

# Memphis Natural Gas 101

MLGW's View of Natural Gas



- MLGW is the nation's largest three-service municipal utility, serving nearly 421,000 customers.
- MLGW started in 1939, its parent companies started more than 100 years ago.



# Electricity

- MLGW:
  - Purchases electricity from the Tennessee Valley Authority (TVA).
  - TVA's largest customer, representing 11% of TVA's total load.



# Natural Gas

- MLGW:
  - Distribution network is more than 4,650 miles in length.
  - 30 to 40 billion cubic feet of gas to its customers each year.



# Water

- MLGW:
  - Operates one of the largest artesian well systems in the world.
  - Operates 10 water pumping stations and more than 175 wells.



# RESIDENTIAL GAS BILLS

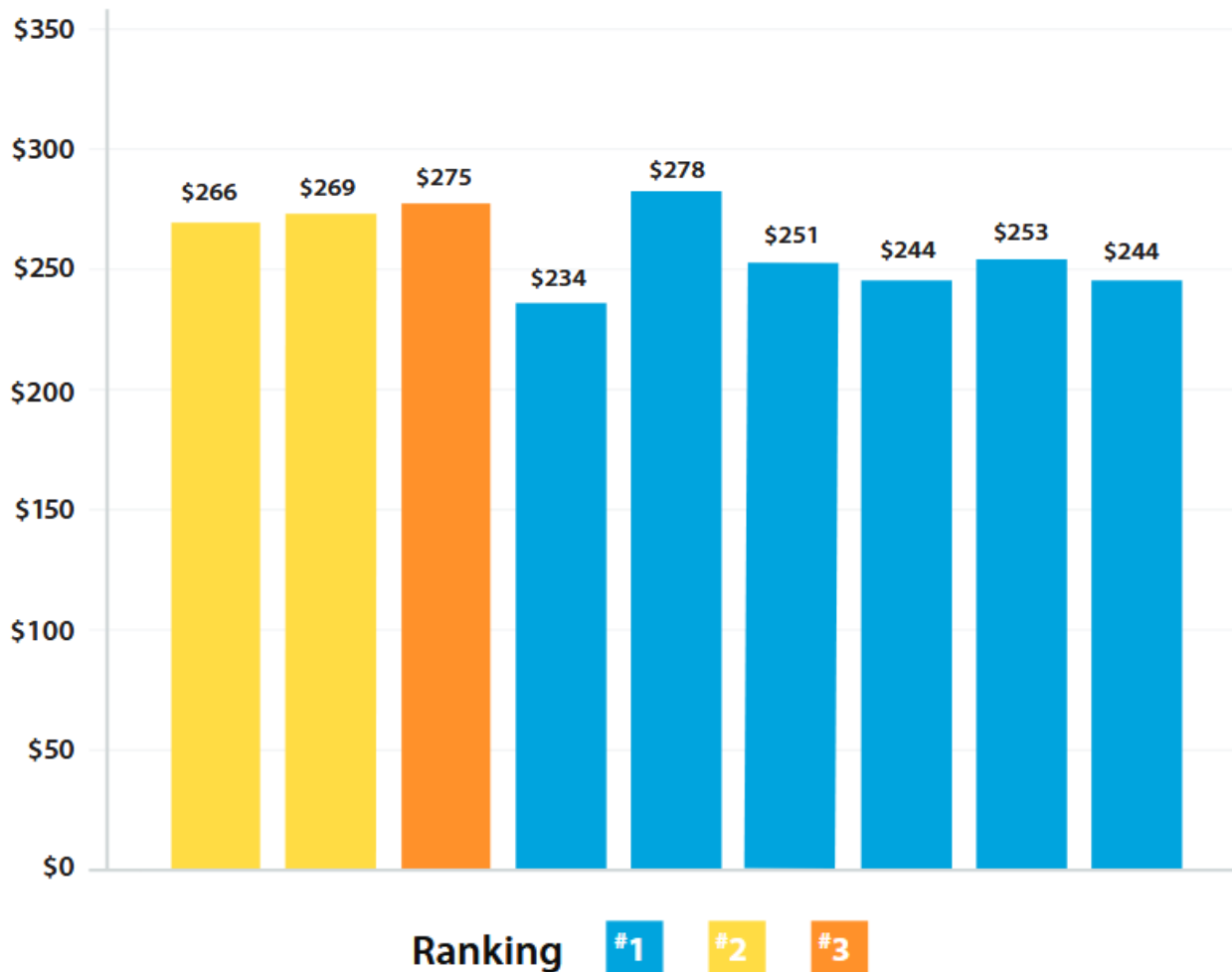
Rates in effect January 2018

Location		Company	10 CCF	50 CCF	100 CCF	150 CCF	200 CCF	250 CCF
1	San Antonio, TX	CPS Energy	\$14.57	\$34.63	\$59.72	\$84.80	\$109.88	\$134.97
2	<b>Memphis, TN</b>	<b>Memphis Light, Gas and Water</b>	<b>\$15.52</b>	<b>\$37.60</b>	<b>\$65.20</b>	<b>\$88.30</b>	<b>\$111.40</b>	<b>\$134.50</b>
3	Denver, CO	Public Service Company of Colorado	\$20.35	\$40.17	\$64.94	\$89.71	\$114.47	\$139.25
4	Omaha, NE	Metropolitan Utilities District	\$21.99	\$41.96	\$66.93	\$91.89	\$116.86	\$141.82
5	Oklahoma City, OK	Oklahoma Natural Gas	\$25.38	\$54.93	\$75.74	\$96.55	\$117.36	\$138.18
6	Milwaukee, WI	WeEnergies	\$16.08	\$39.50	\$68.76	\$98.03	\$127.29	\$156.56
7	Las Vegas, NV	Southwest Gas Corporation	\$17.10	\$42.29	\$73.79	\$105.28	\$136.77	\$168.27
8	Indianapolis, IN	Citizens Energy Group	\$19.00	\$46.59	\$76.69	\$106.78	\$136.88	\$166.97
9	Houston, TX	CenterPoint Energy	\$22.34	\$48.19	\$80.49	\$112.80	\$145.10	\$177.41
10	St. Louis, MO	Laclede Gas Company	\$35.26	\$69.08	\$94.53	\$119.98	\$145.42	\$170.87

# Memphis tops list for low winter utility bills

For the past 27 years, Memphis customers have spent less for their winter utility bills than their counterparts in many metro areas. Since 1992, Memphis has captured the top ranking 16 times. The 2018 ranking includes what a homeowner would pay for 1,000 kilowatt-hours of electricity, 200 hundred cubic feet (CCF) of gas and 10 CCF each for water and sewer. The dollar amounts have been rounded.

