norms, but fell quickly

Source: EPD Fundamentals

# U.S. NGL Supply Potential Assuming Sufficient Markets (MBPD)



- Increasingly, the biggest risk to growing NGL production from shales is supply exceeding markets.
- Producers curtailed lean gas drilling over the last two years in areas such as the Haynesville and Fayetteville due to excess supplies of natural gas, which led to depressed prices, low returns on capital and significantly less investment
- Limiting propane's access to markets would likely have similar impact on drilling for rich natural gas in places like the Marcellus, Utica, Eagle Ford and Permian



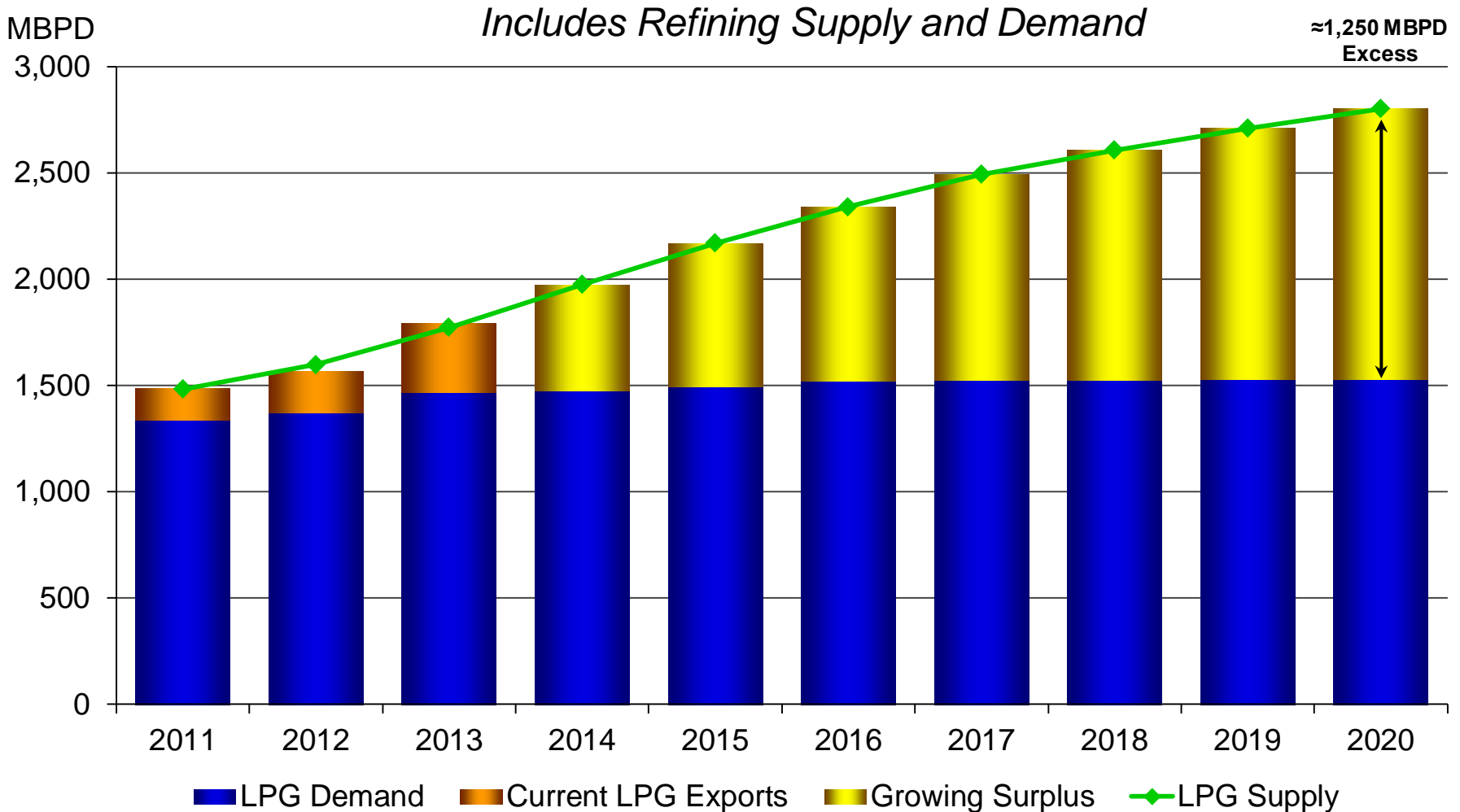
NGL Component:	Q4/2008	Current	2020
Ethane*	686	1,275	2,509
<b>Propane</b>	<b>499</b>	<b>870</b>	<b>1,453</b>
N. Butane	129	230	505
Iso Butane	172	257	292
Natural Gasoline	262	349	576
<b>MBPD</b>	<b>1,748</b>	<b>2,982</b>	<b>5,336</b>

