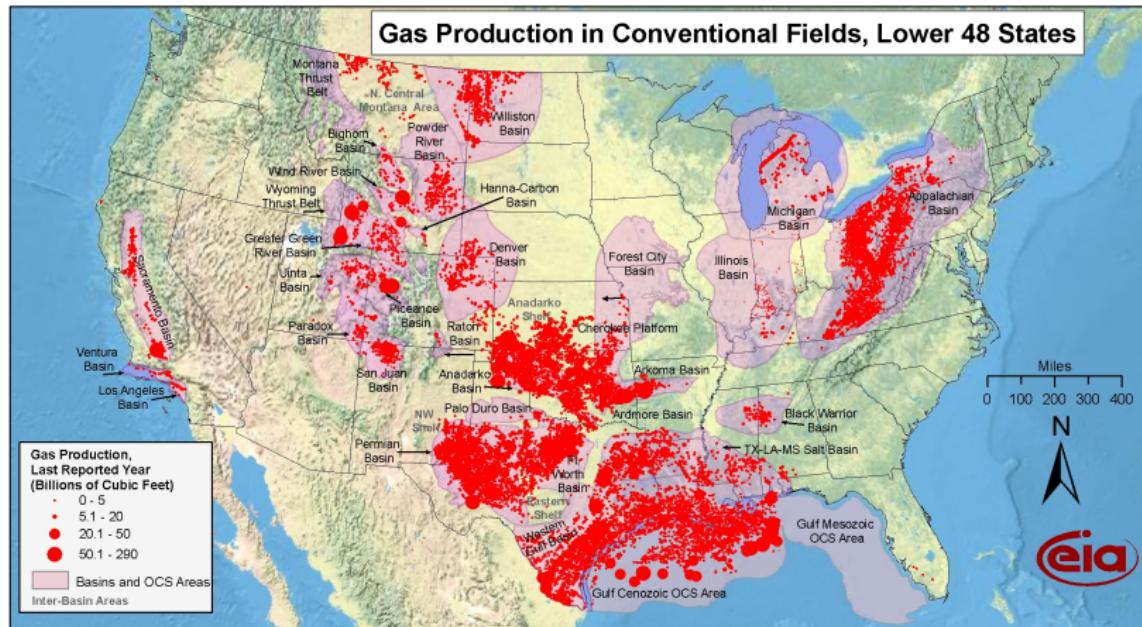


# Introduction to Natural Gas

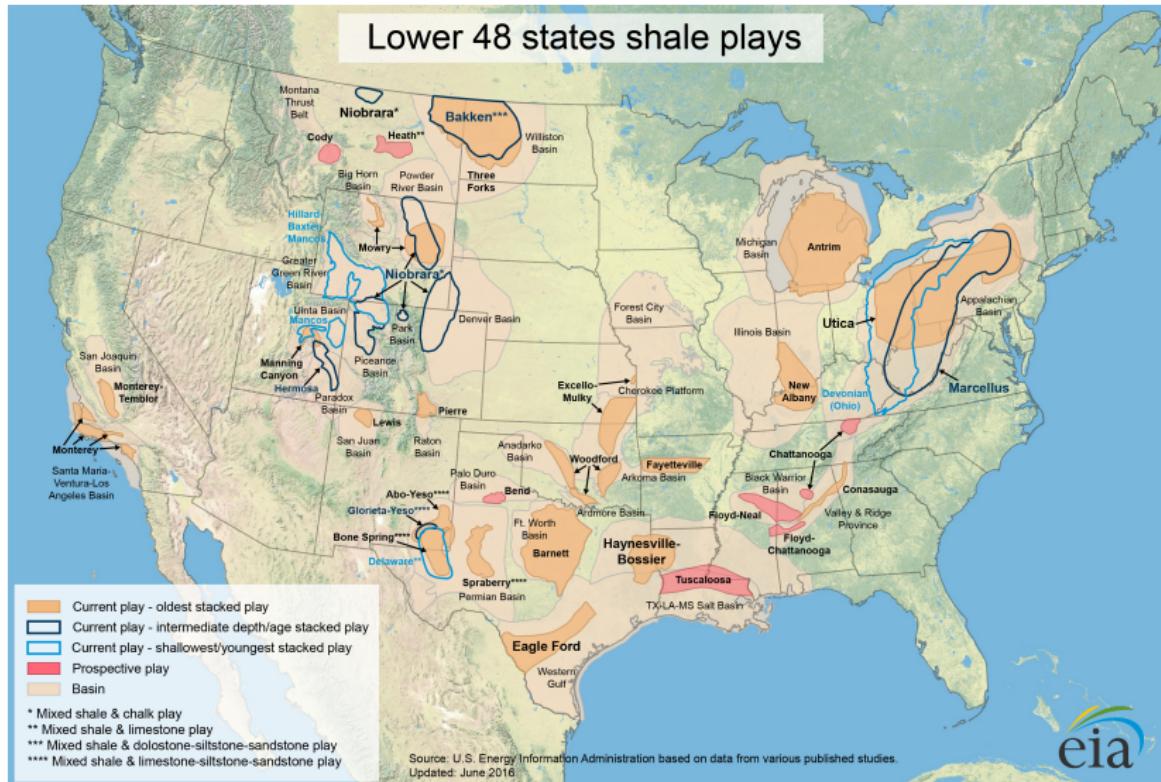
James Woods

# Where is it produced? Just conventional



Source: Energy Information Administration based on data from HPDI, IN Geological Survey, USGS  
Updated: April 8, 2009