## Memphis Remains Among the Top For The Past 9 Years



# GAS PORTFOLIO MANAGEMENT

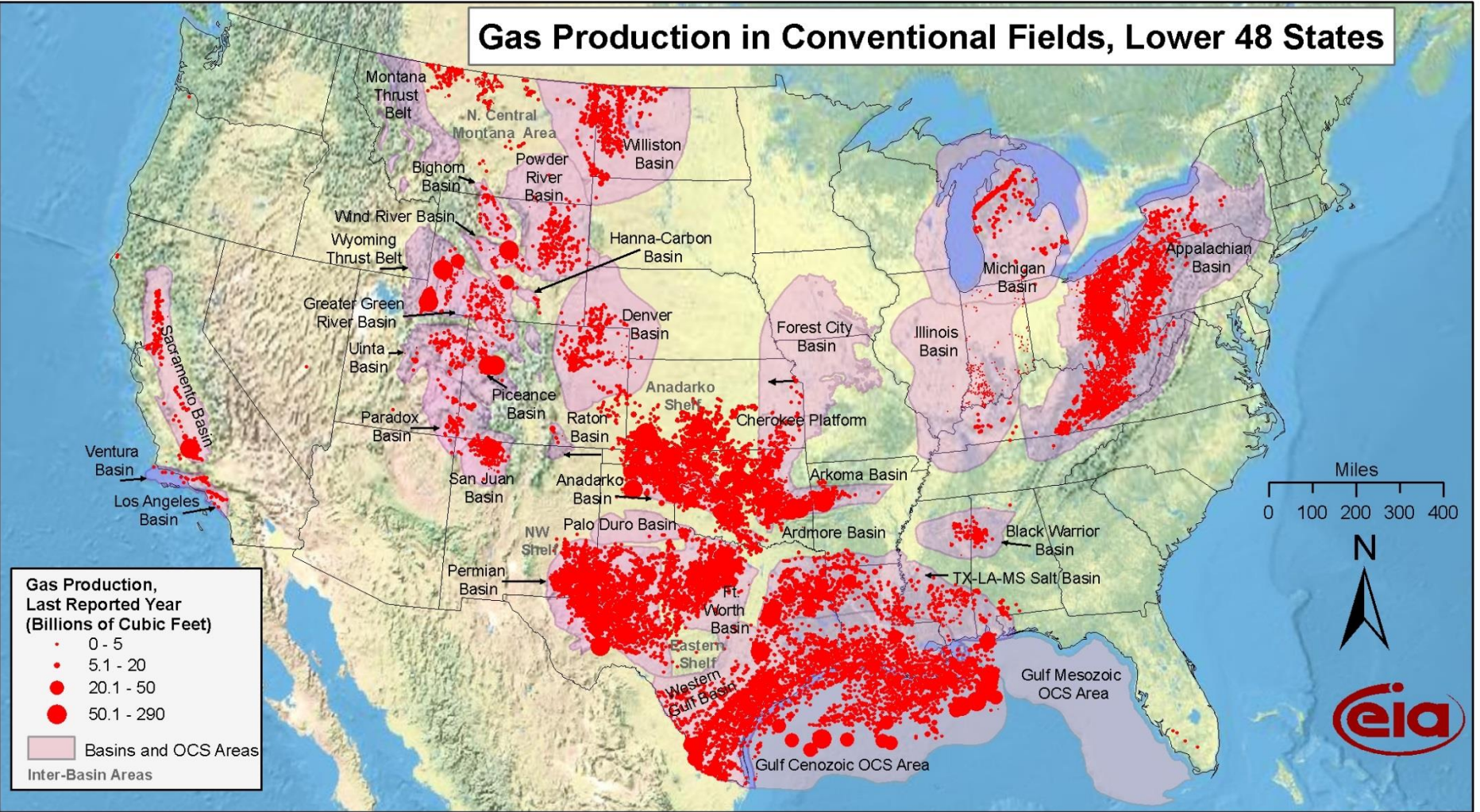
Responsibilities include:

- Purchase natural gas for MLGW
- Transport natural gas to Memphis
- Hedge to protect against upward price movements
- Manage MLGW's LNG and CNG sales





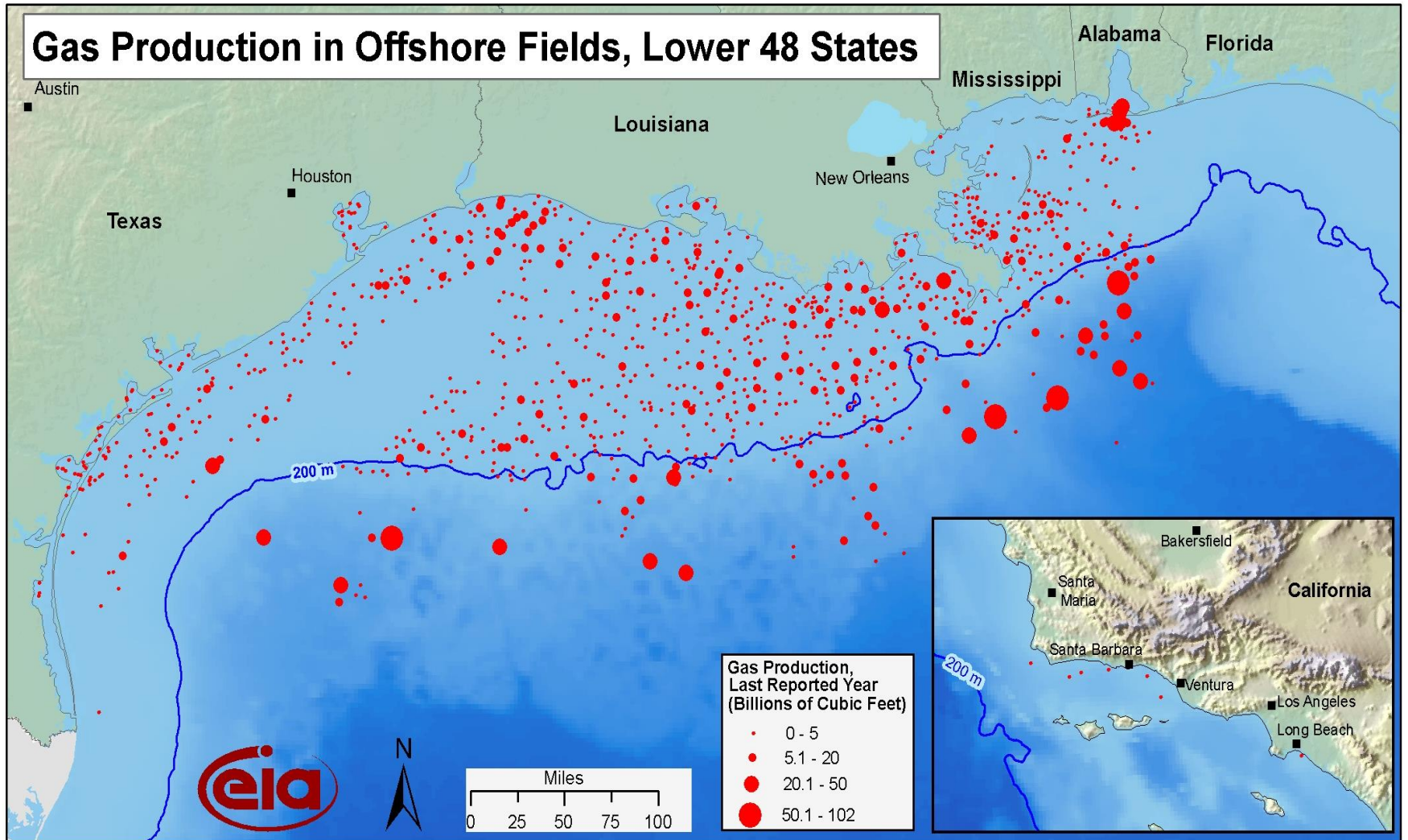
# Gas Production in Conventional Fields, Lower 48 States



Source: Energy Information Administration based on data from HPDI, IN Geological Survey, USGS