\* Current is increased by 200–250 MBPD for estimated ethane rejection

Source: EPD Fundamentals

# LPG (Propane and Butane)

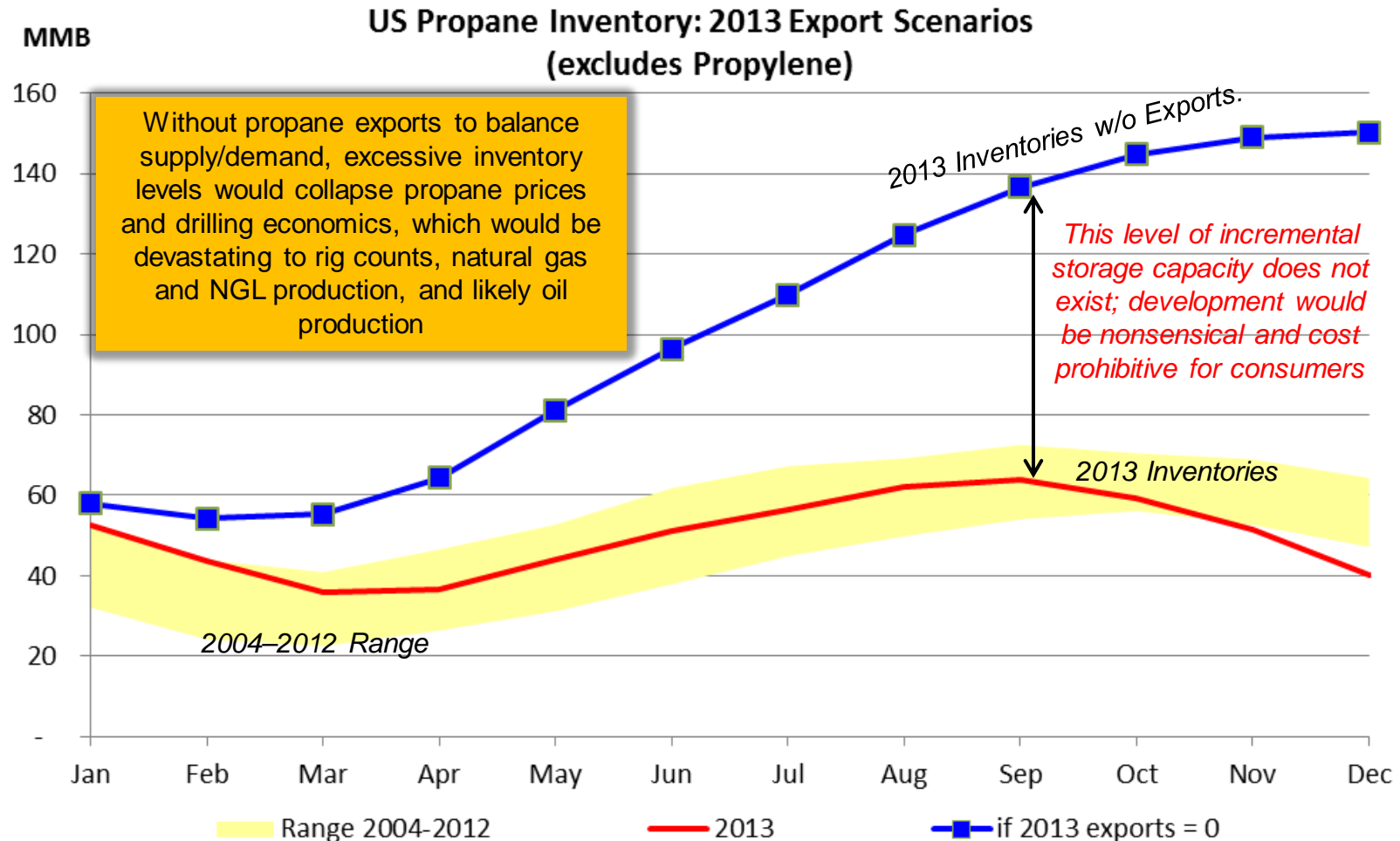
## A Growing Surplus versus U.S. Demand



Source: EPD Fundamentals

Note: LPG is Propane and Butane

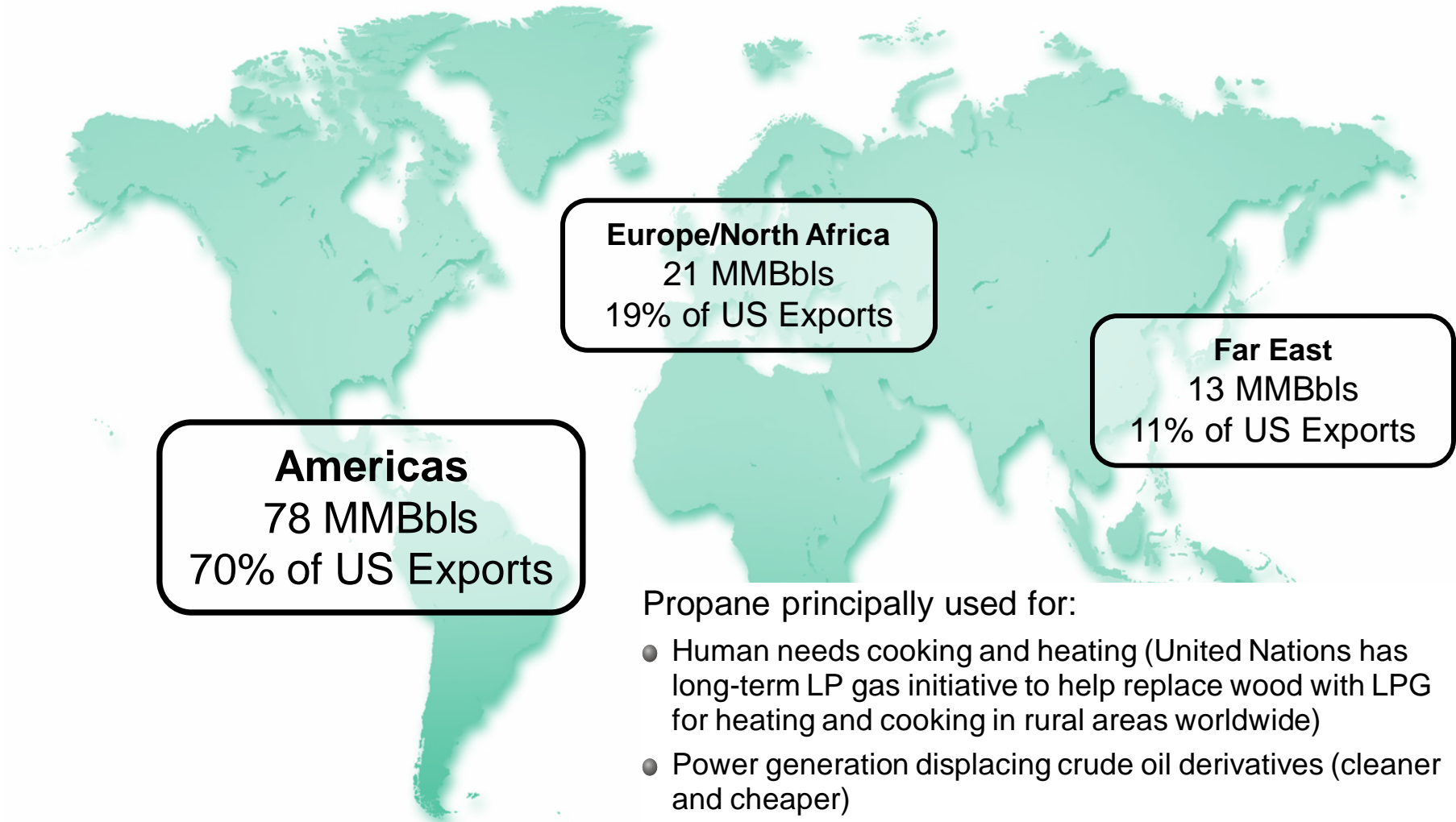
# Propane Exports are Critical to Maintaining Gas, NGL and Crude Oil Production



Sources: EIA and EPD Fundamentals

# Destinations for U.S. Propane Exports 2013

## Reduces Our Partners Reliance on U.S. Adversaries

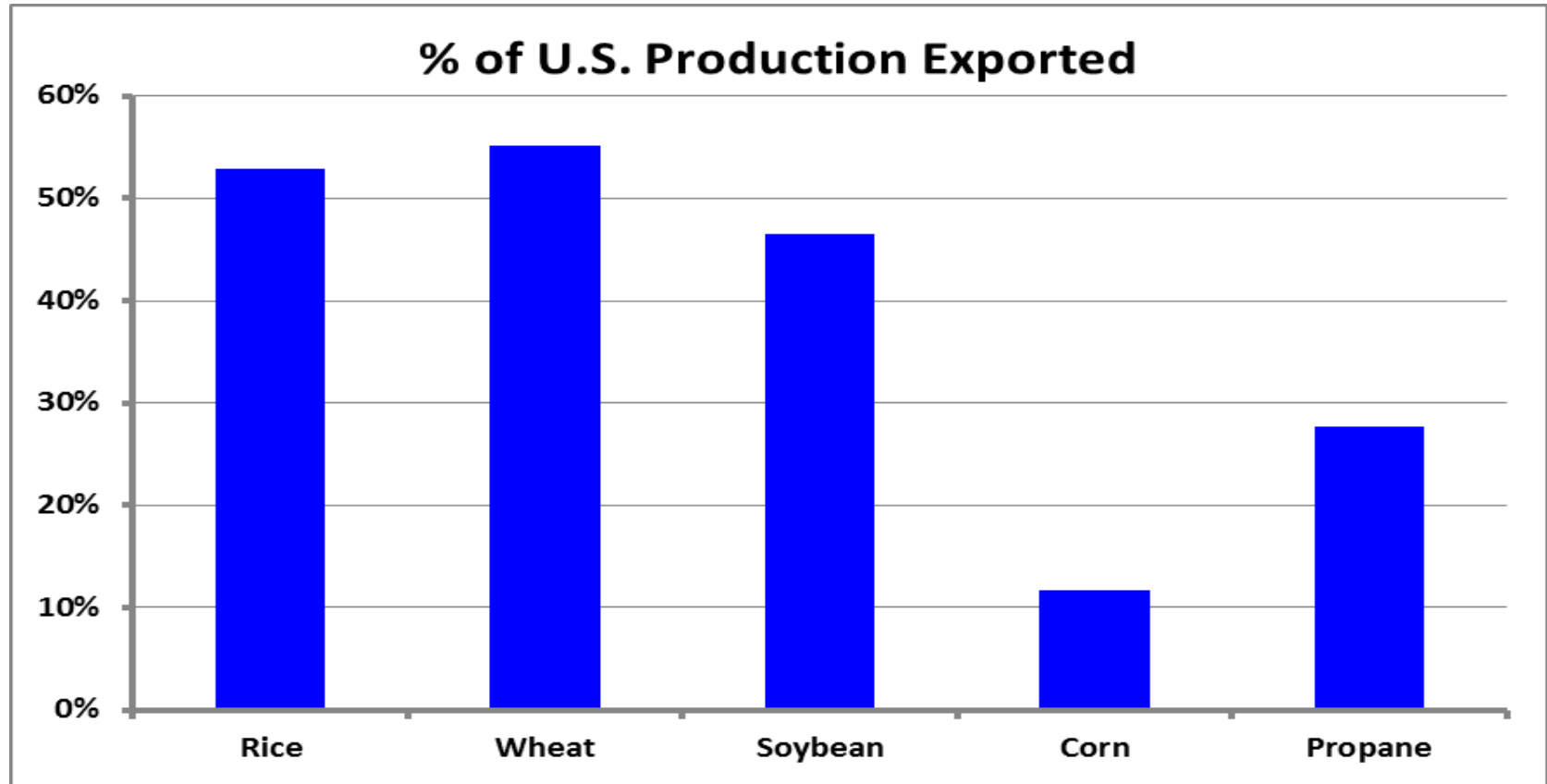


Propane principally used for:

- Human needs cooking and heating (United Nations has long-term LP gas initiative to help replace wood with LPG for heating and cooking in rural areas worldwide)
- Power generation displacing crude oil derivatives (cleaner and cheaper)
- Petrochemical feedstock

Source: Waterborne

# U.S. Energy Producers Need Access to Export Markets Just as U.S. Ag Producers Do



- *U.S. Ag exports are critical to balancing U.S. supply with demand. The U.S. is the world's largest exporter of wheat, corn and soybeans*
- *Without access to global markets, the U.S. agriculture industry would be severely impacted: lower production, lower investment, lower employment and, ultimately, higher prices for U.S. consumers*