# More in the shale areas.

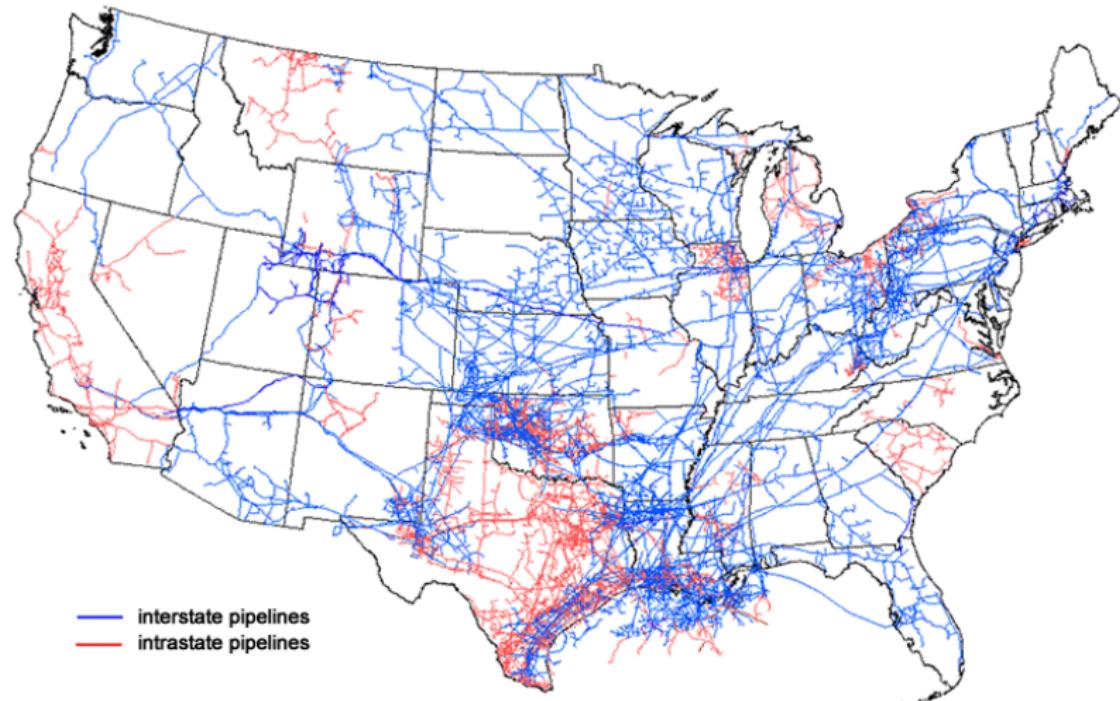


Fracking Well. Will see with oil well with associated gas



# How do you move it within the US? Pipelines.

Map of U.S. interstate and intrastate natural gas pipelines



Source: U.S. Energy Information Administration, *About U.S. Natural Gas Pipelines*