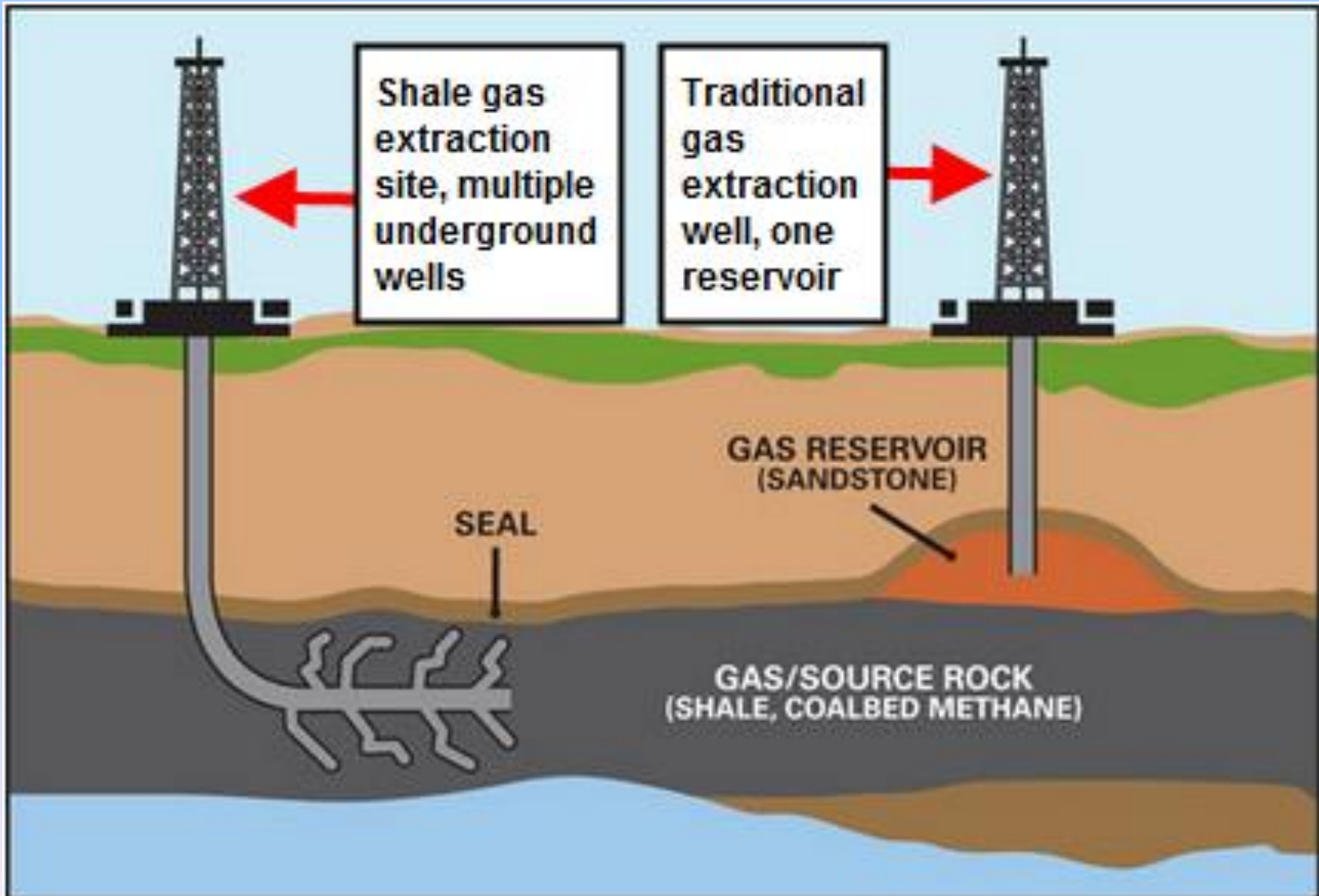


# Gas Production in Offshore Fields, Lower 48 States



Source: Energy Information Administration based on data from MMS, HPDI, CA Dept of Oil, Gas & Geothermal

5,280 feet = 1 mile



# Where Do We Buy The Gas?

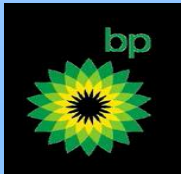
Onshore Texas, Louisiana, Arkansas, Kansas.





# Purchase Natural Gas For MLGW

- Purchase gas from over 30 natural gas suppliers such as BP Energy, Shell, ConocoPhillips, Tenaska, etc.



# Who Do We Buy Gas From?



# How Does The Gas Get To Memphis?

- Gas pipelines.
- MLGW uses the Texas Gas, Trunkline and ANR pipelines.



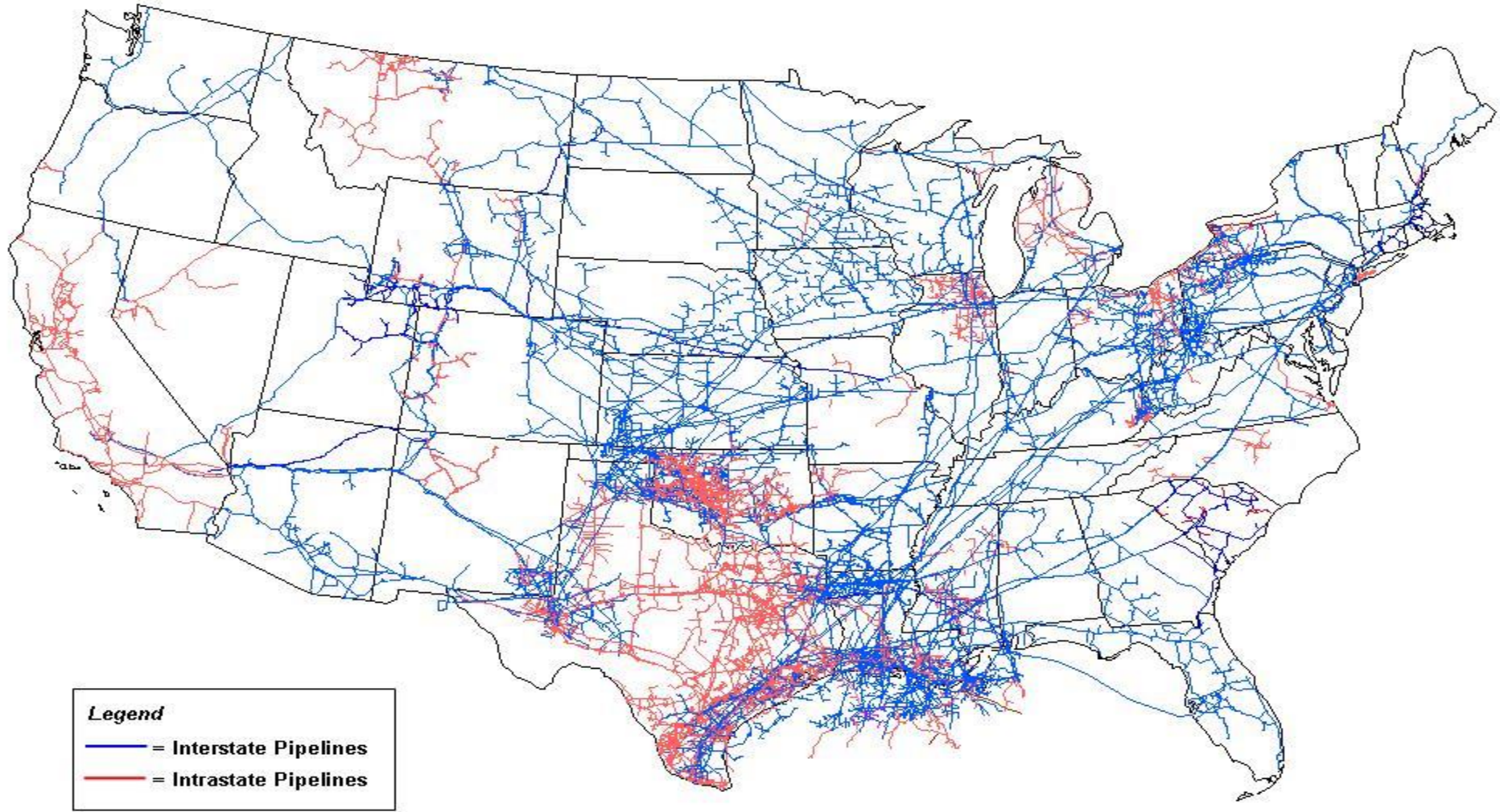
# Transport MLGW's Natural Gas To Memphis

- Transport natural gas from supply points in Texas, Louisiana and Kansas to Memphis.
- This gas is transported on the ANR, Trunkline and Texas Gas Pipeline systems.