Sources: Est. 2013 USDA and EIA



# NGL Terms and Infrastructure

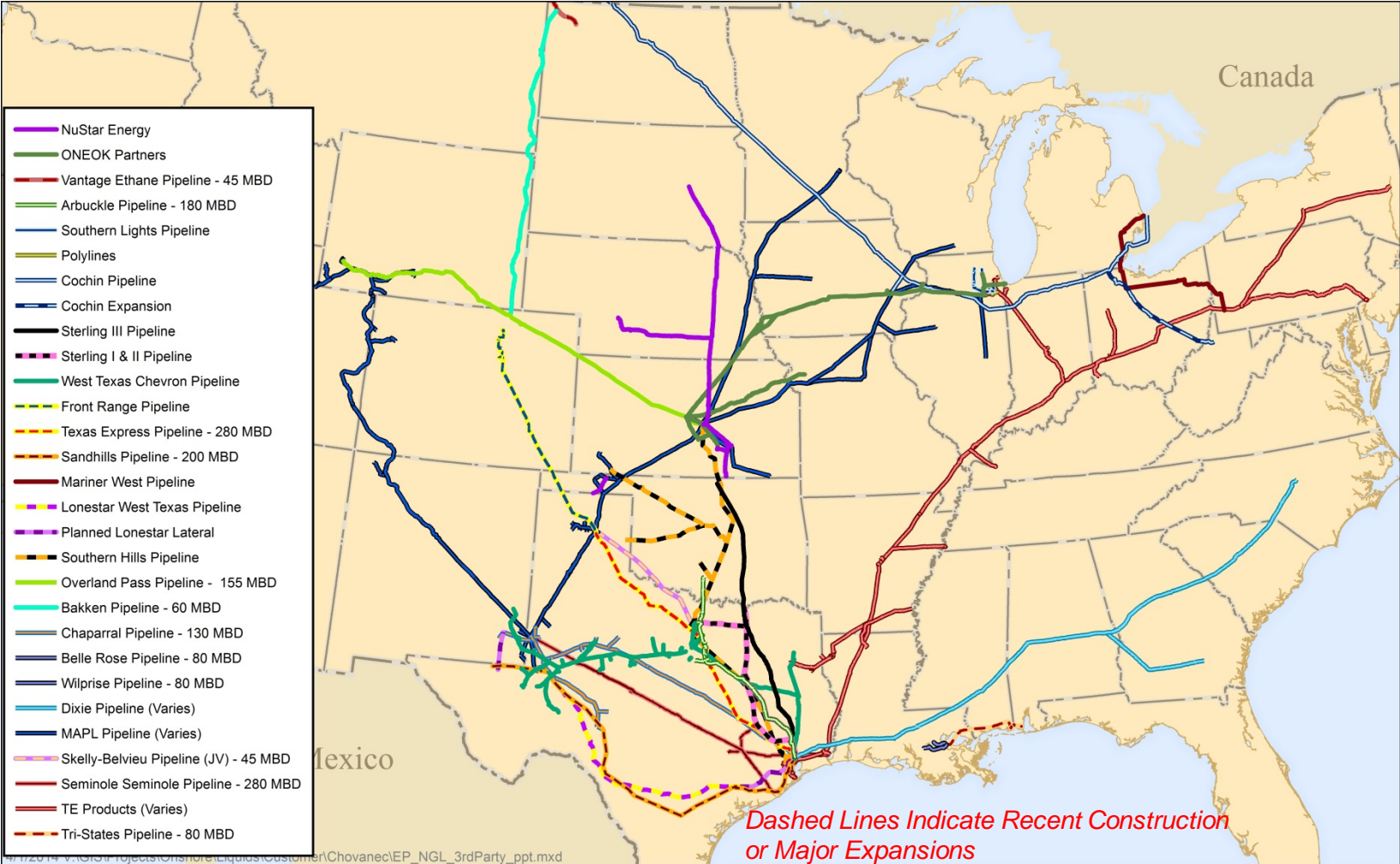


# Key NGL Industry Terms



- **Natural Gas Liquids:** Natural gas liquids (NGLs) are hydrocarbons produced from natural gas and oil (from oil as associated natural gas and from the refining process). Generally, the term NGLs include: ethane, propane, butane, isobutane and natural gasoline (pentanes). NGLs have a wide variety of end markets, including home heating, bottled gas products, gasoline blending, and are used extensively as petrochemical feedstocks
- **LPG:** Liquefied Petroleum Gas - Refers to the propane and butane components of the NGL stream
- **Natural Gas Processing:** Natural gas processing involves the separation of raw natural gas into its natural gas and natural gas liquids components using a gas processing plant that removes the heavier hydrocarbon NGL components from natural gas. Natural gas that contains significant NGLs is referred to as “wet” or “rich” prior to being processed to remove the NGLs and “dry” after it is processed. Gas that does not include NGLs in the underground reservoir is also referred to as “dry gas”
- **Natural Gas Processing Plant:** Gas Processing plants generally use a cryogenic low temperature distillation process involving expansion of the gas through a turbo-expander followed by distillation in a demethanizing column. Some older gas processing plants use lean oil absorption process rather than the cryogenic turbo-expander process, but the NGL recoveries are much lower. Recovered NGLs are then shipped as a mixed stream to a fractionator facility where they are split into their component products. The residue gas from the NGL recovery section is the final, purified sales gas which is then shipped by pipeline to the natural gas end-use markets.
- **Y Grade:** The NGL products that come from a gas processing plant in their mixed form before being fractionated into their individual component parts of ethane, propane, butane, isobutane and natural gasoline. (aka, “raw mix”)
- **Fractionation:** Once natural gas liquids (NGLs) have been separated from a natural gas stream, they are further separated into their component parts, or fractions, using a distillation process known as fractionation
- **Mont Belvieu:** The Gulf Coast NGL market center located approximately 25 miles east of Houston Texas that contains a significant amount of the Gulf Coast’s NGL fractionation facilities, storage and NGL pipeline distribution facilities. The area is built on top of a large, stable salt dome where caverns are leached to store NGLs and other hydrocarbon products. Mont Belvieu, Texas and Conway, Kansas are the nation’s largest NGL market centers
- **Conway:** The midcontinent NGL market center near Conway Kansas that has NGL fractionation, storage and pipeline distribution facilities

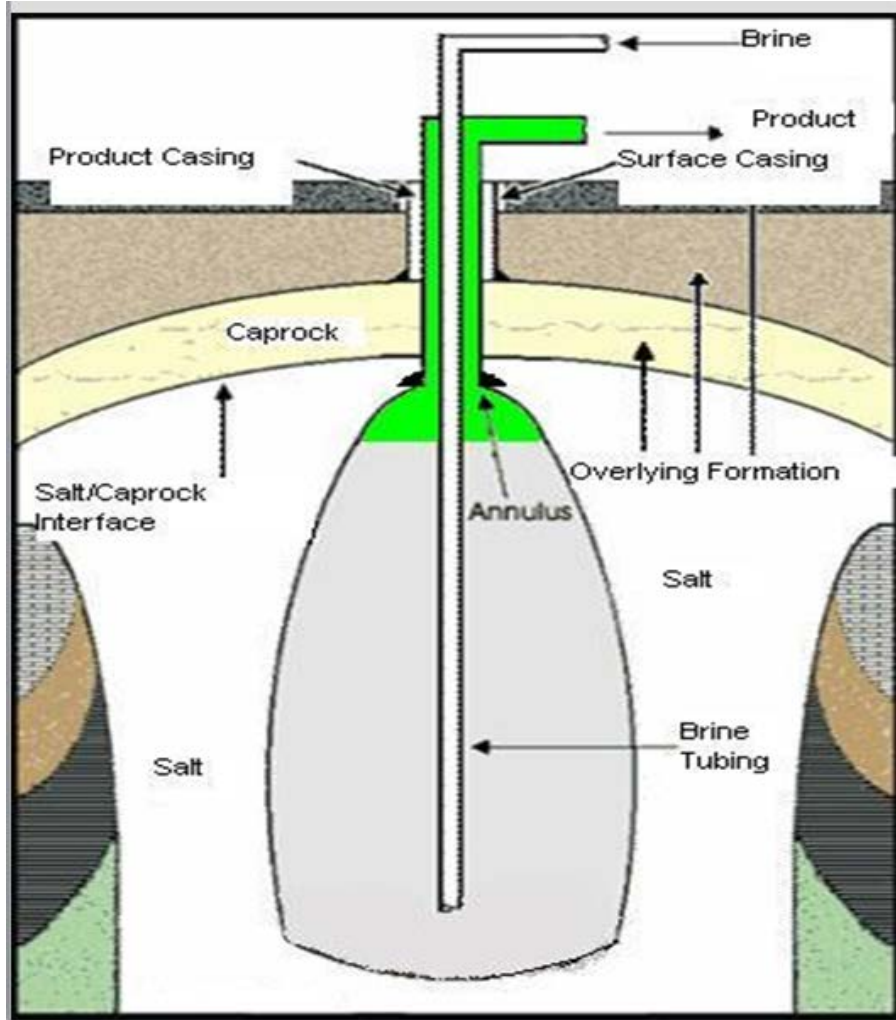
# U.S. Major NGL Pipelines Including Product Delivery Pipelines



# NGL Propane Delivery Pipelines



# Salt Dome Caverns: Very Large, Stable, High Pressure, No Refrigeration Required



- >1000 Salt Caverns in service mostly in Texas, Louisiana, Kansas and Mississippi
- Used for NGL Storage, Natural Gas Storage and Brine Production
- Size - from 350,000 - 20,000,000 Bbls
- Earliest Caverns circa 1960
- Conventionally Drilled
  - Casing Depths from 1300' – 3600'
  - Cavern Depth 2800' – 6000'
  - Caverns are developed by solution mining
- NGL Operating Rates can approach ~10,000 BPH injection and withdrawal

# Enterprise Mont Belvieu Storage



- 35 existing wells (over 110,000,000 Bbls)
- 4 wells (12 MMBbls) in development
- Caverns storing over 20 different products
- Over 100 pipeline interconnects

## North Storage

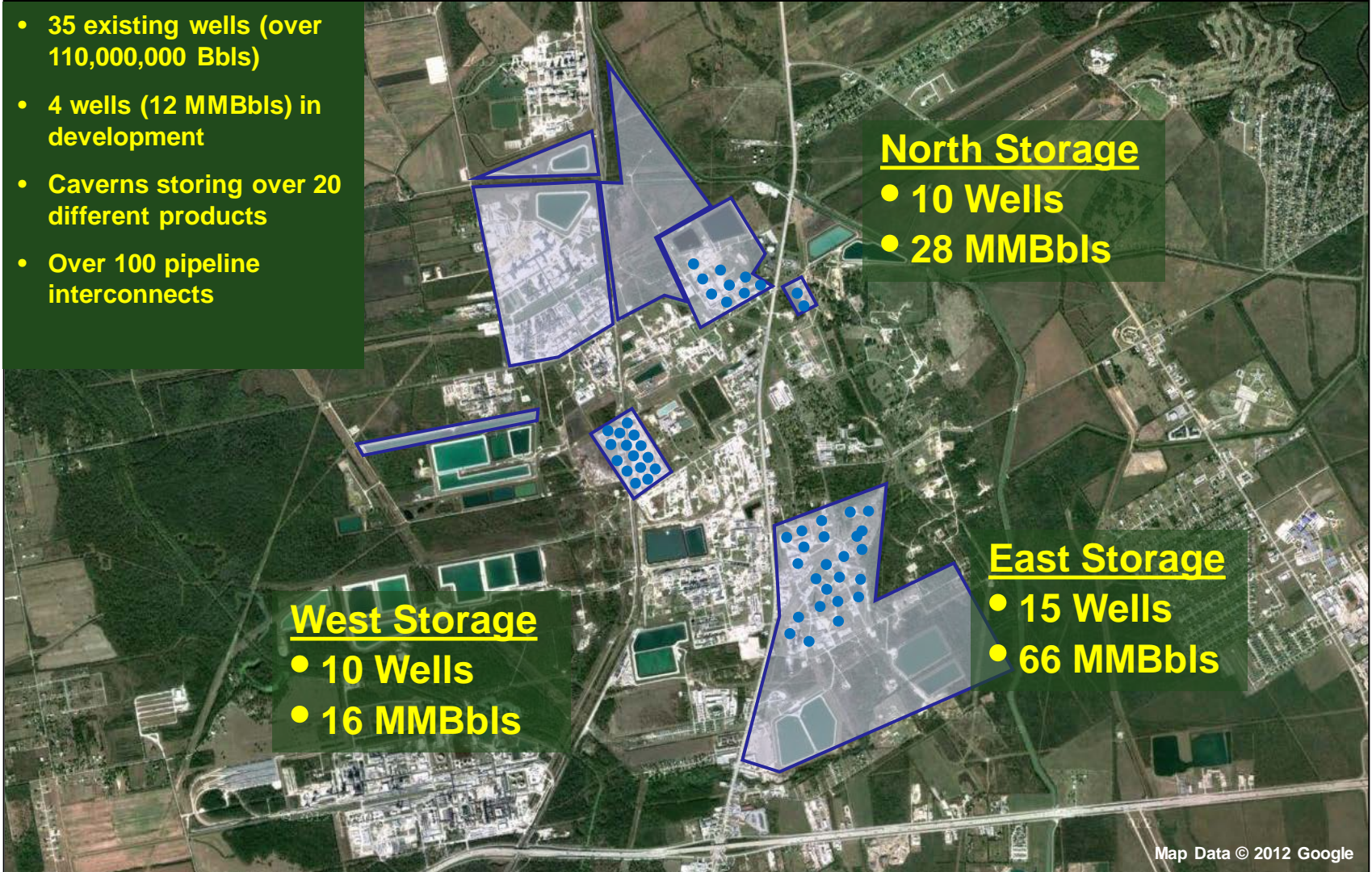
- 10 Wells
- 28 MMBbls

## West Storage

- 10 Wells
- 16 MMBbls

## East Storage

- 15 Wells
- 66 MMBbls



Map Data © 2012 Google

# Refrigerated LPG Storage Enterprise Products Apex Facility



- Location: North Carolina
- Refrigerated Capacity: 440,000 Bbls
- Additional Steel Tanks: 900,000 gallons (10 x 90K/each)
- Receipts: Dixie Pipeline
- Deliveries: Truck

# Other Forms of Propane Transport and Storage



**Rail Car** – 700 Bbls (30,000 Gallons)  
**Above Ground Storage** - 700 to 1,400 Bbls  
(30,000 – 60,000 Gallons)  
**Terminals** – 1,400 to 15,000 Bbls (60,000 to  
600,000 Gallons)