## What about those pipelines?

- ▶ There are more intrastate pipelines than shown, plenty in TX and CA but also other states
- ▶ Picture pipes ranging from a foot to three+ feet for trunk lines.
- ▶ Compressor stations every 50-100 miles, ~1,500 total
- ▶ 200 psi to 1,500 depending
- ▶ They are privately owned
  - ▶ Open access, posted prices, is a thing.
  - ▶ For intrastate, within, state PUC regulate
  - ▶ For interstate, FERC regulates (You can find current Tariffs at <http://etariff.ferc.gov/TariffList.aspx>)

# Compressors



# Compressor Station

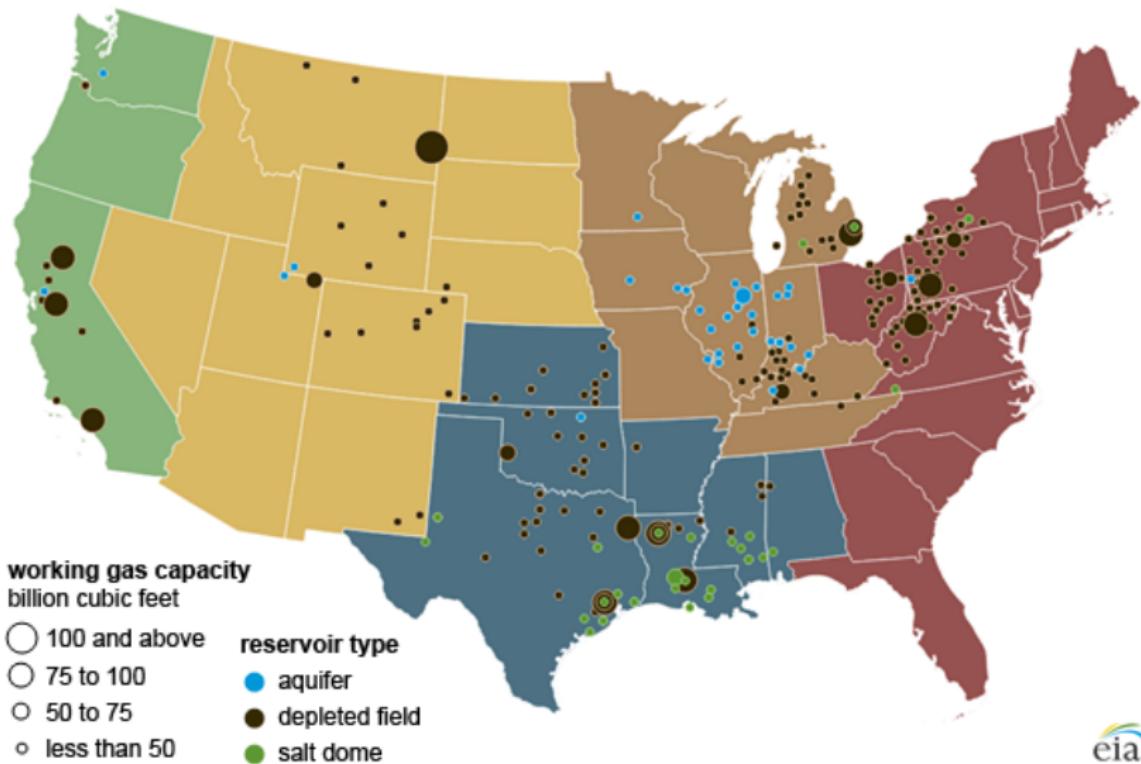


Compressor Station Complex

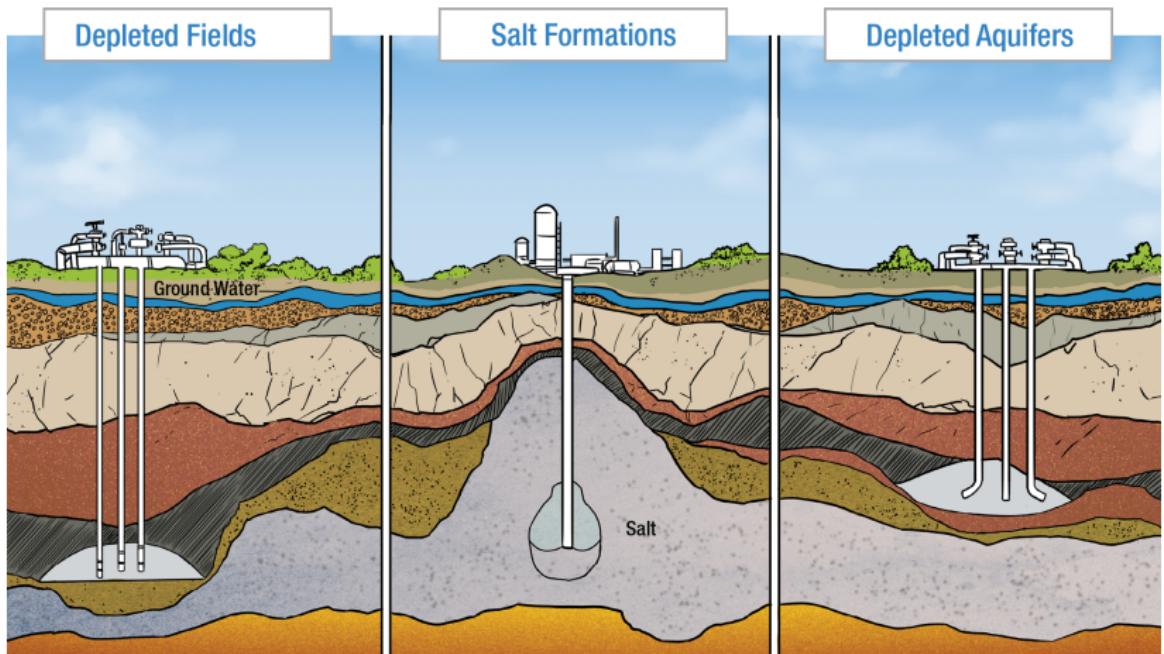
© [www.PaForestCoalition.org](http://www.PaForestCoalition.org)

# Storage is important

U.S. underground natural gas storage facilities by type (July 2015)