# U.S. Natural Gas Pipeline Network

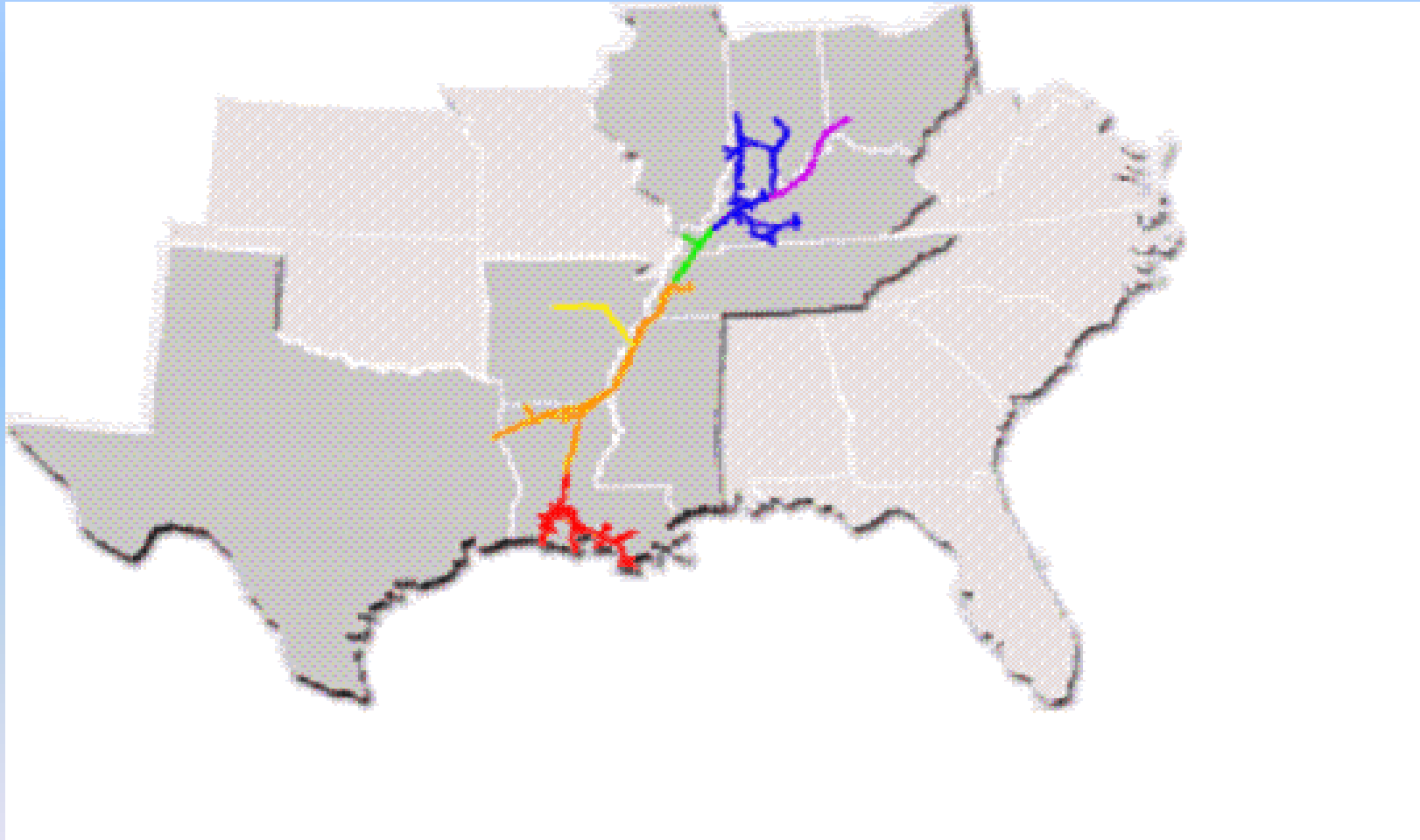


Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division, Gas Transportation Information System



Image courtesy of Nabucco Gas Pipeline International GmbH

# Texas Gas Transmission Pipeline



# Trunkline & Panhandle



# ANR Pipeline



# Gas Buying Process

Gas Buying – Scheduling - Gas Cost Data

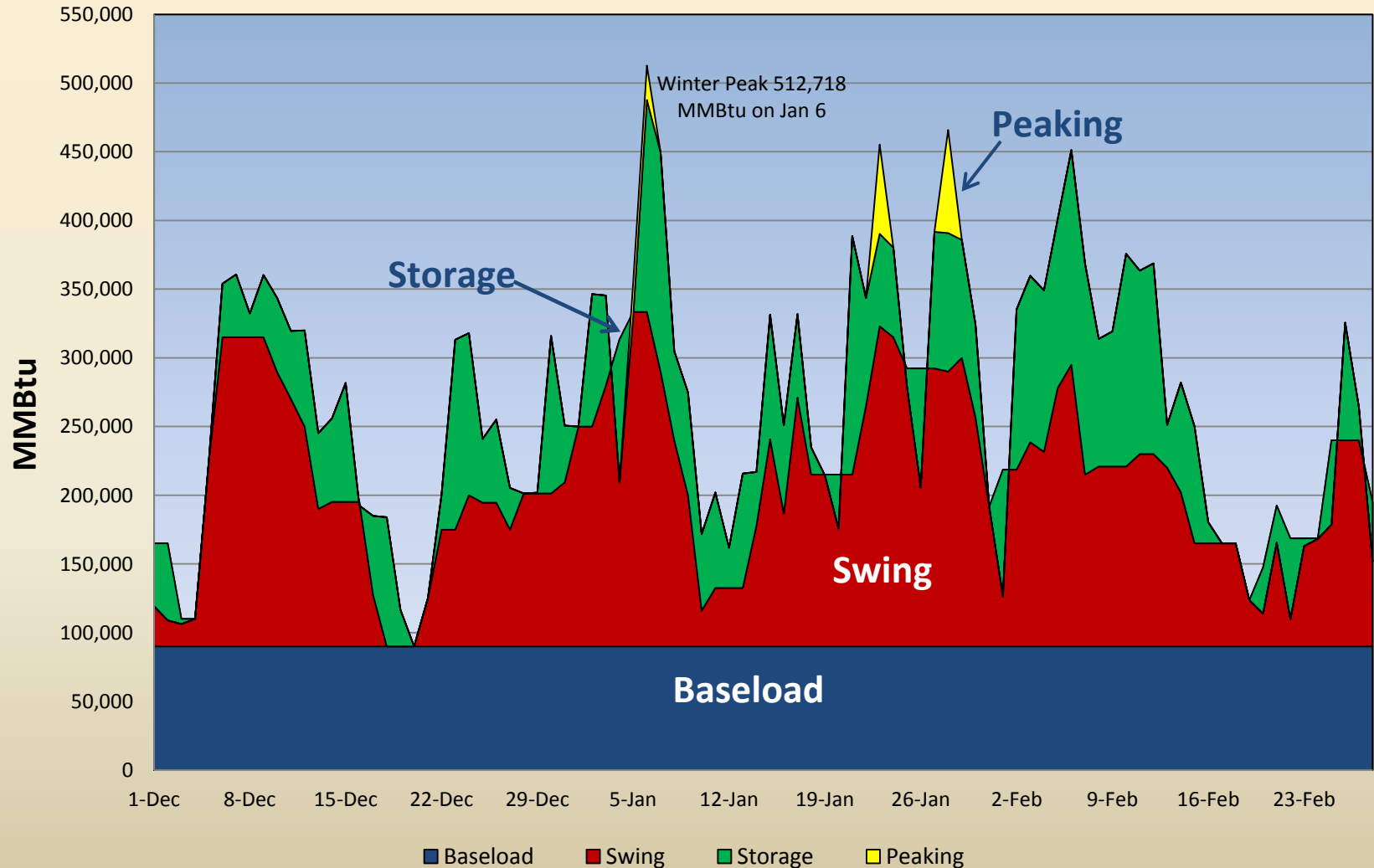


# Gas Buying

- Baseload-
  - Minimum level needed during each day over a season.
  - Price: First of the Month Index
- Swing-
  - Daily purchases to supplement daily needs.
  - Price: Daily average price or a daily fixed price.
- Storage-
  - Withdraw in the Winter and Refill in the Summer.
- Peaking Supply-
  - Used only in times of high demand.