Bobtail - 2,500 Gallons



Long Haul Truck 225 Bbls (9,500 Gallons)



Residential Propane Tank 500 Gallons

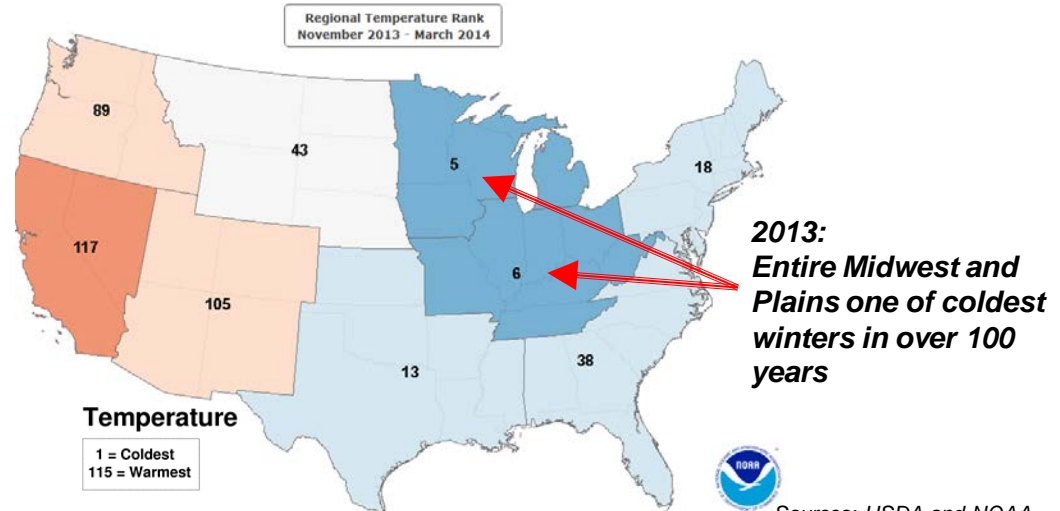
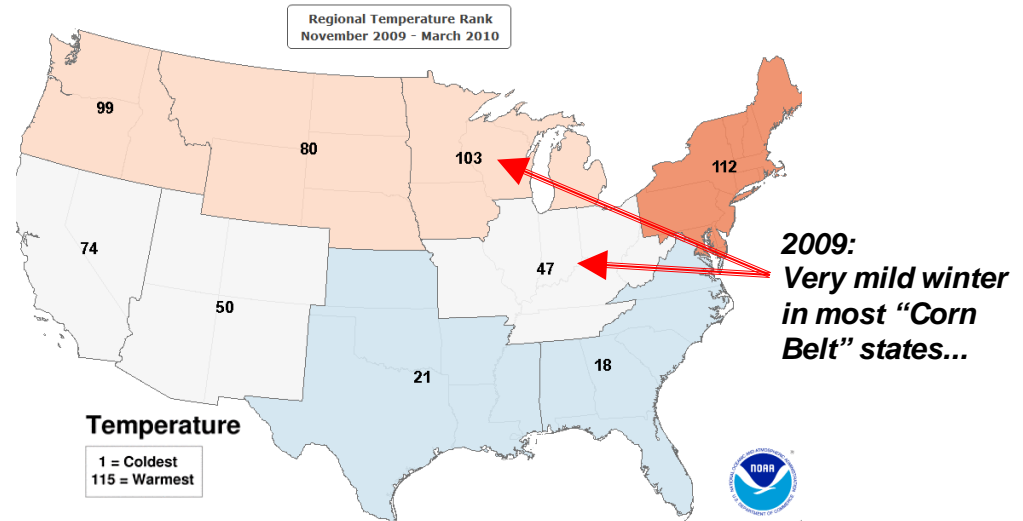
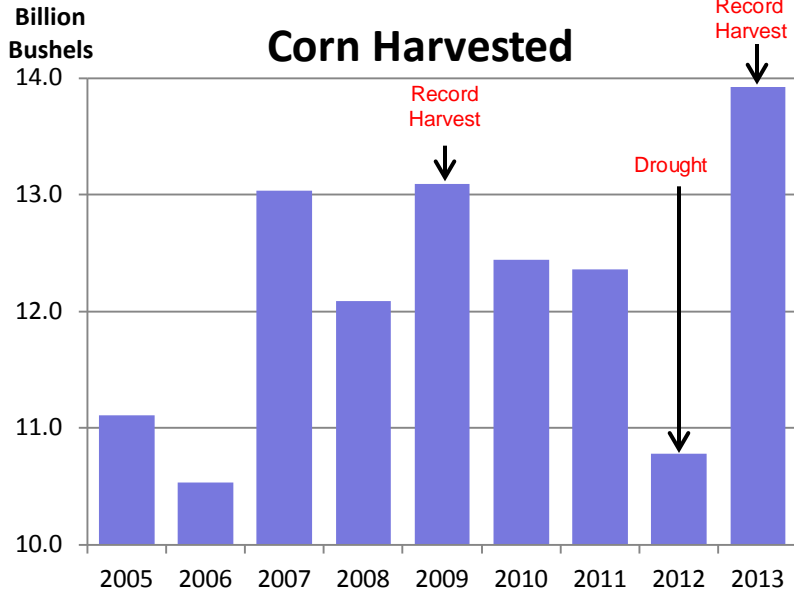


# Revisiting The Winter of 2013 / 2014



# Crop Drying & Winter: 2009 vs. 2013

## *Similar harvest sizes, but very different winters*



	2009	2013
Top 10 Corn Producing states*, Harvested Acres (000)	64,190	68,980
October Precipitation for "Corn Belt" states	6.0"	3.3"
Variation from 100 year average	160%	43%

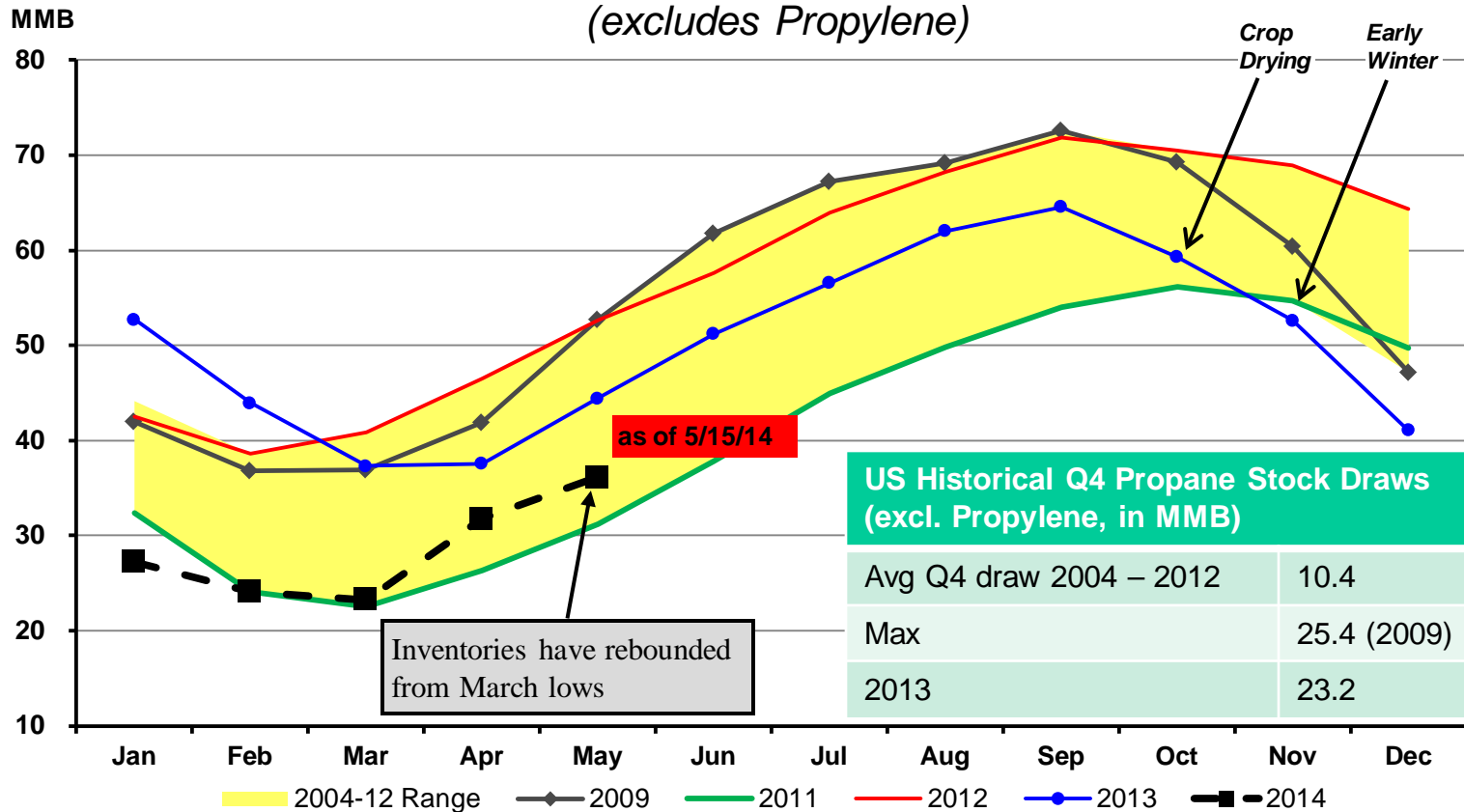
\* In order, IA, IL, NE, MN, IN, SD, KS, OH, WI, MO