# Most Storage is just old gas wells



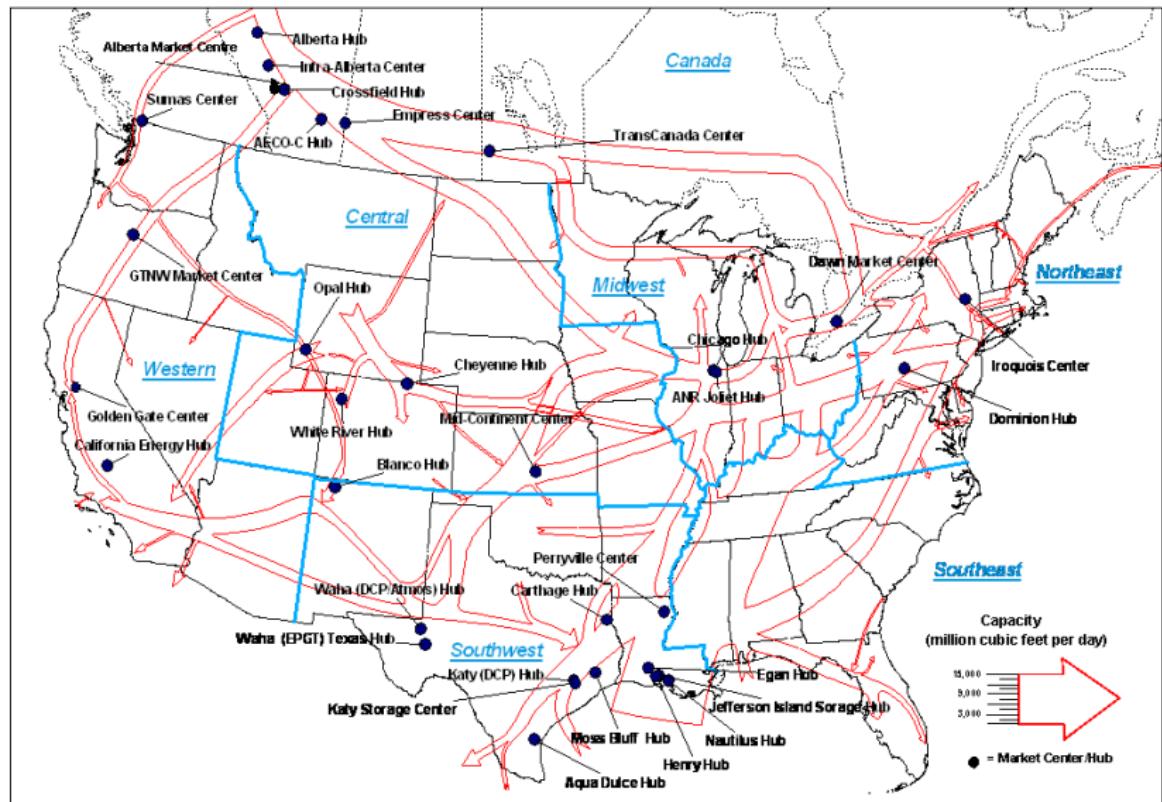
## Storage is very seasonal

There is a weekly report on storage by EIA

[http://www.eia.gov/dnav/ng/hist/nw2\\_epg0\\_swo\\_r48\\_bcfw.htm](http://www.eia.gov/dnav/ng/hist/nw2_epg0_swo_r48_bcfw.htm)

- ▶ Note the seasonality
- ▶ Note the factor of 2+ changes over the term

# Hubs, where transactions are made



# Part of Henry Hub LA



## Getting to Prices

- ▶ You will see wellhead prices, but
- ▶ Most references prices are at the hubs.
  - ▶ Henry Hub in LA is the most common reference hub for prices
  - ▶ There are fairly firm relationships between other hubs and HH except when there is congestion.
  - ▶ Changes in the usual difference are usually called basis blowout. Term is not specific to energy.
- ▶ Intercontinental Exchange for Gas Itself
  - ▶ <https://www.theice.com/products/OTC/Physical-Energy/Natural-Gas>
- ▶ FERC for transportation tariffs (Regulated)
  - ▶ <http://etariff.ferc.gov/TariffList.aspx>
  - ▶ Some are fixed and some have a market rate component.
- ▶ EIA has easier access to prices  
<https://www.eia.gov/dnav/ng/hist/rngwhhdM.htm>

It is hard to talk about gas separate from transportation.

## Intro Deregulation in Natural Gas

- ▶ Transmission companies used to own the gas.
  - ▶ Buy on one end
  - ▶ Sell on the other
- ▶ Natural Gas Policy Act of 1978 started the process . . . but didn't work well
- ▶ FERC 236 1985 simplified product definitions
- ▶ FERC 636 in 1992 was where it really started.

## Key Points about Deregulation in General

- ▶ The point is not to keep hands off and let the markets develop into whatever form they want.