# Dec 2013 - Feb 2014

## City Gate Supply



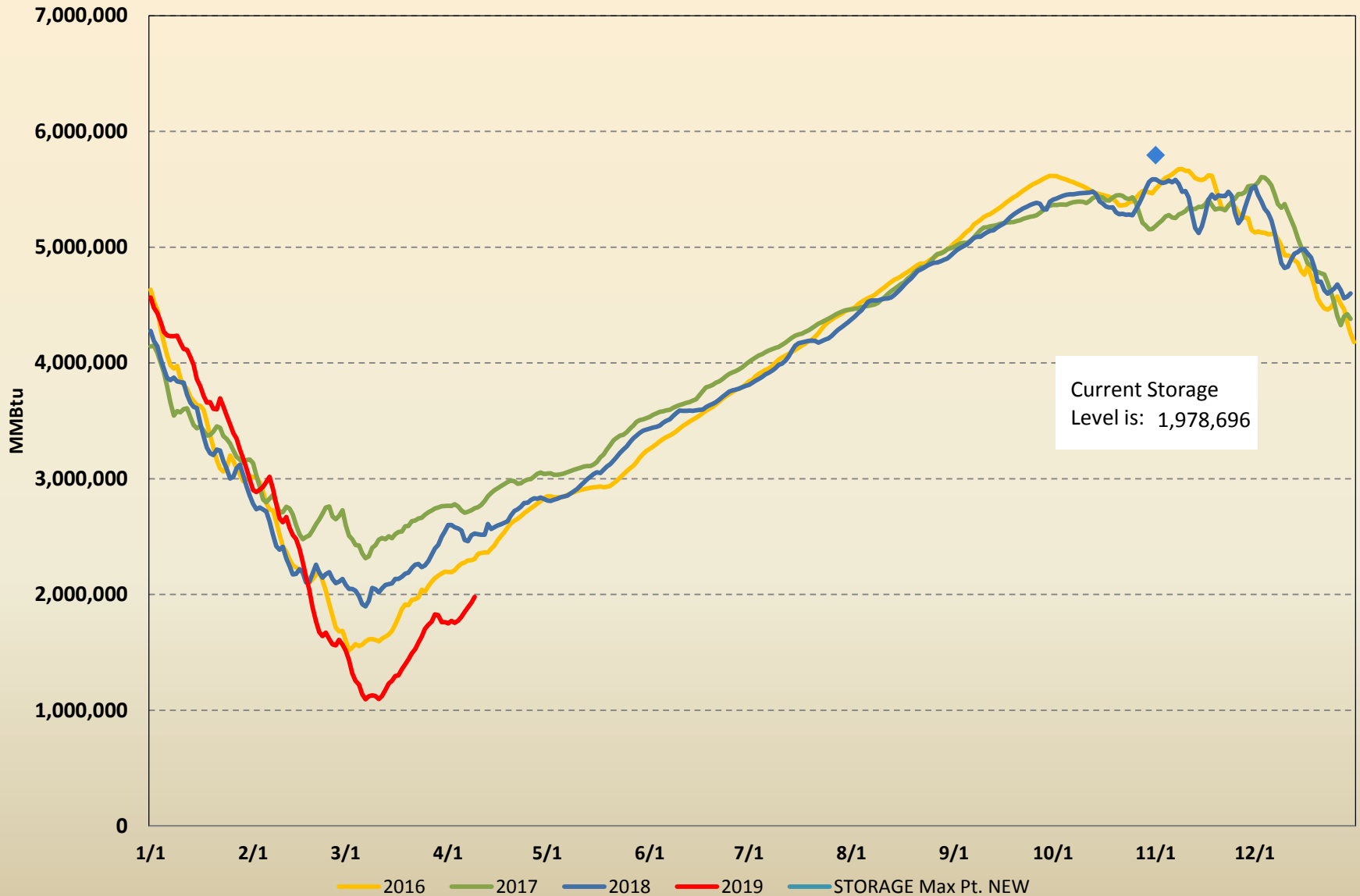


# Load Forecasting

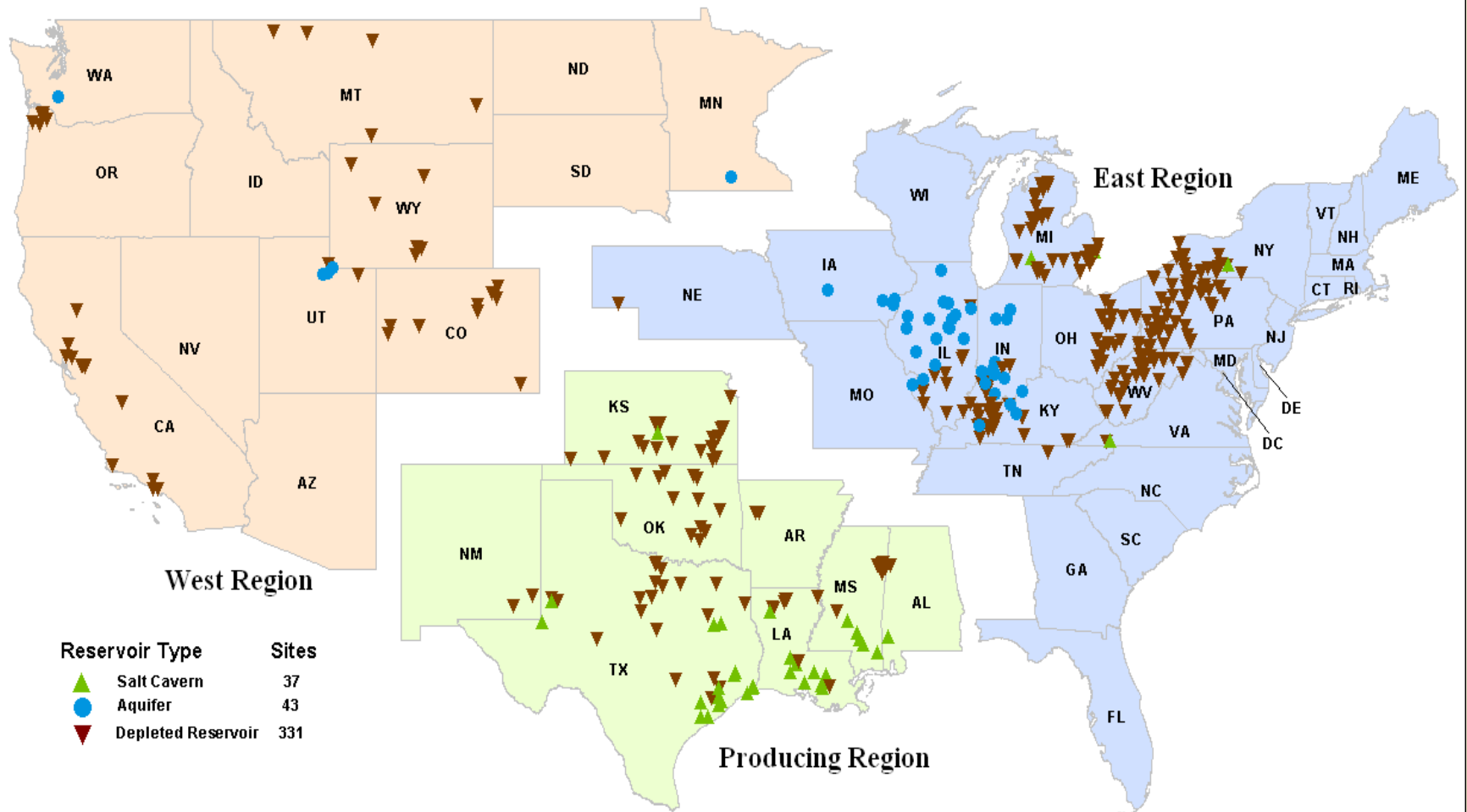
- Use weather data from NOAA
- Use regression analysis to predict how much gas will be burned based on forecasted temps.
- Used to determine:
  - How much baseload and swing will be needed.
  - How much gas will be injected or withdrawn from storage.