Sources: USDA and NOAA

# “Normal” Aggregate Propane Inventories Severely Impacted by 2x Average Drawdown in 4Q2013



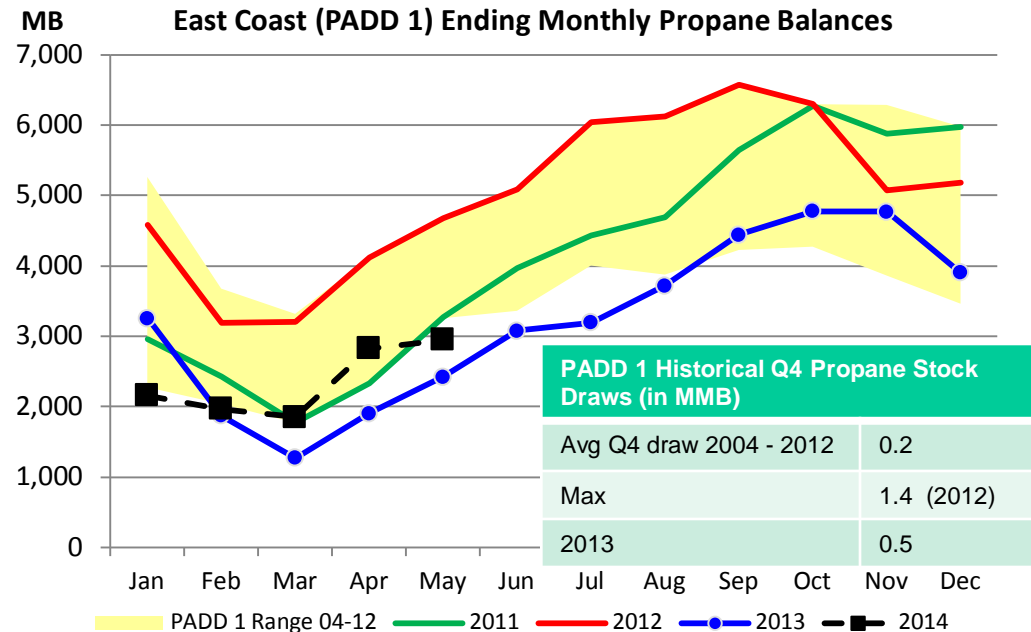
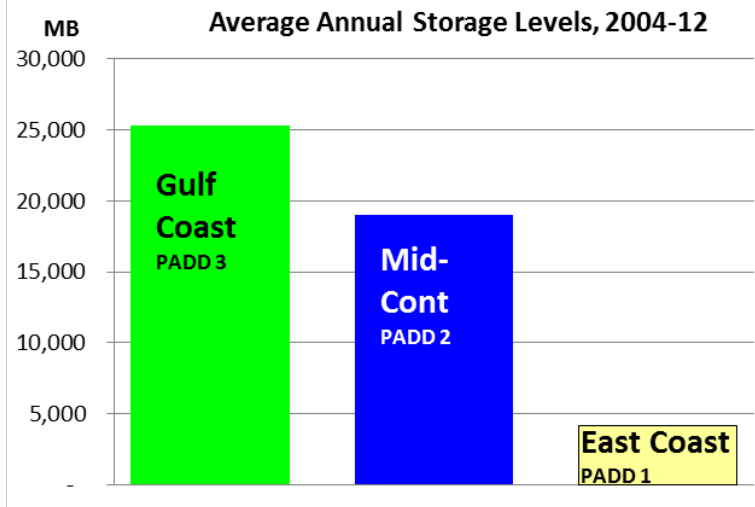
## US Propane Ending Inventory Balances (excludes Propylene)



EIA monthly data to Feb 2014 then weekly data starting in March 2014  
**Note: May data is up to 5-16-2014 only**

Sources: EIA and EPD Fundamentals

# East Coast has Limited Storage Capacity; Low Propane Inventories Throughout 2013



EIA monthly data to Feb 2014 then weekly data starting in March 2014  
 Note: May data is up to 5-16-2014 only

- East Coast (PADD 1) historically dependent on imports from other regions to supply winter demand; this dynamic is changing as production from Marcellus and Utica increases
- In 2012, in coordination with the state of Ohio, Enterprise began deactivating its Todhunter storage facility (900,000 barrels of NGL storage capacity) due to mechanical integrity concerns
- Conversion of TEPPCO / ATEX to ethane service facilitates continued production growth from Marcellus/Utica that will reduce East Coast/Midwest's dependence on imports. However, like with natural gas, storage is required for extreme peaking needs and significant storage constraints remain.

Sources: EIA and EPD Fundamentals

# Without Access to USGC Supplies by Water Northeast Also Relied on Foreign Supplies



Total Imports into East Coast (MB)	
Dec 2013	1,726
Jan 2014*	2,345
Feb 2014*	3,255

- Winter 2013 – 2014 U.S. was exporting (Gulf Coast) and importing (North East) because of no Jones Act VLGCs
- Vessel Transit Time from Houston Ship Channel to U.S. East Coast: ≈6 days vs. 3 - 5 Week Lead Time for Pipeline Shipments

	Total LGCs + VLGCs* (each VLGC ~ 550MB, LGC carries ~ 400MB)	Total GCs compliant with Jones Act
Existing	~190	0
On Order	~70	0
Projected Fleet	~260	0

\* VLGC / LGC: (Very) Large Gas Carrier  
Vessel estimates via Poten & Partners (shipping broker)

\* Preliminary data from EIA

# Northeast Supplies Expected to Grow Significantly



## ● Marcellus / Utica Announced Processing Additions (by year)

Capacity MMcfd	2010	2011	2012	2013	2014	2015	2016
Total Additions per Year	448	728	515	2,675	3,520	2,200	200
Cumulative	505	1,233	1,748	4,423	7,943	10,143	10,343

## ● Enterprise Forecast of Associated Propane Production (primarily Marcellus and Utica)

	2010	2011	2012	2013	2014	2015	2016	2020
Propane Forecast, Mbpd	16	22	29	47	103	217	264	292

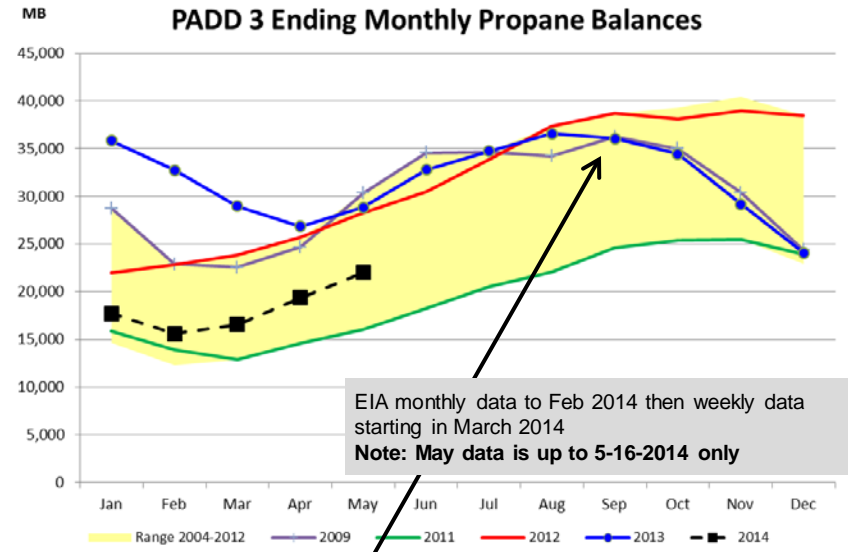
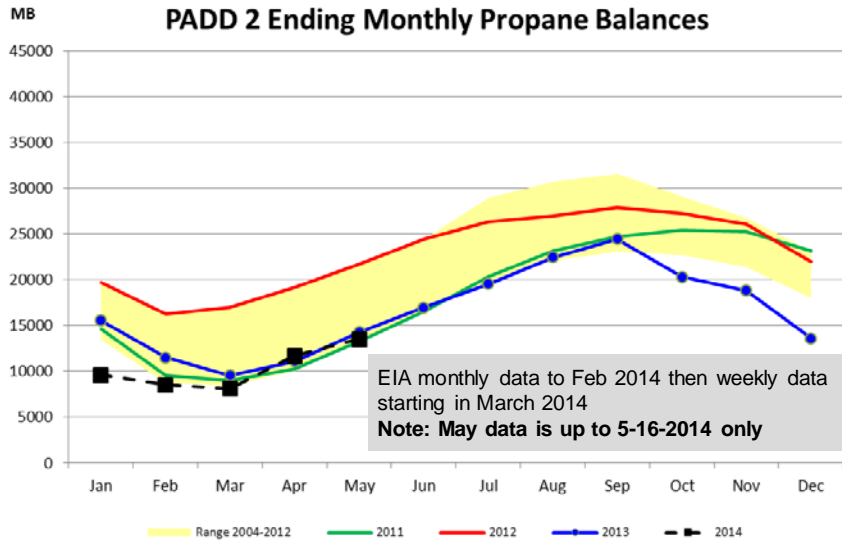
## ● Winter 2013 Northeast Processing Plant Delays

- Mark West Marcellus Houston PA Plant Mudslide – Reduced processing capacity August – December 2013. Propane Impact ~6,000 Bbls/d
- Dominion / Blue Racer Natrium Plant Fire – Delayed Plant start up from September 2013 to February 2014. Propane impact ~5,000 Bbls/d

- **ATEX Ethane Take Away** – Online Q4/2014, up to 190,000 Bbls/d ethane which allows producers to continue to drill

***Summary – The Northeast is expected to be increasingly oversupplied with propane from the Marcellus and Utica on all but peak winter demand days***

# Midcontinent Also Had Low Propane Inventory Levels Throughout 2013



The Mid-Continent did not build inventories to normal levels ***throughout*** 2013, thus making it vulnerable to strong 4Q 2013 draws (crop drying / winter)

## PADD 2 Historical Q4 Propane Stock Draws (in MMB)

Avg Q4 draw 2004 - 2012	5.5
Max	12.3 (2009)
2013	10.6

Source: EIA

...whereas Gulf Coast propane inventories were ***elevated*** until the start of winter.