  - ▶ There is a balance between minimizing transactions cost, which your book focuses on, and efficiency.
  - ▶ Markets will tend to reduce transactions cost, merging etc, but that does not make for efficient allocation.
- ▶ The idea is to create market rules that balance allocative efficiency and transaction cost minimization.
  - ▶ Focus on all transactions being visible in some way.  
(Competition requires a good information environment)
  - ▶ Focus on reducing market power (Why pipelines can't own the gas in them any more.)
  - ▶ Open access (Law of one price)
  - ▶ Put a price on everything
    - ▶ Storage
    - ▶ Timing and reliability of transport access
    - ▶ Unbundling of prices.

# Transactions Cost Economics

Goes back to Coase 1937 (Nobel). Williamson (Nobel also), Elinor Ostrom (Nobel too), Hart and Holstrom (2016 Nobel)

Transactions are not cost free:

- ▶ Search and information cost (Coordination)
- ▶ Bargaining (Defining what you want)
- ▶ Enforcement (Getting people to do what they said)
- ▶ Strategic behavior (Hold Up Problem) Transaction specific investments

Minimizing Transaction Cost often means vertically integrating:

- ▶ Merge with your suppliers or with who you supply.
- ▶ Working with only one internal supplier may minimize current costs but may not provide incentives to reduce further.
- ▶ Larger firms often mean more market power in terminal market.

## Intent of regulation is to get closer to perfect competition

- ▶ Information rich
- ▶ Minimized market power
- ▶ Information is contained in prices
- ▶ There are a lot of prices
- ▶ Complex trading floor operations to control cost and risk.