# MLGW's Texas Gas Storage Account



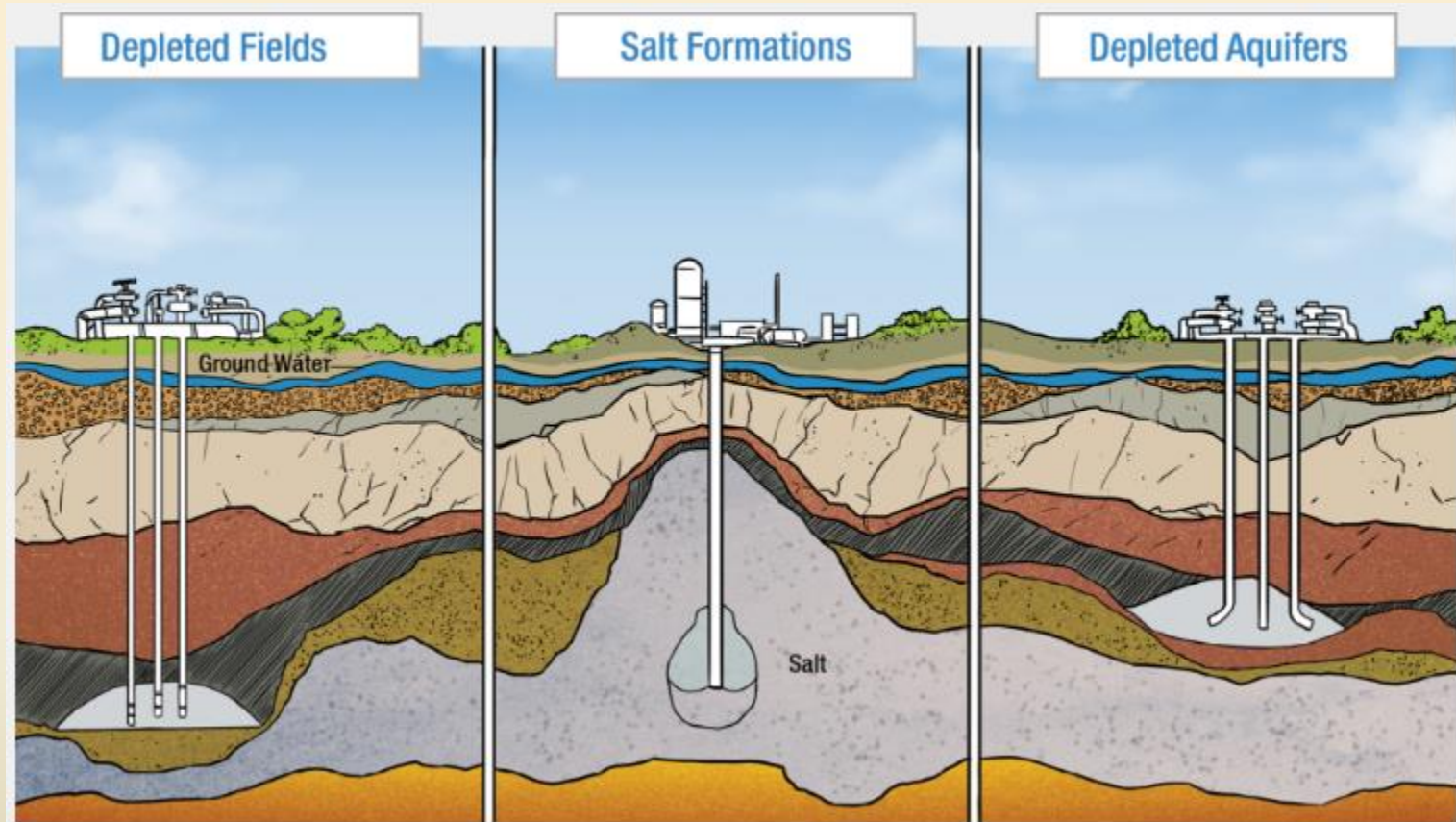
## U.S. Lower 48 Underground Natural Gas Storage Facilities, by Type



Note: Locations of storage facilities presented in the map are approximate. Some symbols representing storage facilities may overlap.

Source: U.S. Energy Information Administration, Form EIA-191A, "Annual Underground Gas Storage Report"

# Underground Natural Gas Storage



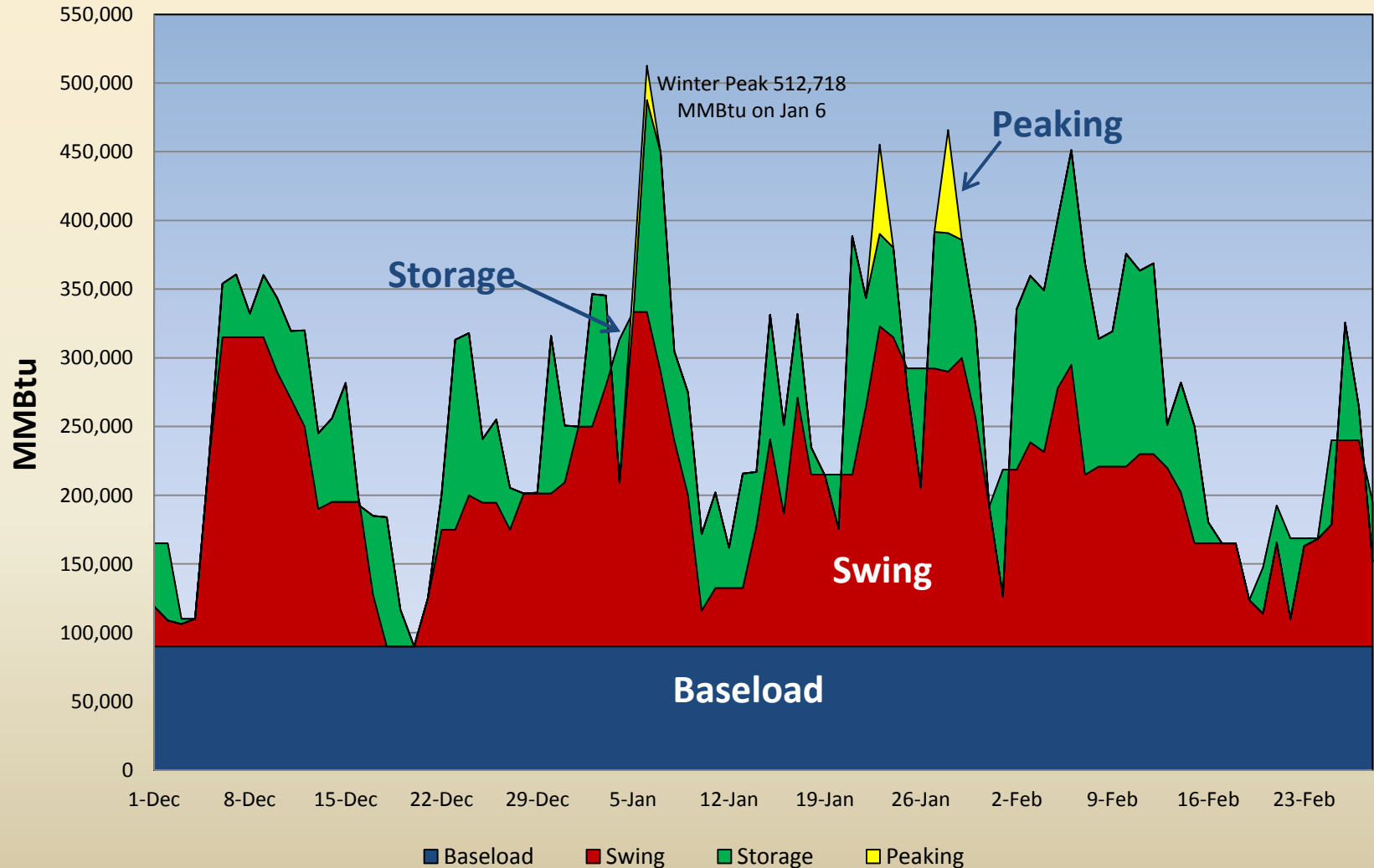
# MLGW LNG Plant

- Built in 1997
- 65,000 gpd production
- 12,000,000 gallon tank
- Truck loading rack
- Room for expansion



# Dec 2013 - Feb 2014

## City Gate Supply



# Scheduling



# Scheduling

- Schedule gas movements on Texas, Trunkline and ANR pipeline systems and delivered gas at our city gate.
- Nominate gas on pipeline websites.
- Five nomination cycles.
- Manage any supply cuts (shortages) of gas nominated into MLGW's system.
- Work with MLGW Scada group to get all MLGW purchased gas and transport customer's gas into MLGW's system.





# Gas Cost Data



- Pay pipeline and gas supply invoices.
- Report gas cost data to:
  - The Rates Group for charging MLGW's rate paying customers.
  - The Management Accounting Group for recording in MLGW's financial statements.