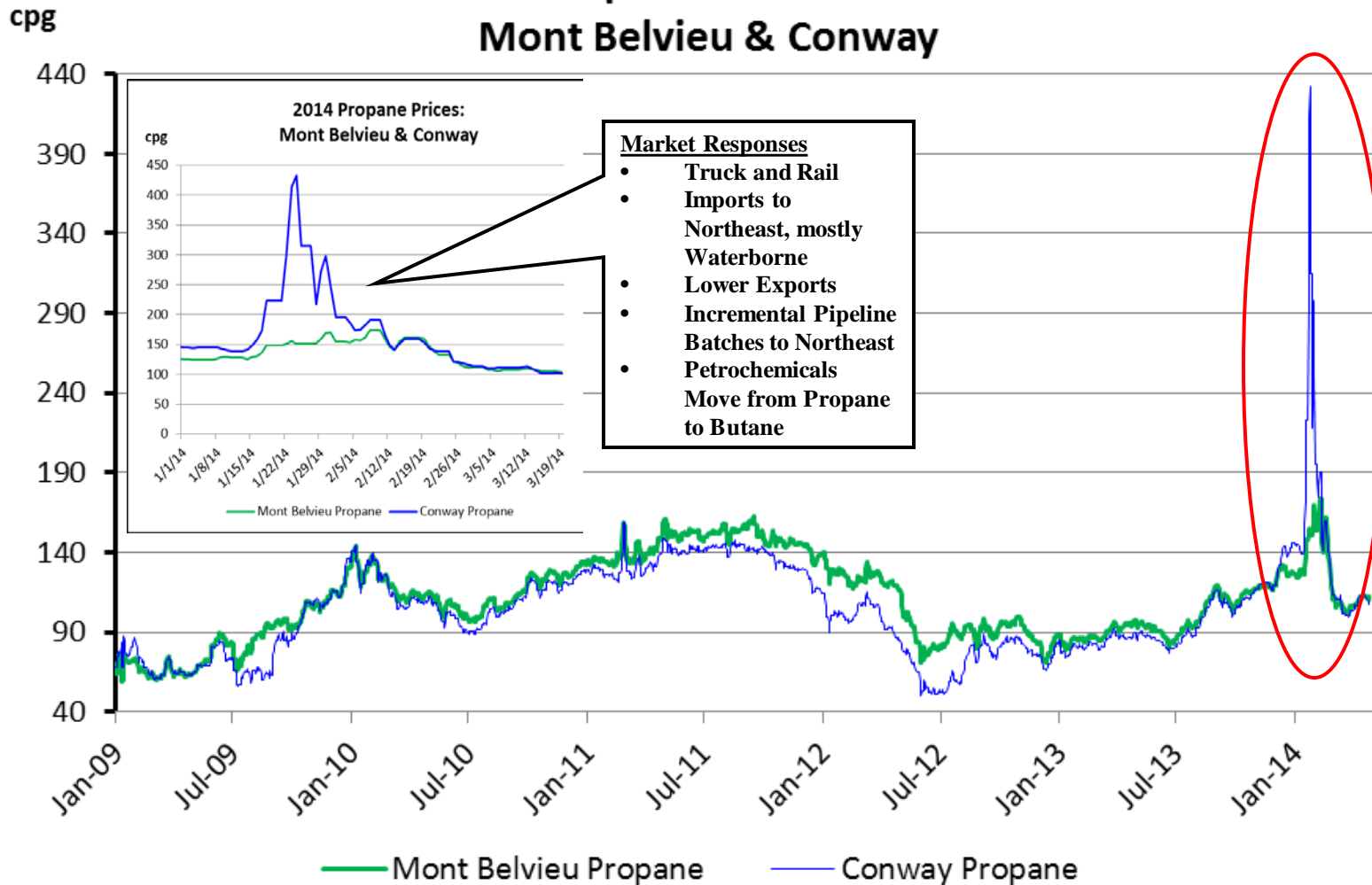
## PADD 3 Historical Q4 Propane Stock Draws (incl Propylene, in MMB)

Avg Q4 draw 2004 - 2012	4.0
Max	12.3 (2009)
2013	11.5

# Mid-Continent Price Blip in January 2014 Industry Responds to Supply Market Areas



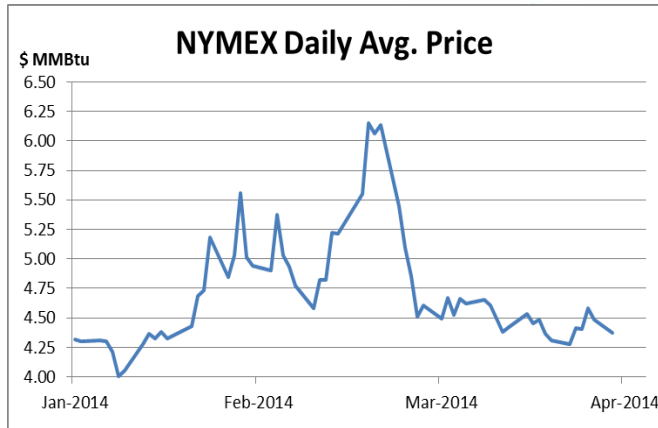
**Historical Propane Prices 2009 - 2014:  
Mont Belvieu & Conway**



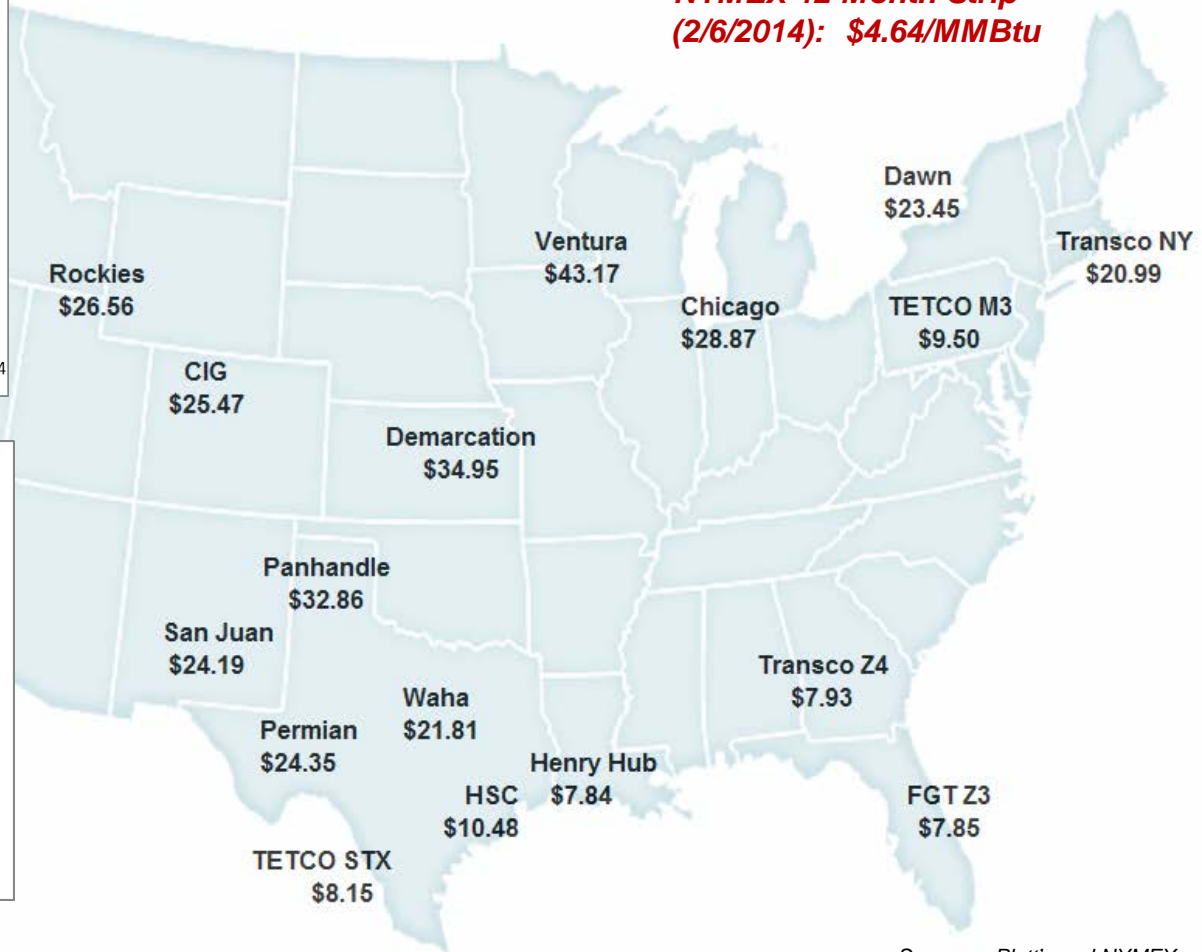
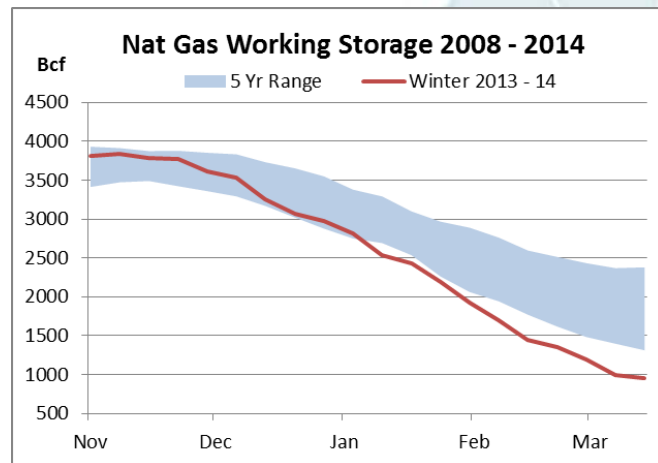
# Natural Gas Prices Also Spiked Due to Bottlenecks and Low Inventories



## Regional Prices on 2/6/2014



**NYMEX 12 Month Strip - (2/6/2014): \$4.64/MMBtu**



Sources: Platt's and NYMEX



# Today's Update

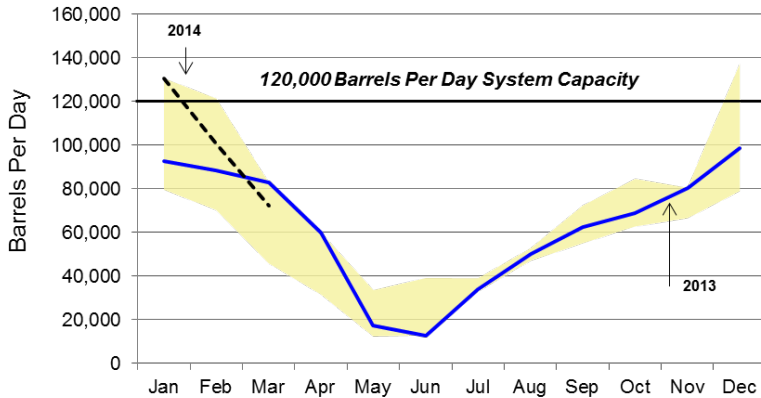


- **Propane Production** - Field production is > 900 MBPD, up from 780 MBPD in May 2013. Combined with refinery-produced propane, total propane produced is averaging 1,250 MBPD. *(Note: this is from DOE weekly data stating that we produced 1,550 MBD of propane and propylene, but we estimate the propylene at ~300 MBD, which leaves us with 1,250 MBD of propane)*
- **Propane Demand** - On a downward trajectory vs. prior years
  - Petrochemicals estimated to consume considerably less propane in 2014 than in years past (~ 150 MBPD less than 2013)
  - Petrochemicals are extremely price sensitive, and will switch feedstocks as warranted to maximize profitability. Throughout 2014, ethylene production economics have favored using both ethane and butane over propane; in contrast, during 2013 propane was the most profitable feedstock for making ethylene in Q1, and nearly again in Q2.
- **Crop Drying** - 88% planted, at 5 year average and 15% ahead of 2013. 2013 was a late crop plant due to the abnormally large rainfall across much of the Midwest.
- **Inventory Levels** – 36.1 MMB. Back within the 5-year average band but below 2013 levels. However, increased production should create opportunities to reach normal 65-70 MMB of storage prior to crop drying. *(Note: we have 39.9 MMB of propane and propylene, of which we have 3.8 MMB of propylene, which leaves us with 36.1 MMB of propane)*