# MLGW Gas Sales



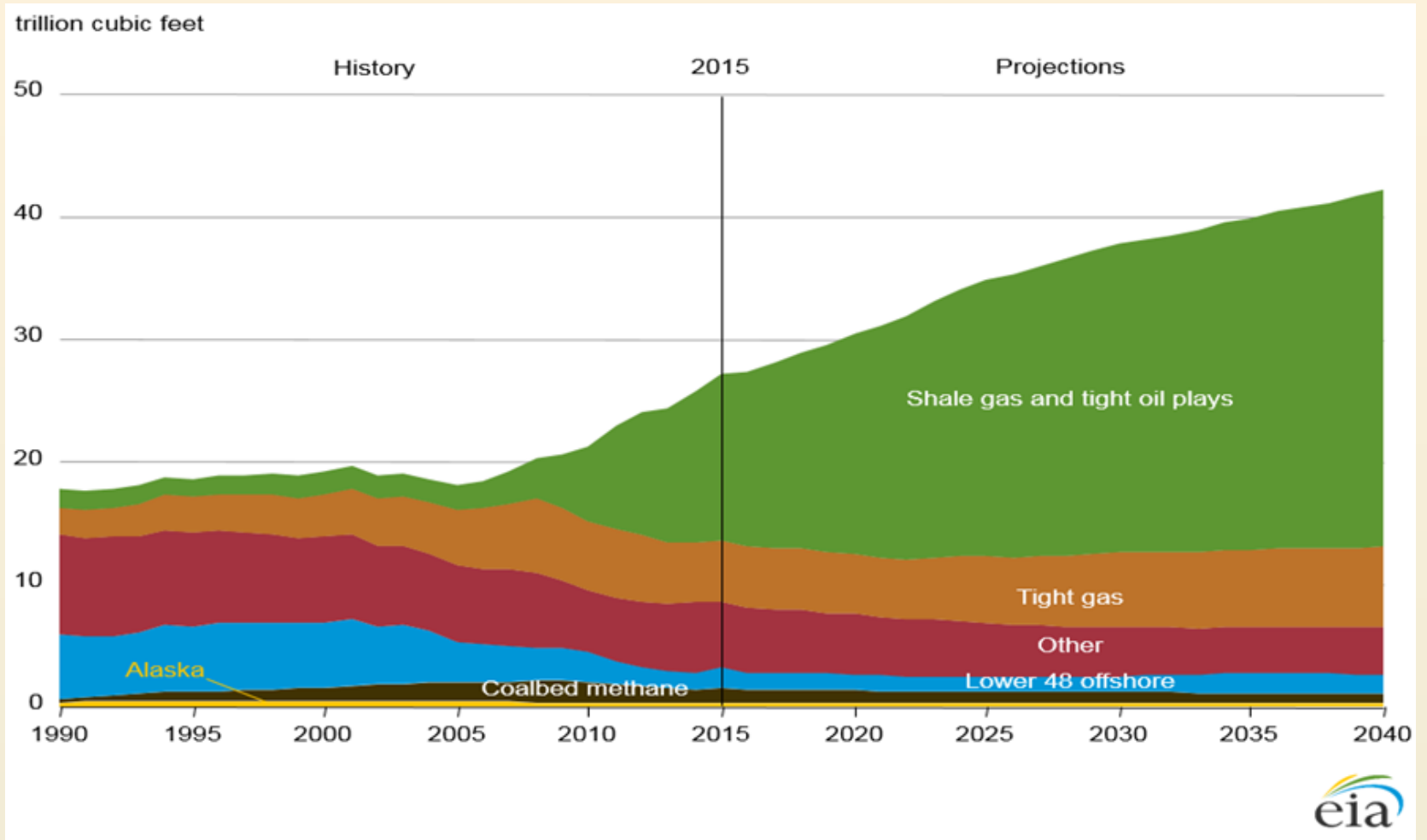
- Residential Customers:

<b>Gas</b>	G1/G3	January 1, 2016	Gas rate for all residential customers
	PGA	Varies Monthly	Purchased Gas Adjustment Rider

- Commercial/Industrial Customers:

<b>Gas</b>	G7	January 1, 2016	Gas Service for Small Commercial/Industrial Customers
	G8/G9	January 1, 2016	Gas Service for larger Commercial/Industrial Customers (at least 100 ccf of Maximum Daily Demand)
	G10/G12	January 1, 2016	Interruptible Off-Peak Gas Service for Commercial/Industrial Customers (at least 1,500 ccf of Maximum Daily Demand)
	FT	January 1, 2016	Firm transportation of customer-owned gas general service
	G-10/G-12 Market	January 1, 2016	Schedule G-10 & G-12 market large general service – interruptible
	PGA	Varies Monthly	Purchased Gas Adjustment Rider

# Natural Gas Supply



# Industrial Transport Customers

- Manage the incoming gas for 40 large industrial customers.
- Some of these customers are:

Cargill, Inc

Cascade Tissue

Chemours Chemical

ConAgra Foods

GlaxoSmithKline

Hershey Company

Kellogg Company

Merck

Midwest Zinc

Nucor Steel

Owens Corning

Pennakem

Smuckers

TVA

Valero Refinery

# Industrial Sales Customers

- Calculate/Bill gas sales of 20 large industrial customers.
  - Some of these customers are:

Archer Daniels Midland

Buckman Laboratories

Electrolux

Lebonheur Children's Hospital

Methodist Hospital Systems

Mitsubishi

Regional Medical Center

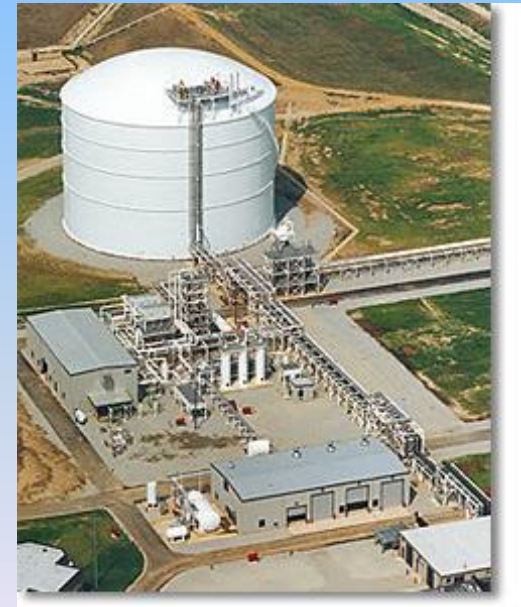
ST Francis Hospital

ST Jude Children's Hospital

UT Health Science Center

# MLGW's LNG Sales

- LNG:
  - Optimized MLGW's LNG storage to sell LNG to customers such as UPS, Clean Energy, Cummins, etc.
  - LNG sales revenues for since 2012 : \$35 million.