# Enterprise Propane Delivery Pipelines

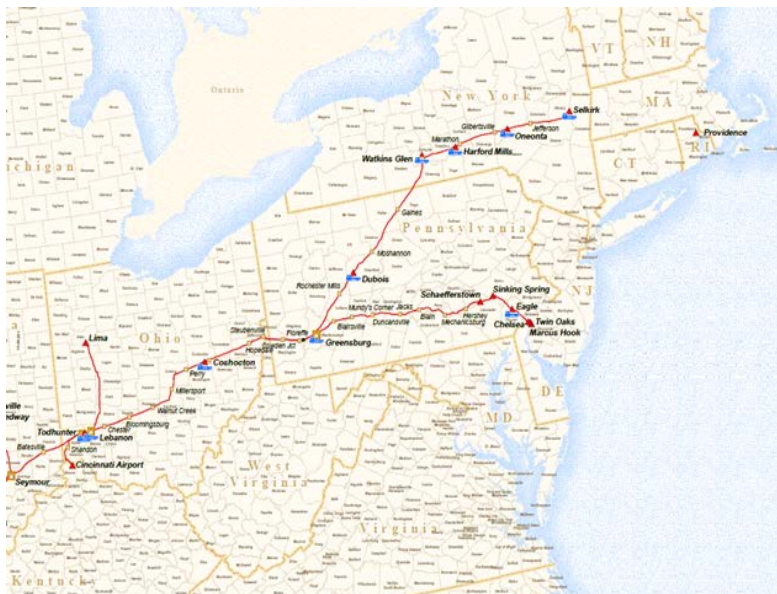
# Dixie 5-Year System Demand



- On average (5-year) Dixie Pipeline transports 64,000 BPD versus a capacity of 120,000 BPD
- On average (5-year) the pipeline operates at 53% of capacity; approximately 20.4 million barrels of propane capacity goes unutilized each year
- From June through September, 2013:
  - Over 1,300,000 barrels of propane underutilized against the historical maximum pipeline usage
  - Over 9.7 million barrels of propane underutilized against the pipeline capacity

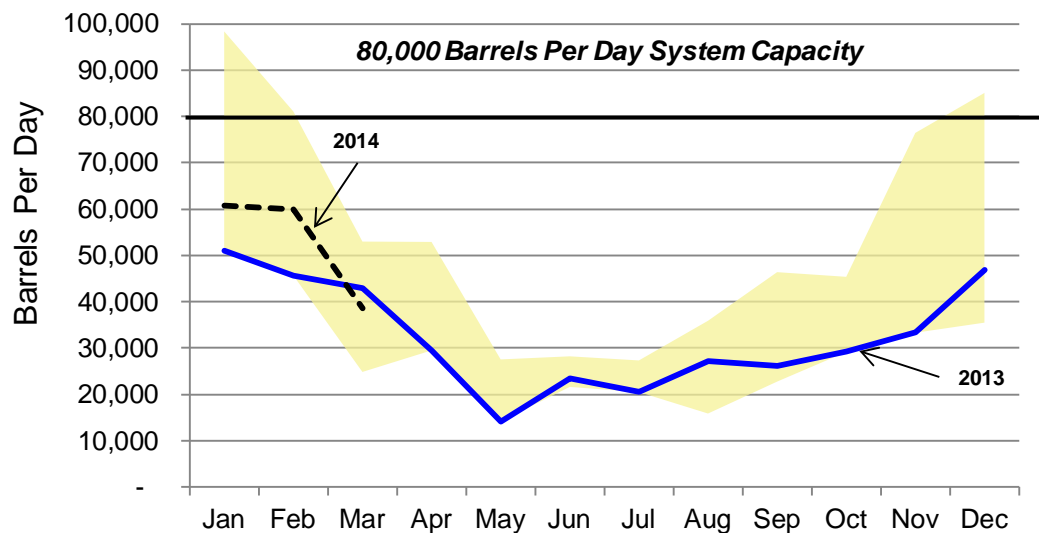


# TE Products System 5-Year System Propane Demand



- On average (5-year) TE Products Pipeline transports 42,000 BPD of propane versus a capacity of 80,000 BPD
- On average (5-year) the pipeline operates at 52% of capacity; approximately 13.9 million barrels of propane capacity goes unutilized each year
- From June through September, 2013:
  - Over 1,200,000 barrels of propane underutilized against the historical maximum pipeline usage
  - Over 6.8 million barrels of propane underutilized against the pipeline capacity

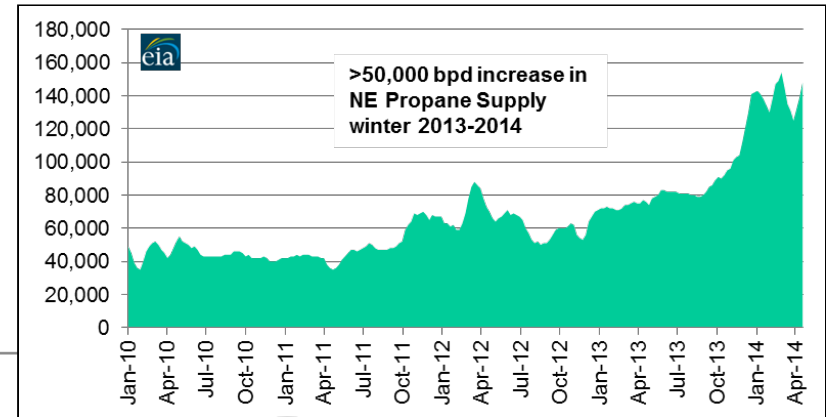
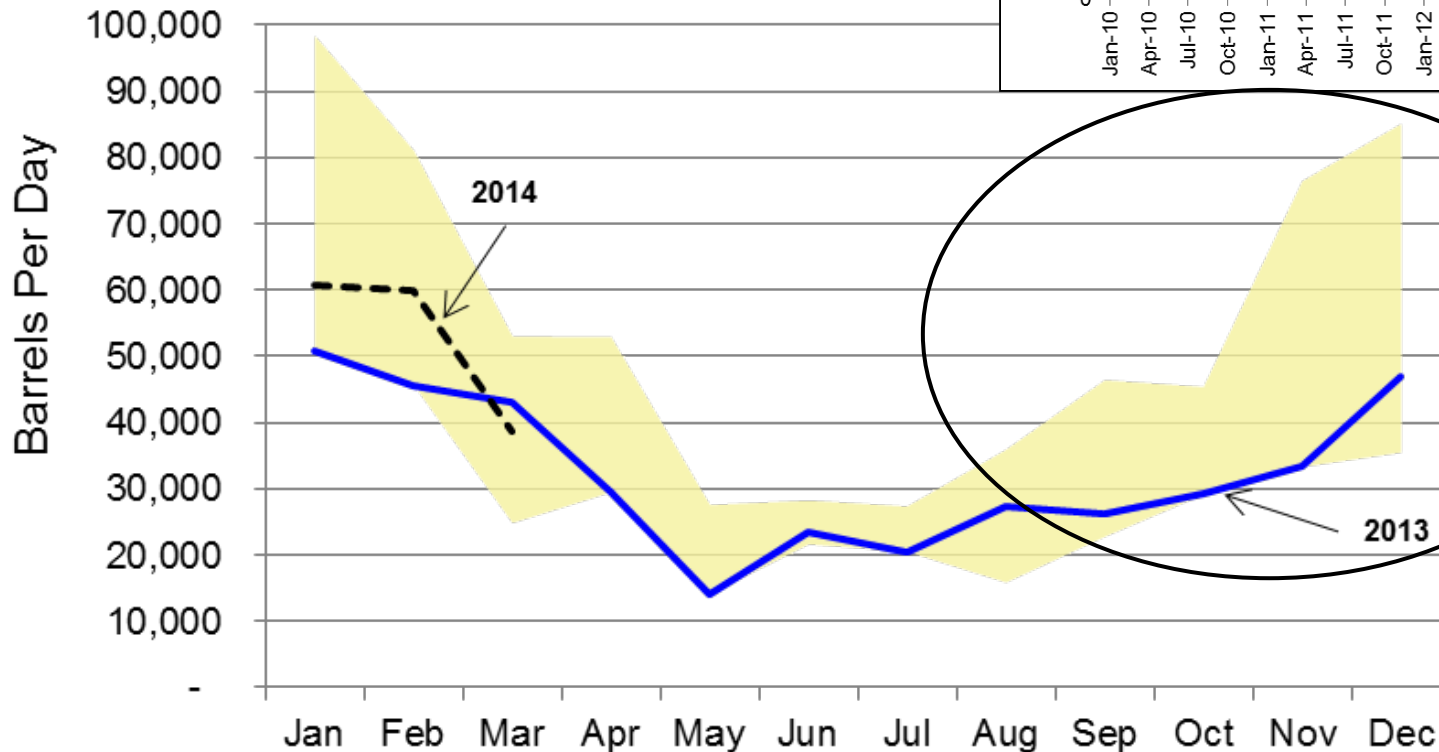
*Note: TE Products propane capacity based on typical peak propane demand, not mainline pipeline capacity (200,000 BPD)*



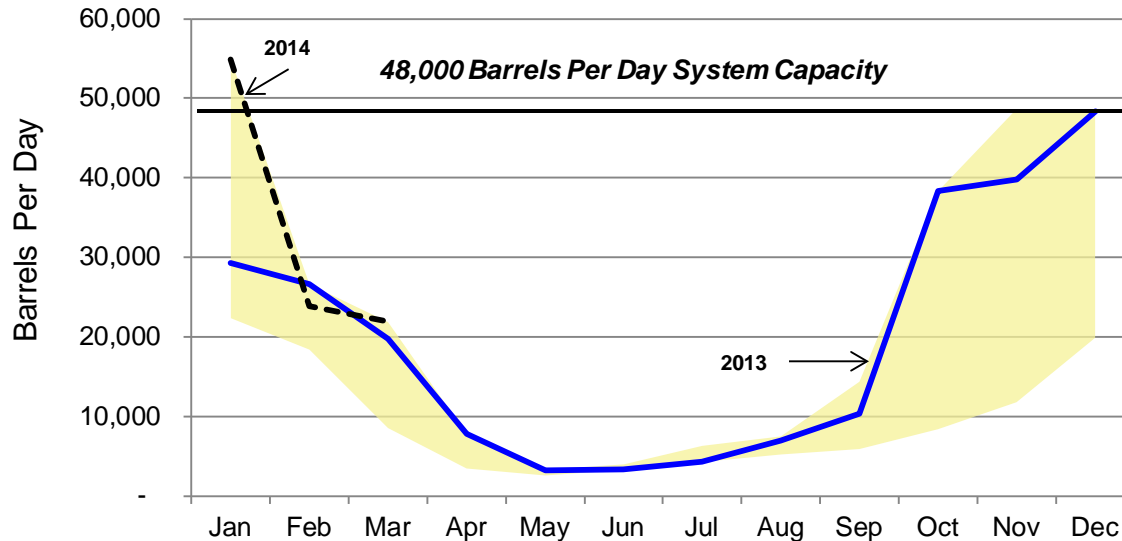
# TE Products System Changing Propane Supply Dynamics



- 30,000 bpd decrease in Propane shipments in 2013 related to 50,000 BPD increase in Marcellus / Utica propane production



# MAPL West Blue 5-Year System Demand



Note: Operations above pipeline capacity requires withdrawals from pipeline storage (Greenwood, NE)

- On average (5-year) the West Blue transports 15,500 BPD versus a capacity of 48,000 BPD
- On average (5-year) the pipeline operates at 32% of capacity; approximately 11.8 million barrels of propane capacity goes unutilized each year
- From June through September, 2013:
  - Over 5 million barrels of propane underutilized against the pipeline capacity

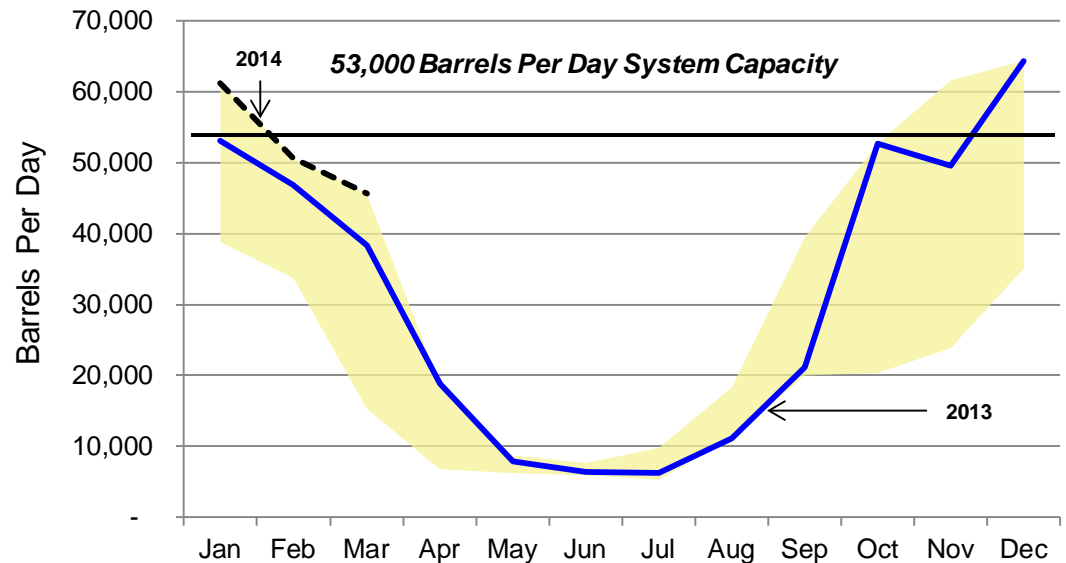


# MAPL East Blue 5-Year System Demand



Note: Operations above pipeline capacity requires withdrawals from pipeline storage (Iowa City, IA)

- On average (5-year) the East Blue transports 27,000 BPD versus a capacity of 53,000 BPD
- On average (5-year) the pipeline operates at 50% of capacity; approximately 9.5 million barrels of propane capacity goes unutilized each year
- From June through September, 2013:
  - Over 900,000 barrels of propane underutilized against the historical maximum pipeline usage
  - Over 5 million barrels of propane underutilized against the pipeline capacity





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# Recommendations



# Propane Sales

## A Localized, Non-Utility Industry

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- The retail propane industry is dominated by small local and regional companies that deliver propane to rural customers including residential and agriculture consumers
  - There are ~ 4,000 propane dealers in the U.S.
    - Often there are several propane dealers that serve each region
    - There are ~ 1,250 propane dealers in the Mid-continent, including co-ops that support the region's agriculture activities
- Nationwide, the retail propane industry is supplied by ~ 100 wholesale companies
- Different than the natural gas (LDC) and electricity distribution industries, the propane industry operates as non-utility function
  - It is the wholesaler's/retailer's responsibility to recoup storage costs from their customers
  - Many fragmented parts in the supply chain (e.g. pipelines, wholesalers, retailers, trucks)

# Potential Recommendations Without Capital Investments

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- Fill Existing Storage facilities
  - The Midcontinent has significant storage capacity (~35 million barrels), but propane industry participants (wholesalers and retailers) did not elect to utilize the available capacity to prepare for winter of 2013 / 2014. According to EIA data, ~12 million barrels of capacity, or 35% of capacity, was left empty.
  - Associations of retail propane distributors should develop “fill early and often” marketing programs to encourage their customers to proactively “top off” their tanks in advance of winter and during breaks in winter weather
- Similar to electric and natural gas utilities, retail propane distributors should promote leveled fixed prices / billing services on a seasonal and / or year-round fixed prices to protect consumers from price volatility and large seasonal billings. Wholesalers already offer this risk / working capital management service to retail distributors.
- Retail propane distributors and states should advertise availability of LIHEAP funds to consumers in advance of winter in conjunction with “fill early” effort
- Develop a tax incentive / rebate / ad valorem tax relief on a per barrel basis at the federal or state level that would encourage wholesalers and retailers to prepare for strong harvest / winter by utilizing available storage facilities
- Pipelines have an inherent incentive to encourage throughput and have tried many allocation methodologies through the years. However, pipelines should continue to reevaluate their allocation processes to maximize peak season loading (i.e. which could result in reducing lengthy truck lines during the day but influence loadings during nights/weekends).

# Potential Infrastructure Enhancements



- In regions with infrastructure bottlenecks, encourage interstate and intrastate propane pipelines and storage facilities to conduct open seasons to assess private / customer support to underwrite capacity additions
- Evaluate/Develop Smaller Strategic Storage Facilities

## **Indicative Specifications for Regional Refrigerated Propane Storage**

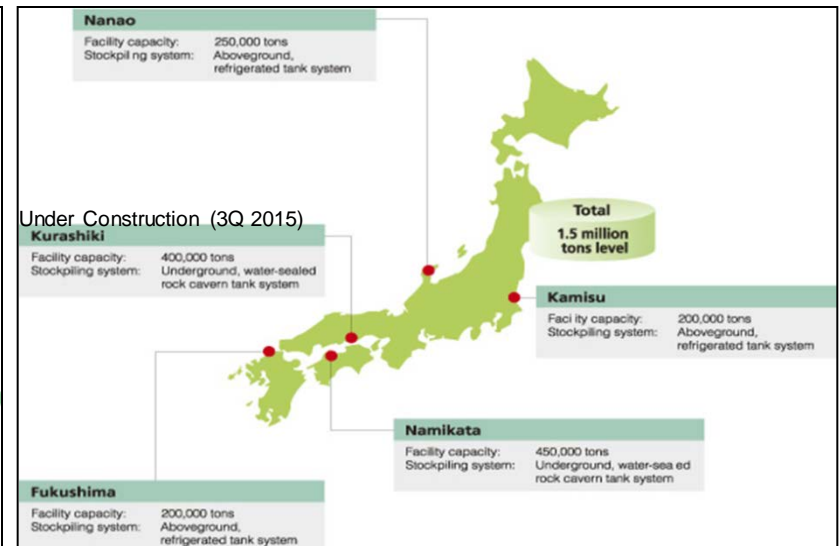
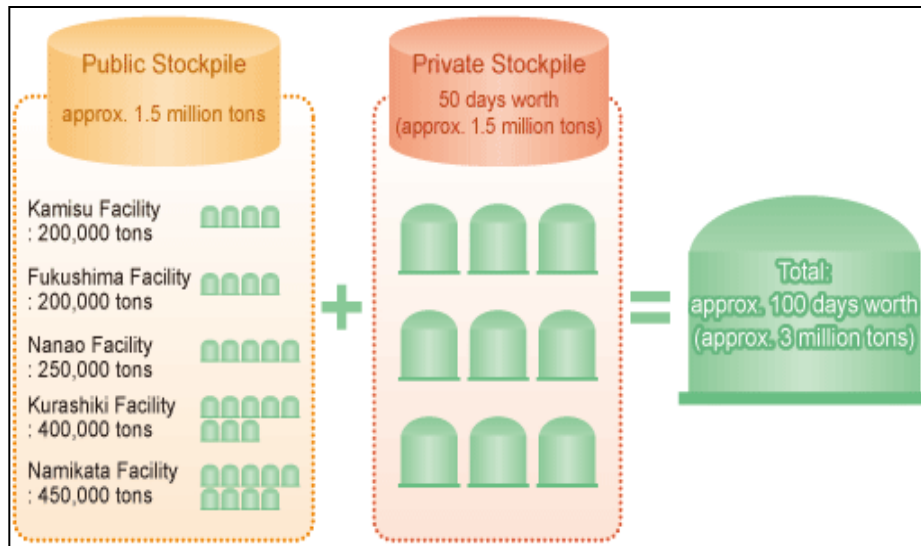
- 250,000 barrels of capacity
- ≈8 bay truck loading outlet
- 15–20 acre footprint
- Locate near propane pipeline, rail or barge facilities
- Estimated construction cost, excluding land, \$200 to \$300 Million

In siting facilities, Federal / State governments should work jointly with the retail propane distribution industry to evaluate remote market areas with the most acute need: largest market demand in relation to most significant supply bottlenecks during peak conditions

# Japan's LPG Initiatives



- Japan established a Public Stockpiling program totaling (18.5 Million Barrels of LPG), the equivalent to 50 days of supply
- In addition, Japan has a Private Stockpiling program worth another 50 days of supply (18.5 Million Barrels of LPG)



Source: Japan LP Gas Association



## ● Potential Solutions

- Promote utilization of existing regional storage facilities
  - Promote consumer programs to fill year round, “top off” before winter and levelize prices
  - Pipelines should continue to reevaluate allocation methodologies to further attempt to encourage maximum product liftings during peak demand
  - Assess customer support to underwrite market area storage and capacity additions
  - Evaluate large regional storage facilities
- Continue exports to provide propane year-round market demand assurance to shale developers which, in turn, creates more long-term domestic supply. Limiting or disallowing LPG exports (propane and butane) would likely result in many unintended, negative consequences.
- On most days, U.S LPG (propane and butane) is already in significant excess and production is expected to nearly double by 2020 while U.S. demand is flat at best
  - LPGs cannot be left in the natural gas stream. Without exports, U.S. producers would have to significantly curtail drilling and investment in developing shale plays, which would result in lower natural gas and LPG production, and higher energy prices.