# MLGW CNG Sales



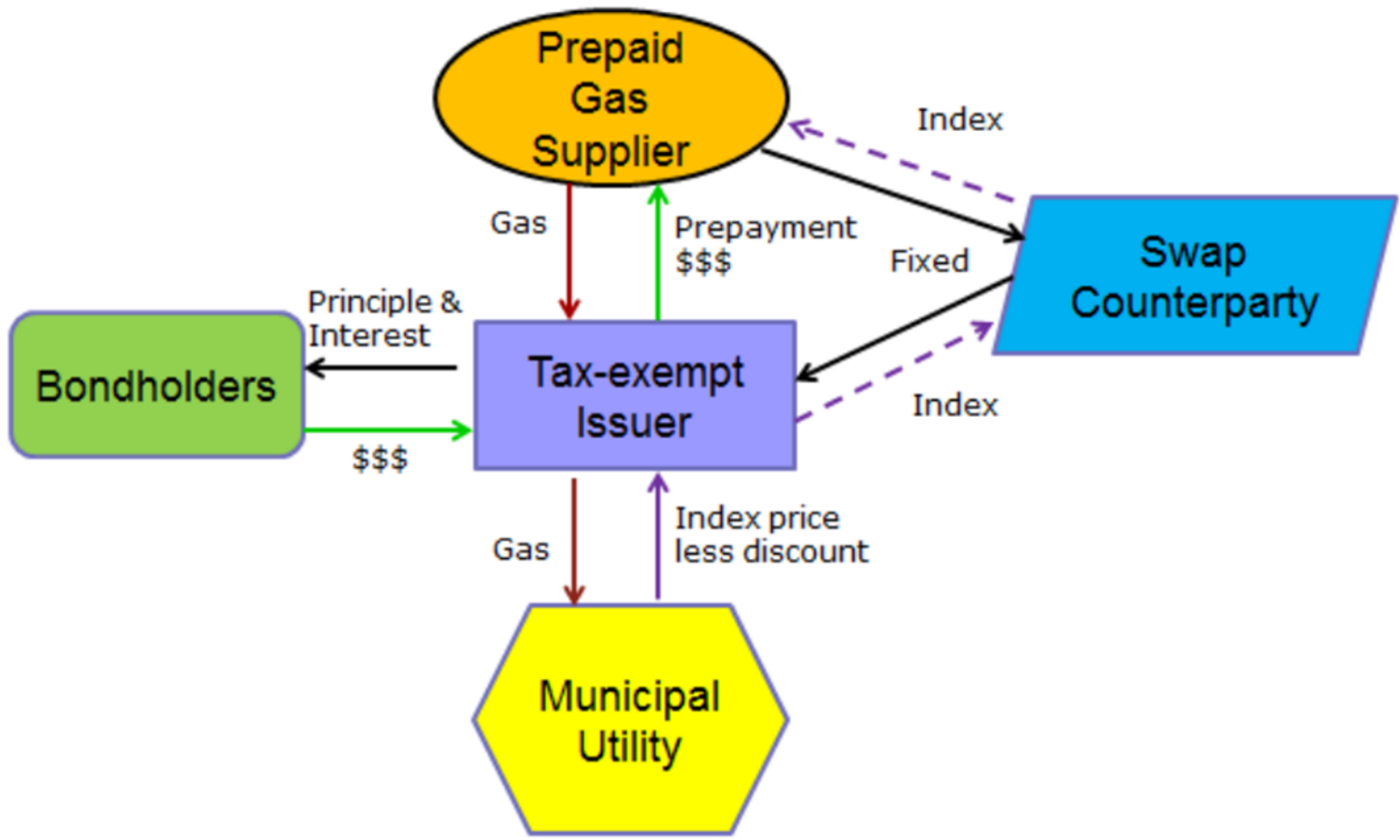
# MLGW Landfill Gas





# MLGW Natural Gas Prepays

- MLGW has been involved in six natural gas prepay transactions.
- Savings to our customers:
  - 2007 – 2018 the savings ranged from \$4 million to \$7 million per year.
  - Starting 2019 the savings will \$8 million per year.
- Gas prepay transactions are a mechanism for municipal utilities to utilize their tax-exempt status to achieve a discount on the market price of gas.
- Value is created between the difference in the municipal rates and commercially available rates



# Natural Gas In The News

## Permian Basin



# Natural Gas In The News

Dec 7, 2018

**NATURAL GAS INTELLIGENCE**

**Permian Delaware's Wolfcamp, Bone Spring Assessed as Largest-Ever Unconventional Province**

*The Dallas Morning News*

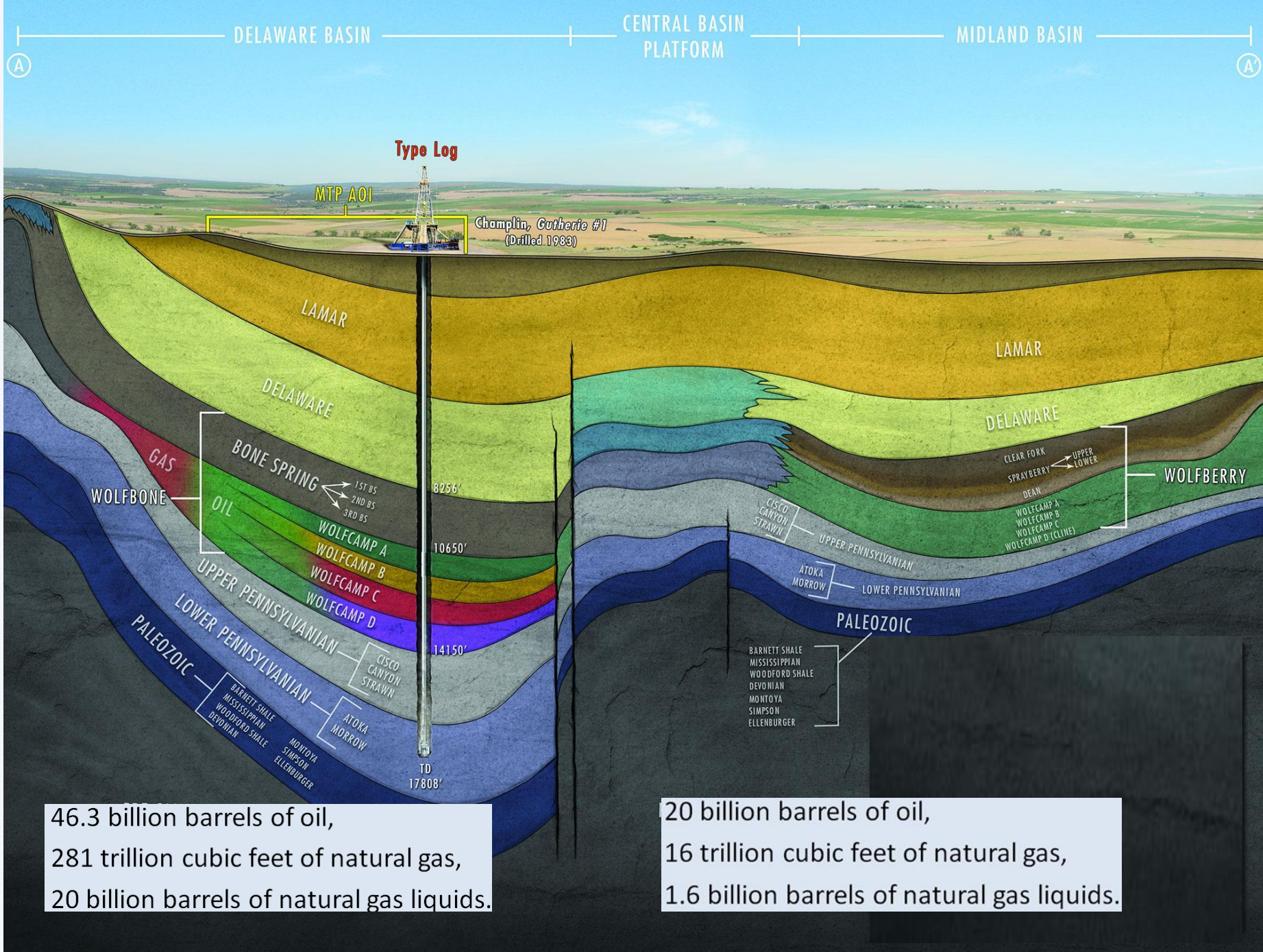
**USGS: Permian Basin's vast reserves could be bigger than anyone imagined**

**USGS: Permian's Wolfcamp is largest potential oil and gas resource ever assessed**

**HOUSTON** ★  
**CHRONICLE**

# Wolfcamp and Bone Springs Shale Formations Delaware Basin

- Largest estimate of continuous oil that USGS has ever assessed in the United States.
- Location: Texas Permian Basin
- Estimates per U.S. Geological Survey:
  - 46.3 billion barrels of oil,
  - 281 trillion cubic feet of natural gas,
  - 20 billion barrels of natural gas liquids.



46.3 billion barrels of oil,  
281 trillion cubic feet of natural gas,  
20 billion barrels of natural gas liquids.

20 billion barrels of oil,  
16 trillion cubic feet of natural gas,  
1.6 billion barrels of natural gas liquids.



# People who don't know the meaning of I Can't

- Net Exporter of Natural Gas and Crude Oil.
- LNG terminals
- Offshore drilling platforms
- Sub-sea gathering systems
- Energy independence
- Hundreds of uses of crude oil and natural gas

